GEOMETRICAL PROPORTION AND THE CHRONOLOGICAL METHOD OF APOLLODORUS*

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The most influential of the Hellenistic chroniclers was Apollodorus, an Athenian scholar who took up residence in Alexandria as a student and colleague of Aristarchus. His *Chronica*, an iambic composition in four books, presented a concise annalistic history of the Greek world from the fall of Troy to his own times. The original work does not survive, but later authors frequently cite Apollodorus as their chronological authority. Even when he is not cited by name, the influence of Apollodorus can often be recognized, especially in the biographical tradition, by means of his distinctive chronological method. Hermann Diels demonstrated a hundred years ago that many of Apollodorus' biographical dates derived from theoretical construction rather than documentary evidence. If a person's date of birth was not known, Apollodorus computed one for him by fixing a date for his *akmê*. He assigned to the person the age of forty at the time of an event which reasonably could be associated with his *akmê*—the "bloom" of his professional career. Thus Solon was forty years old in the year of his archonship, Thales when the sun was eclipsed as he had foretold, Thucydides in the first year of the Peloponnesian War. Felix Jacoby documented the hypothesis fully in his monumental *Apollodors Chronik*. Jacoby proved also that Apollodorus used the interval of forty years to date the relative *akmai* of teacher and pupil. By synchronizing the *akmê* of one with the birth of another, Apollodorus could generate dates for an entire series of persons presumed to have

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succeeded one after another as leading practitioners in any given field.[1]

The chief characteristics of Apollodorus' method are now familiar to students of early Greek chronology and the Greek biographical tradition. Important questions nevertheless remain. Why Apollodorus chose the age of forty for the *akmê* is by no means self-evident. Furthermore, a method which relies only on intervals of forty years seems inflexible. It is incapable of accommodating complexities in the tradition without producing distortions—absurd intervals and dates. One wonders how Apollodorus dealt with traditions when the interval of forty years was inappropriate. Not every famous person lived long enough to reach his theoretical *akmê* at the age of forty. For one who was both illustrious and long lived, not every achievement could be associated with his *akmê*. Some accomplishments would have to be dated to an earlier stage of his career, some to a later. Apollodorus would also require a method for systematizing the relative chronology of people whom the tradition suggested were separated by an interval of less than forty years. Few preceptors actually have pupils forty years younger than they. Some synchronism other than that between birth and *akmê* is necessary to accommodate the common relationship between a master and a younger contemporary who was both his student and subsequently his colleague.

There is evidence to suggest that Apollodorus' chronological method did include theoretical ages other than the *akmê* and corresponding intervals of less than forty years. This more complex set of intervals permits a wider range of synchronizations capable of accommodating a variety of traditional relationships. The numerical relationship of the ages and intervals used is also significant for our understanding of the philosophical model upon which Apollodorus' method was based. The most nearly complete evidence appears in two important cases where Apollodorus dealt with the relative chronology of three closely related persons. In both instances the three persons are aged 25, 40,

[1] Hermann Diels, "Chronologische Untersuchungen über Apollodors Chronika," *RhM* 31 (1876) 1–60. Felix Jacoby, *Apollodors Chronik: Eine Sammlung der Fragmente*, Philologische Untersuchungen 16 (Berlin 1902), reprinted Arno Press (New York 1973). Summary treatment appears in *FGrHist* 244. See also the contribution of Erwin Rohde, "*Γέγονε* in den Biographica des Suidas," *RhM* 33 (1878) 161–220, 620–22, 638, reprinted in Rohde's *Kleine Schriften* I (Leipzig 1901) 114–84.

and 64 years, respectively, at one of Apollodorus' epochal dates for synchronization.

The three tragedians constitute one case. The direct evidence for the Apollodoran chronology is meager and consists of a single citation from the *Chronica* in Diodorus: "At the same time (406/5) Sophocles the tragic poet died. He lived ninety years and won eighteen victories. The chronicler Apollodorus says that Euripides also died in the same year."[2] The tradition is unanimous in dating the death of Aeschylus to 456/5 and the deaths of Euripides and Sophocles to within a few months of each other in 407/6 or 406/5.[3] Apollodorus synchronized the deaths of Sophocles and Euripides in 406/5 and stated that Sophocles was ninety years old at the time. Jacoby has shown that this computation of Sophocles' age derives from synchronizing his *akmê* at the age of forty with the death of Aeschylus in 456/5.[4] Diodorus omits Apollodorus' computation of Euripides' life-span. Diogenes Laertius, however, cites Apollodorus for the date of Socrates' birth in 469/8 and adds that Euripides was born in 480/79, the archonship of Calliades.[5] Jacoby argues that this date too is an excerpt from Diogenes' Apollodoran source.[6] Born in 480/79, Euripides was seventy-five years old at his death, a computation in which Apollodorus agreed with the opinion of Eratosthenes.[7] Jacoby suggests that Apollodorus made the year of Aeschylus' death a synchronistic epoch for his treatment of the three tragedians. For according to his *vita* (p. 139 Westermann), Euripides made his first dramatic presentation in 456/5. Apollodorus thus synchronized the death of Aeschylus with the *akmê* of Sophocles and the first presentation of Euripides.[8]

