

the technical terms used in the industry. Overall this is a well presented volume, with an abundance of clear diagrams, and is thus thoroughly recommended.

Charles J. Knill
John F. Kennedy

Aging: A Natural History. By R.E. Ricklefs and C.E. Finch, Scientific American Library, New York, 1995. xi + 210 pp. Price \$32.95. ISBN 0-7167-5056-2.

Although aging is an extremely complex and fundamental aspect of life, scientific investigations are gradually transforming our knowledge of its sources and our ability to intervene in its ultimately terminal processes. This volume aims to enlighten its readership to the reasons behind such complexities by discussing the aging patterns of humans and many other species, providing an authoritative treatment of the aging process, drawing on biomedical research and the natural history of animals and plants to describe this 'dreaded' biological phenomenon in fascinating detail.

Contemporary theories of aging and their implications for the future prospect of extending the human life span are presented, all of which have implications for polymeric carbohydrates. Specific topics discussed include genetic mutations, cellular degeneration, body wear and tear, gradual deterioration of the immune system, and environmental causes of aging. Many older people suffer from elevated blood sugar levels which can result in dramatic consequences for how they age. This is due to the loss of insulin effectiveness in promoting muscle glucose uptake. Such increased glucose levels are responsible for a whole host of chemical interactions which can result in the glycation and subsequent cross-linking of long-lived proteins, such as collagen and elastin, causing decreased flexibility and elasticity of the eye lens and connective tissues in the joints, afflictions generally associated with old age. Such phenomena, of course, involve glycoproteins, proteoglycans, and hyaluronic acid.

The desire to attain even greater human life spans continues to grow, and evidence suggests that future biomedical advances will delay and may even eliminate some afflictions associated with advanced age. Indeed, one of the most revolutionary changes in human lifestyles this century has been the gradual increase in human longevity with an ever growing number of individuals receiving their telegrams from Her Majesty The Queen. Three score years and ten is no longer considered to be a ripe old age.

Such aspects of human society raise a number of important issues which impinge on all aspects of our life, such as the medical challenge of improving the quality of life for the elderly, and the economic challenge of supporting an ever increasing population of

retired men and women. The ability of society to resolve such issues relies to some extent on an understanding of the aging process.

In conclusion, this is a well written and extremely informative tome that provides many new insights into the aging process, from laboratory and clinical studies, and also confronts the fundamental issues of how environmental factors have differing influences on the genetic bases of aging patterns in different species. It is therefore highly recommended for those interested in a different viewpoint of the processes, deeply associated with the molecules which they research, which are so often forgotten.

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Charles J. Knill

Food Additive Toxicology. Edited by J.A. Magu and A.T. Tu, Marcel Dekker, Inc., New York, 1995. viii + 542 pp. Price \$175.00. ISBN 0-8427-9245-9.

Food additives have become an intrinsic part of modern foodstuffs, and if many were banned from use, dramatic changes in our food supply and subsequent eating habits would result. A food additive can be defined as any component (single substance or mixture), other than a basic foodstuff component, that finds its way into a food during any stage of its production, processing, packaging, storage or preparation for consumption. The use of food additives is therefore not a recent application, indeed, alcohol, salt, vinegar, spices and smoke have traditionally been utilised to extend the 'shelf-life' of a wide variety of foodstuffs for hundreds of years. Nevertheless, increasing consumer demand for the development of new, and modification of existing, food products with improved characteristics, e.g. texture, flavour, nutritional quality, etc., has resulted in a dramatic increase in the utilisation of natural and synthetic food additives over the last quarter of a century.

This thoroughly up-to-date volume provides both historical information and the latest toxicological data on various classes of food additives by examining the production, application and safety of numerous compounds used to enhance and preserve the quality of foods. A detailed description of the classes of food additives is initially provided, covering the roles of a variety of additive classes including anticaking and antibrowning agents, curing and drying agents, emulsifiers, enzymes, and fumigants and humectants. In-depth discussions of the hazards and safe usage of additives in food, including food acidulants, antimicrobial agents, food colourings, flavourings, antioxidants, etc., are provided. The roles of incidental and/or unintentional food additives are also discussed.