Sophocles was forty years old in the year of Aeschylus' death, and Euripides was twenty-five. Apollodorus' date for the birth of Aeschylus is nowhere specifically attested. Aeschylus was firmly associated with the Persian Wars, however, through both the eyewitness report of his *Persae* and the epitaph memorializing his

[2] Diodorus 13.103.4–5 (*FGrHist* 244 F 35).
[3] *Marmor Parium*, *FGrHist* 239 A 59, 63, 64 and Comm.
[4] F. Jacoby, *Apollodors Chronik* 255.
[5] Diogenes Laertius 2.44–45.
[6] F. Jacoby, *Apollodors Chronik* 257.
[7] *FGrHist* 241 F 12.
[8] F. Jacoby, *Apollodors Chronik* 258.

participation in the victory. If Apollodorus synchronized his *akmê* with the epoch of the Persian Wars in 480/79, Aeschylus was born in 519/18 and he was sixty-four years old (inclusively counted) at the time of his death in 456/5. The fact that Apollodorus synchronized the birth of Euripides with the epoch of the Persian Wars suggests that this reconstruction is correct. A synchronism between the *akmê* of Aeschylus and the birth of Euripides suits Apollodorus' method.[9]

In the system of Apollodorus, then, Aeschylus, Sophocles, and Euripides were aged 64, 40, and 25 at the epochal year of Aeschylus' death. This set of numbers might be regarded as coincidental, deriving from separate computations according to the method of the *akmê* with the usual chronographic synchronisms. Sophocles' age results from the synchronism of his *akmê* with Aeschylus' death. Aeschylus' age derives from synchronizing his *akmê* with the battle of Salamis. Euripides' age derives from the synchronism between his birth and the *akmê* of Aeschylus at the time of the Persian Wars. The set of synchronisms at the year 456/5, however, is too remarkable to pass over without further investigation. That Apollodorus should have synchronized the *akmê* of Sophocles with the death of Aeschylus is not surprising, especially since it resulted in a total life-span for Sophocles which accorded well with the indisputable fact that he lived to an advanced age.[10] For the same year to have been also that of Euripides' first presentation is a coincidence which arouses suspicion. Jacoby believes that the date is documentary and was one of Apollodorus' starting points.[11] Records were indeed kept of the dramatic festivals, and the extant remains show that victories were duly recorded from early in the fifth century. The oldest fragments are too poorly preserved, however, to indicate whether the names of all contestants were entered as early as 456/5, victorious or not.[12] On the other hand,

[9] Aeschylus' epitaph is preserved in his *vita* (p. 120 West.), and Pausanias (1.14.5) comments on the fact that it mentioned his participation in the Persian Wars but not his literary career. The Apollodoran computation of his age at death is most nearly approximated by the sixty-three years of the *vita* (p. 121 West.), a figure which would result from the Apollodoran data exclusively counted.

[10] The interval of more than sixty years between his first victory in 469/8 (*Marmor Parium*, *FGrHist* 239 A 56) and his death was sufficient to establish this fact, quite apart from the stories told about Sophocles as an old man.

[11] F. Jacoby, *Apollodors Chronik* 255, 259.

[12] For the evidence see Kaibel and Wilhelm, *Urkunden dramatischer Aufführungen in*

synchronisms such as that between the first presentation of Euripides and the *akmê* of Sophocles are characteristic of chronographic invention. Aeschylus too is reported to have made his first presentation at the age of twenty-five.[13] The year would have been 495/4 in Apollodorus' chronology, synchronous with the birth of Sophocles. The presence of a second such coincidence suggests that the age of twenty-five for first presentations derives from theoretical considerations in synchronistic chronography, rather than documentary evidence.

The case of the tragedians is not conclusive, since their ages in 456/5 could have been separately derived. The synchronisms at that year do suggest, however, that we should look elsewhere among the fragments of Apollodorus to see if there is another case where three persons are synchronized at the ages of 25, 40, and 64. Just such an instance is found at the synchronistic epoch of the fall of Sardis in connection with the philosophers Anaximander, Anaximenes, and Pythagoras. The evidence is as follows:

(1) Diogenes Laertius 2.2. (*FGrHist* 244 F 29): "A summary of Anaximander's chief doctrines was made, which Apollodorus of Athens somehow came upon. For he states in his *Chronica* that in the second year of the 58th Olympiad (547/6) he was sixty-four years old and died shortly thereafter."[14]

Athen (Vienna 1906), and Pickard-Cambridge, *The Dramatic Festivals of Athens*, revised by Gould and Lewis (Oxford 1968).

[13] The *Suda* s.v. *Αἴσχυλος*: *ἠγωνίζετο δὲ αὐτὸς ἐν τῇ θ' ὀλυμπιάδι ἐτῶν ὢν κε'*. The text does not specifically state that this was the first presentation, but it is a natural inference since only the first would warrant such a notice. The date in the 9th Olympiad (744/1) is usually corrected to the 70th (500/497) through comparison with the statement of the *Suda* that Pratinas competed with Aeschylus and Choerilus in that Olympiad. If the emendation is right, the date does not accord with the Apollodoran chronology, which places Aeschylus' twenty-fifth year in 495/4. Combination of data from once independent sources is not unusual in the *Suda*. The *Suda*'s date is Aeschylus' twenty-fifth year according to the chronology of the *Marmor Parium* (*FGrHist* 239 A 48, 59). The Apollodoran date for Aeschylus' first presentation at the age of twenty-five is the origin of Eusebius' notice (107[h] Helm) under the 71st Olympiad (496/3): *Aeschylus tragoediarum scriptor agnoscitur*. For Euripides both the Apollodoran date and the age are transmitted in the *vitae*. His age is given as twenty-six in one text (134 West.), twenty-five in another (139 West.). Both agree on the dates of his birth and first presentation, so that the number 26 seems to be a textual error.

[14] Diogenes adds the phrase, "flourishing about the time of Polycrates the tyrant of Samos." As Jacoby has argued (*Apollodors Chronik* 215–17), the phrase properly belongs

(2) Diogenes Laertius 2.3 (*FGrHist* 244 F 66): "Anaximenes flourished, as Apollodorus says, at the time of the fall of Sardis, and he died in the 63rd Olympiad (528/5)."[15]

(3) Clement, *Strom.* 1.65: Tatian, *ad Graec.* 41; Cicero, *de Rep.* 2.28 (*FGrHist* 244 F 339): Pythagoras flourished in the 62nd Olympiad (532/29) in the time of Polycrates the tyrant of Samos, when he emigrated from Samos to Italy.

According to Jacoby, these dates for the three philosophers derive from separate computations. Apollodorus synchronized the *akmê* of Anaximenes with the death of Thales in the year of the fall of Sardis, 546/5. That year happens to be the fortieth after Thale's *akmê* in 585/4, so that the birth of Anaximenes is synchronized with the *akmê* of Thales. Apollodorus synchronized the *akmê* of Pythagoras with the fixed epoch of Polycrates in 532/1. He dated the *akmê* of Anaximander to the fortieth year earlier, synchronous with Pythagoras' birth in 571/0.[16]

Jacoby's reconstruction is not satisfactory. How Apollodorus derived the date 547/6 for the publication of Anaximander's book remains unexplained, as Jacoby himself concedes.[17] Furthermore, there is no evidence that the precise date of Polycrates' usurpation was known. There was therefore no "fixed epoch of Polycrates" with which to synchronize the *akmê* of Pythagoras. An alternative explanation must be sought. Thales is reported to have been seventy-eight years old in the Apollodoran chronology when he died shortly after giving his assistance to Croesus in launching the war against Cyrus.[18]

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to the biography of Pythagoras and appears here through hasty compression in Diogenes' source material. Some such phrase as "he was a teacher of Pythagoras" has been omitted.

[15] The clauses are reversed in the text so that Anaximenes is made to flourish in the 63rd Olympiad and die at the time of the fall of Sardis. The fall of Sardis in the Apollodoran tradition is always a reference to the war of Croesus and Cyrus. Anaximenes should not be dated down to the time of the Ionian revolt. This argument, already refuted by Jacoby (*Apollodors Chronik* 193), has been revived by G. B. Kerford, "The Date of Anaximenes," *MH* 11 (1954) 117–21.

[16] F. Jacoby, *Apollodors Chronik* 190, 194, 217.

[17] F. Jacoby, *Apollodors Chronik* 190: "die frage ist also nur noch, ob A. die edition des buches mit recht in ol. 58, 2 gerückt hat. wir wissen nicht, welcher mittel er sich zu dieser bestimmung bediente."

[18] Diogenes Laertius 1.37–38 (*FGrHist* 244 F 28).