A comprehensive chapter dealing with the use of

modified starches in the food industry is also included in this volume. This chapter discusses a wide variety of treated starches, including bleached and oxidised starches, and starch hydrolysates. The commercial production and utilisation of various starch derivatives, e.g. cross-linked starches, starch ethers and esters, is also presented. Information on permitted levels, digestion and metabolism, and toxicological data is provided where available.

The volume is extremely informative and well presented, with over 200 tables, drawings and equations, and is also extensively referenced, with more than 1750 literature citations. It is therefore highly recommended as an invaluable resource for food scientists, technologists and toxicologists, and is thus a welcome addition to any scientific library.

Charles J. Knill
John F. Kennedy

Bioorganic Chemistry: A Chemical Approach to Enzyme Action, 3rd Edition. Edited by H. Dugas, Springer-Verlag, New York, USA, 1996. xxii + 700 pp. Price £29.50. ISBN 0-387-94494-X.

Bioorganic chemistry is the application of the fundamental principles and the tools of organic chemistry to the understanding of biological processes. Such an understanding is often accomplished by the aid of molecular models which imitate the living processes in nature. The concept of the model construction is a study of the different parameters of a complex biological process. The success of many models indicates the progress that has been made in understanding the chemistry operation in biological systems.

All living processes require energy which is used for a variety of essential functions. The energy is obtained by performing chemical reactions inside cells. Many of the reactions involve combustion of food. When the food, such as carbohydrates, are eaten and digested, a large number of enzymes are released to cleave the sugars molecules to smaller fragments that will eventually be further oxidised by mitochondrial enzymes. Due to the exothermic nature of these processes, a good fraction of energy liberated will be stored as energy-rich phosphodiester bonds in the form of ATP molecules. At the end of the chain, molecular oxygen is finally reduced to water molecules. This is the essence of respiration, which is basically the result of a series of oxidations of carbon molecules which produces water. These transformations are also related to biochemical processes.

The third edition of *Bioorganic Chemistry* has been updated with examples and references. However, the

main change in this edition is a new chapter on molecular devices describing the aspect of supramolecular chemistry and illustrating some points for future development.

The book is divided into four major areas. The first section introduces bioorganic chemistry in order to understand the processes of enzyme action and biological transformations in the cells via models. Next, descriptions of the chemistry of amino acids, and the synthesis and properties of peptides are presented. Cellular metabolism is under enzymatic control and often the enzymes involved need a substance or cofactor, which is called coenzyme, in order to express their catalytic activities. Therefore, a subsequent section deals with enzyme chemistry, enzyme models and coenzyme chemistry. Finally, the molecular devices are offered.

Bioorganic chemistry provides a link between organic chemistry, biochemistry, and protein and medicinal chemistry or pharmacology. With outstanding figures and over one hundred reference articles, this book is a comprehensive and informative reference for everyone in the fields mentioned above and academia.

Pawadee Methacanon
John F. Kennedy

Medicinal Chemistry: Principles and Practice. Edited by F.D. King, The Royal Society of Chemistry, Cambridge, 1994. xxiv + 314 pp. Price £39.50. ISBN 0-85186-494-5.

The main aim of the medicinal chemist is to identify a potential drug candidate from an initial lead compound which possesses all of the desired qualities, e.g. sufficient biological activity, low toxicity, reasonable stability, water solubility (if required), good bioavailability, and suitable pharmacokinetics and dynamics, for successful development into a high quality, efficient, marketable product. In many instances drugs are associated with carbohydrates, glycoproteins and carbohydrate-directed enzymes in their activities.

This volume essentially encompasses the course of lectures presented at the 7th Royal Society of Chemistry Medicinal Chemistry School, at the University of Kent, and is intended to provide a reasonably sound and in-depth introduction to medicinal chemistry, for the benefit mainly of synthetic chemists who are new to the field. Chapters have been written by authors with a diverse range of scientific backgrounds thereby providing as broad a perspective as possible.

The principles and practices of modern medicinal chemistry are introduced and all aspects of drug discovery, from the initial lead to the final development, are covered. Topics discussed include drug-receptor interactions, enzyme inhibitors, pharmacokinetics, drug