Since his *akmê* was dated to the year of the eclipse in 585/4, his death at the age of seventy-eight must have been dated to 547/6 in the Apollodoran system. Jacoby is doubtless right in suggesting that Apollodorus synchronized the death of Thales with the fall of Sardis. Apollodorus' date for the fall of Sardis was therefore 547/6.[19] The fact that this was a synchronistic epoch accounts for the appearance of the date in the biography of Anaximander. According to Apollodorus, Anaximander was sixty-four years old at that date. Anaximenes reached his *akmê* at the time of the fall of Sardis. Since Pythagoras flourished at the age of forty in 532/1, he was twenty-five years old in 547/6. The three philosophers were accordingly at the age of 64, 40, and 25 in the epochal year of the fall of Sardis. A chain of relationships among them is attested in the doxographic tradition. Anaximenes was the student, colleague, and successor of Anaximander—that is, he was a younger contemporary.[20] Pythagoras had been a student of Anaximander before his emigration to Italy.[21] This is the second instance of three persons closely related in the tradition having the ages of 25, 40, and 64 at one of Apollodorus' synchronistic epochs. Apollodorus apparently dealt with the three as a group and stated their ages for the epoch of the fall of Sardis. The age of sixty-four he associated with the alleged publication of a book summarizing Anaximander's chief doctrines. The age of forty marks the *akmê* of his younger contemporary Anaximenes. Pythagoras at the age of twenty-five was forty years younger (by inclusive count) than his master Anaximander.

A third such instance can unfortunately not be reconstructed from the extant fragments of Apollodorus. It is not likely, however, that the appearance in synchronism of the ages 25, 40, and 64 in two such important cases as those adduced is fortuitous. Proof that the intervals of 25, 40, and 64 years do indeed constitute a theoretical set follows from consideration of the numerology itself. Two approaches are instructive. First, the ages of 25 and 64 suit the method of the *akmê* well. The set—25, 40, 64—permits chronographic synchronisms among the persons involved at several stages of their careers. The

[19] Cf. H. Kaletsch, "Zur lydischen Chronologie," *Historia* 7 (1958) 39.
[20] Theophrastus *apud* Simplicium, DK 13 A 5.
[21] Iamblicus, *vit. Pyth.* 11.

interval between 25 and 64 is the same as the interval between 1 and 40. The outer two numbers are thus separated by the forty year interval of the *akmê*, inclusively counted. For persons to whom the ages of 25 and 64 are assigned in synchronism, the synchronism between birth and *akmê* also applies. That synchronism appears at the 25th year before the epochal date. At the 40th year before the epochal date, there is a synchronism between the birth and the 25th year of the two oldest persons in the set. The age of 64 marks a significant event for a person's later years—Aeschylus' death, the publication of a book in Anaximander's case. The age of 25 signifies a first entry to fame—first presentation for the tragedians, for Pythagoras the age at which he received the mantle of philosophy from Anaximander. The possibilities are well illustrated in the case of the tragedians, as the following outline shows:[22]

519/18: Aeschylus' birth
495/4: Aeschylus' first presentation at the age of 25
Sophocles' birth
480/79: Aeschylus' *akmê* at the age of 40
Euripides' birth
456/5: Aeschylus' death at the age of 64
Sophocles' *akmê* at the age of 40
Euripides' first presentation at the age of 25

The ages of 25, 40, and 64, applied in synchronism at an epochal date, produce synchronisms of the sort typical in Hellenistic chronography at other dates. This fact alone suggests that 25 and 64, like 40, are theoretical ages associated with the method of the *akmê*. The second approach to the numerology offers further confirmation that the appearance of these ages at epochal dates in the Apollodoran system is not accidental. There is a rigorous mathematical relationship

[22] The first presentation of Sophocles in 469/8 (*Marmor Parium*, *FGrHist* 239 A 56) lies outside the system. He was victorious in his first contest (Plutarch, *Cimon* 8.8), and the victory was duly recorded. Apollodorus had therefore no need to resort to his model. The *akmê* of Euripides in 441/0 happens to be synchronous with Sophocles' generalship (Androtion, *FGrHist* 324 F 38). The date marks Sophocles' fifty-fifth year in Apollodorus' system, and Plutarch (*Moralia* 785b) says Sophocles was fifty-five years old when he wrote the poem to Herodotus. The date of the generalship is documentary, but the poem may have been artificially synchronized with it and Sophocles' age at the time computed by reference to the Apollodoran birthdate.

among the numbers themselves. The ratio of 25 to 40 is the same as the ratio of 40 to 64 ($\frac{25}{40}=\frac{40}{64}$). Reduced to simplest integers the ratio is that of 5 to 8 ($\frac{25}{40}=\frac{5}{8}=\frac{40}{64}$). The square root of 25 is 5, the square root of 64 is 8, the factors of 40 are 5 and 8. More simply stated, the numbers 25, 40, and 64 form a geometrical proportion. Three quantities—*a*, *b*, *c*—are said to be a geometrical proportion if $a/b=b/c$ or $b^2=ac$. The numbers 25, 40, and 64 form a geometrical proportion of the special type $a^2/ab=ab/b^2$, where $a=5$ and $b=8$ $((5\times 5)/(5\times 8)=(5\times 8)/(8\times 8))$.

The chronological method of Apollodorus included theoretical ages of twenty-five and sixty-four, as well as forty. This conclusion follows from the appearance of these ages in synchronism at two of Apollodorus' significant epochs, from their close relationship in the method of the *akmê* for synchronistic chronography, and from the fact that the numbers themselves form a geometrical proportion. The origins of the system will be examined shortly. First it is essential to note that Apollodorus did not apply the method arbitrarily. The set permitted him to systematize the relative chronology of persons among whom there existed a closer or more complex relationship in the tradition than the method of the *akmê* alone could accommodate. He applied the theory only in such a way as to produce a suitable representation of the tradition. In the case of the tragedians the relative chronology had long received expression in the tradition that Aeschylus was a mature man at the time of the Persian Wars, Sophocles a youth, and Euripides no more than an infant. Aeschylus' participation in the Persian Wars was attested in his epitaph, the birth of Euripides had been synchronized with the very day of the battle of Salamis as early as Timaeus, while Sophocles was reported to have been among a chorus of youths who celebrated the victory.[23] The details may be regarded as late invention; but the tradition in its broad outlines is doubtless quite old, and it underlies most computations of the tragedians' birthdates. The *Marmor Parium* (*FGrHist* 239 A 50) synchronizes the birth of Euripides with a victory of Aeschylus in the year 485/4. Aeschylus was forty years old at the time, according to the ages assigned to him elsewhere on the stone (A 48, A 59). The age of twenty-eight for Sophocles at the time of his first victory in

[23] *Vit. Aesch.* 120 West., Timaeus *FGrHist* 566 F 105; *vit. Soph.* 127 West.

469/8 (A 56) suggests that the *Marmor's* source synchronized his *ephêbeia* with the battle of Salamis. This same tradition led to Philochorus' statement (*FGrHist* 241 F 12) that Euripides was over seventy when he died and to Eratosthenes' more precise computation (*FGrHist* 241 F 12) that Euripides, since he was born about the time of the Persian Wars, must have been seventy-five years old when he died. Apollodorus had no serious disagreement with the earlier authorities. The dates of the tragedians' deaths were known from contemporary record. Apollodorus diverged only in lowering the date of Euripides' death by a few months to bring it into synchronism with the death of Sophocles.[24] Eratosthenes' computation had already brought Euripides' twenty-fifth year into synchronism with the death of Aeschylus. It was a simple matter to assign the *akmê* of Sophocles to the same year. It remained only to compute the birthdate of Aeschylus. By assigning to him the age of sixty-four at his death, Apollodorus was able to preserve the synchronism between Euripides' birth and Aeschylus' *floruit* at the time of the Persian Wars. Apollodorus adopted and made a final synthesis of the vulgate tradition, converting the relative chronology to an absolute one, by assigning to the three tragedians the ages of sixty-four, forty, and twenty-five at the epochal year of Aeschylus' death in 456/5. By this chronology Sophocles was twenty-seven years old at the time of his first victory in 469/8, a date transmitted from documentary record. Sophocles was supposed to have been victorious when he made his first presentation.[25] It therefore seemed appropriate to date the first presentations of Aeschylus and Euripides to about the same time in their lives—the theoretical age of twenty-five.

The philosophers Anaximander, Anaximenes, and Pythagoras were traditionally associated as master, colleague, pupil.[26] Anaximander was supposed to have been a younger contemporary of Thales and Pythagoras was firmly associated with Polycrates.[27] Thales' *akmê* had

[24] In thus dating the death of Euripides to 406/5, Apollodorus had precedent in Timaeus' (*FGrHist* 566 F 105) synchronism between the death of Euripides and the accession of Dionysius as tyrant of Syracuse in that year. Eratosthenes too seems to have adopted the synchronism, since he stated (*FGrHist* 241 F 12) that Euripides was seventy-five years old when he died.

[25] Plutarch, *Cimon* 8.8.

[26] See above, notes 20 and 21. The attempt to synchronize the three is thus pre-Apollodoran, while the precise dates derive from the Apollodoran synthesis.

[27] Theophrastus *apud* Simplicium, DK 12 A 9; Aristoxenus, fr. 16 Wehrli.

been dated to 585/4 in synchronism with the eclipse and the Lydo-Median war. Polycrates could be dated about 530 through the synchronism with Cambyses.[28] Given these *termini*, Apollodorus systematized the relative chronology of Anaximander, Anaximenes, and Pythagoras by assigning to them the ages of sixty-four, forty, and twenty-five at the epoch of the fall of Sardis in 547/6. With the birthdate of Pythagoras thus fixed at 571/0, Apollodorus was able to infer a more precise date for Polycrates. According to Aristoxenus (fr. 16 Wehrli), Pythagoras was forty years old when he emigrated from Samos to Italy after seeing the tyranny of Polycrates take root. The *akmê* of Pythagoras in 532/1 therefore implies the date for Polycrates' usurpation a year or two earlier. Eusebius dates the usurpation of Polycrates and the beginning of the Samian thalassocracy to 533/2. The *floruit* of his friend Anacreon appears at the same date. Diodorus dates the *akmê* of Pythagoras to 533/2, a statement perhaps deriving from confusion with the Apollodoran date for Polycrates.[29]

A related case appears in the Apollodoran chronology for Pittacus. According to Diogenes, Apollodorus dated the death of Pittacus after ten years in retirement to 578/7. Diogenes dates the *akmê* to 612/11. Pittacus was accordingly sixty-four years old when he resigned his *aisymnêteia* in 588/7, and it is possible that this fact reflects the use of a theoretical age as a starting point.[30] Such speculation does of course have its limits. Apollodorus did not always use the theoretical ages. In the case of Hellanicus, Herodotus, and Thucydides, for example, Apollodorus dealt with the three as a group and stated their ages for

[28] How Apollodorus derived the date for the eclipse cannot detain us here. It is reported by Pliny, *NH* 2.53, a passage which derives from Apollodorus through the *Chronicle* of Nepos. That Polycrates and Cambyses were contemporaries is attested by Herodotus (3.39; 3.120) and Thucydides (1.13.3). Apollodorus could infer an approximate date for the synchronism by reference to the lists of the Persian kings.

[29] Eusebius, p. 104 Helm. The *Suda*, however, dates the *floruit* of Anacreon to 532/1. The *Suda*'s date for Anacreon derives from synchronism through Polycrates with Pythagoras, while Diodorus' source made the opposite mistake, excerpting the date for Polycrates instead of that of Pythagoras.

[30] Diogenes Laertius 1.74–75, 79 (*FGrHist* 244 F 27). The text states that Pittacus died in the third year of the 52nd Olympiad (570/69), but adds that he was over seventy when he died. Since he flourished at the age of forty in 612/11, either the date of his death or the age is in error. Jacoby (*FGrHist* 244 F 27 Comm.) emends the date, arguing that the β' of $\nu\beta'$ is a dittography repeated under the influence of the date for the *akmê* (Olympiad $\mu\beta'$). The correct date is therefore the third year of the 50th Olympiad, 578/7.

the synchronistic epoch of the first year of the Peloponnesian War—sixty-five, fifty-three, and forty. These ages cannot be seen as a variant of the set 64, 40, 25. Apollodorus applied the theoretical set only when he deemed it both appropriate and necessary for the systematization of the tradition. In the case of the historians, Apollodorus thought he had better evidence for the independent computation of their respective *akmai*.[31]

It remains to ask how the Apollodoran chronology came to be influenced by this particular model with theoretical ages at twenty-five, forty, and sixty-four. Eduard Meyer believed that the forty year intervals of Apollodorus' method derived from genealogical chronology. On that hypothesis, Apollodorus' choice of the number reflects an historiographic practice which Meyer attributed to Hecataeus, according to which forty years was considered the average length of a biological generation.[32] The appearance of theoretical ages at twenty-five and sixty-four, however, renders that hypothesis inadequate. Furthermore, while the interval of forty years between literary and philosophical successions may perhaps be interpreted as representing an "intellectual generation," that interval derives from the method of the *akmê* itself—not vice versa. It is the synchronism between birth and *akmê* which produces the interval. We must therefore investigate the origins of the concept of *akmê* and ask how the age of forty came to be associated with it. For Apollodorus, the *akmê* represents intellectual maturity—a usage which has its parallel in the medical literature relating to physiological maturity.[33] As Jacoby has suggested, such a concept derives from the natural division of human life into several stages.[34] Solon, for example, divided life into ten

[31] Gellius 15.23 (*FGrHist* 244 F 7). For the computations see F. Jacoby, *Apollodors Chronik* 277–84, and for a somewhat different reconstruction A. A. Mosshammer, "The Apollodoran Akmai of Hellanicus and Herodotus," *GRBS* 14 (1973) 5–13.

[32] Eduard Meyer, "Herodots Chronologie der griechischen Sagengeschichte, mit excursen zur Geschichte der griechischen Chronographie und Historiographie," *Forschungen zur alten Geschichte* I (Halle 1892) 151–88. Meyer's argument is characterized as "a series of ingenious inferences" by Lionel Pearson, *The Early Ionian Historians* (Oxford 1939) 106, and criticized at length by Fordyce Mitchell, "Herodotus' use of Genealogical Chronology," *Phoenix* 10 (1956) 48–69.

[33] E.g., *de diaet.* 1.25: ὅσα δὲ τῶν σωμάτων ἀκμάζοντά ἐστι καὶ ἐν τῇσιν ἡλικίῃσι τῇσι γονίμῃσι δύναται τρέφειν καὶ αὔξειν. Cf. *epidem.* 1.1.15, 19.

[34] F. Jacoby, *Apollodors Chronik* 41–47.

stages of seven years each. The maturity of physical strength he set in the fourth hebdomad, while mind and tongue were at their best during the seventh and eighth (that is, between the ages of forty-three and fifty-six).[35] A more natural division is that into four stages representing, by analogy with the cycle of the seasons, infancy, growth, maturity, and decay. Such a doctrine existed in Pythagoreanism. Diogenes Laertius reports that Pythagoras "divides the life of man thus —childhood, twenty years; youth, twenty; manhood, twenty; old age, twenty. The ages are proportionate to the seasons: childhood to the spring, youth the summer, manhood autumn, and old age winter."[36] The divisions imply an *akmê* at the age of forty, and it was this doctrine which led Aristoxenus to state that Pythagoras was forty years old when he left Samos in order to found a philosophical community in Italy (fr. 16 Wehrli). Jacoby argues therefore that it was the Pythagorean division of the perfect life from which the method of the *akmê* derived. Apollodorus adopted the teaching from Aristoxenus.[37]

According to Diogenes' source, the four stages of the perfect life were of equal length—twenty years each. Apollodorus' chronological method, however, included theoretical ages at twenty-five and sixty-four—not twenty and sixty. Together with the *akmê* at the age of forty, the figures form a geometrical proportion such that the outer two numbers are the squares of the factors of the central term (5×5, 5×8, 8×8). A doctrine of proportion was therefore the basis of Apollodorus' system. Pythagoreanism is the likely source. Proportion was at the heart of Pythagorean mathematics. Proclus specifically attributed to Pythagoras the discovery of the theory of proportionals.[38] It was by adducing geometrical proportion in similar right-triangles

[35] Solon, fr. 19 Diehl.

[36] Diogenes Laertius 8.10: διαιρεῖται δὲ καὶ τὸν τοῦ ἀνθρώπου βίον οὕτως· παῖς εἴκοσι ἔτεα, νεηνίσκος εἴκοσι, νεηνίης εἴκοσι, γέρων εἴκοσι. αἱ δὲ ἡλικίαι πρὸς τὰς ὥρας σύμμετροι· παῖς ἔαρ, νεηνίσκος θέρος, νεηνίης φθινόπορον, γέρων χειμών. The division of the year into four seasons, rather than three, does not make the doctrine too late for Pythagoreanism. The names and number of the seasons vary from region to region; cf. M. P. Nilsson, *Primitive Time Reckoning* (Lund 1920).

[37] F. Jacoby, *Apollodors Chronik* 46.

[38] Proclus, *in Eucl.* 65.11 (DK 14 6a). For the interpretation of the passage and discussion of the Pythagorean theory of proportionals see Thomas Heath, *A History of Greek Mathematics* I (Oxford 1921) 84–90, and Paul-Henri Michel, *De Pythagore à Euclide* (Paris 1950) 365–411.

that Pythagoras proved the famed theorem which bears his name.[39] The theory of proportionals also underlies Pythagorean harmonics. Pythagoras found that the basic musical consonances could be produced on a monochord by imposing upon it the proportions of the first four integers (octave = $\frac{1}{2}$, fifth = $\frac{2}{3}$, fourth = $\frac{3}{4}$). This discovery led to the mystical equation of numbers with realities.[40] Apollodorus' numbers are a geometrical proportion of the type $a^2/ab = ab/b^2$. Plato, in a passage where it is generally agreed that he "Pythagorizes," adduces this square proportional as perfect for construction in two dimensions.[41] In harmonics, this type of proportional expresses the relationship among the three consonances, where a is the fifth, b the fourth, and ab the octave ($\frac{4}{9}/\frac{1}{2} = \frac{1}{2}/\frac{9}{16}$). In other words, the octave is the geometrical mean between the squares of the fifth and the fourth.

An extended excursus into Pythagoreanism would be out of place in the present discussion. These few points are sufficient to establish the importance for Pythagoreanism of the geometrical proportion $a^2 : : ab : : b^2$. The Pythagorean preoccupation with square numbers and mean proportionals suggests that Apollodorus' theoretical ages at twenty-five, forty, and sixty-four represent a Pythagorean teaching. The Pythagorean doctrine of the four stages of life may therefore be interpreted accordingly. The perfect life is one of eighty years divided at the arithmetical mean of forty. Each half is subdivided into unequal but proportionate parts such that the arithmetical mean of the whole is the geometrical mean of the parts. The shortest and longest segments can be expressed as square numbers whose roots are the factors of the half. Thus the spring of childhood lasts until the twenty-

[39] The perpendicular of a right-triangle divides it into two similar right-triangles whose sides are proportionate to each other and to the sides of the whole. For demonstration of the Pythagorean theorem (the square of the hypotenuse is the sum of the squares of the legs) see Heath 147–49 and Michel 416–19 (above, note 38).

[40] Heath (above, note 38) 69; *ibid.*, *Aristarchus of Samos* (Oxford 1913) 46–47; cf. G. S. Kirk and J. E. Raven, *The Presocratic Philosophers* (Cambridge 1960) 229. For Pythagorean harmonics see R. P. Winnington-Ingram, "Greek Music: Ancient," *Grove's Dictionary of Music and Musicians* III (London 1954) 770–81, and (in collaboration with J. F. Mountford) "Music," *OCD* (Oxford 1970) 705–13.

[41] Plato, *Timaeus* 32a–b. See Heath (above, note 38) 89, A. E. Taylor, *A Commentary on Plato's Timaeus* (Oxford 1928) 96–99, F. M. Cornford, *Plato's Cosmology* (London 1937) 45–52.

fifth year and youth's summertime growth until the fortieth. At the age of forty life comes into full bloom (*akmê*). The intellectual fruit remains mature and ripe for harvest until the sixty-fourth year before succumbing to winter's decay. At the age of twenty-five, the beginning of summer, one embarks upon his professional career. He reaches his *akmê* at summer's end. At the age of sixty-four, the time of late autumnal harvest, he imparts the nurturing fruit of his life's work to a youth passing from spring into summer at his twenty-fifth year. Such a doctrine is not only mathematically more beautiful than Diogenes' four equal divisions, but is also more nearly representative of life's usual course. Diogenes or his source had received the doctrine in excerpted form. Only the four divisions corresponding to the seasons were reported. Diogenes or his source wrongly inferred that the divisions had been of equal length. Aristoxenus was personally acquainted with eminent Pythagoreans of the fourth century, and he composed a work *περὶ τοῦ Πυθαγορείου βίου* (frr. 26–32 Wehrli).[42] Apollodorus received the doctrine from him in its original form and used it as a model for chronological construction. Whether Apollodorus was the first to do so, it is impossible to know. No earlier chronicler is sufficiently well preserved to permit a positive inference.

The discovery of geometrical proportion in the chronological method of Apollodorus does not account for all the details transmitted in the late chronographic tradition for the persons involved. Nor should one necessarily expect to find such proportions elsewhere in the

[42] The possible musical implications of the 5:8 ratio bear investigation. Only the octave, the fifth, and the fourth are specifically attested for Pythagoras, but it is likely that the third (4:5) was also known. It is usually assumed that the other intervals were generated from the fifth in a series which represents all the intervals as powers of 2 and 3. The evidence, however, is late and bears on Hellenistic practice rather than early Pythagorean. Anyone experimenting with a monochord would surely try the arithmetical mean between the octave ($\frac{1}{2}$) and the fourth ($\frac{3}{4}$). That point is at five-eighths vibrating length, and the interval produced is a minor sixth. If Apollodorus' series of numbers are laid out on a monochord of eighty units, the length of twenty-five sounds a minor sixth to the octave at forty, while the octave sounds a minor sixth in relation to the length of sixty-four. That length in turn sounds a third in relation to the fundamental. Taken together and reduced to a single octave, the three sounds represent an augmented triad. The doctrine thus becomes an expression of the harmony of life. This approach, of course, is highly speculative. Whether or not the ratio 5:8 is significant for Pythagorean harmonics requires separate research into a complex problem which lies outside the bounds of the present investigation.

traditional structure of early Greek chronology. There is no simple solution to the chronographic problem. Nevertheless, this investigation permits the following conclusions:

(1) Greek chronography is embedded in a rich and complex tradition with theoretical roots in philosophy and mysticism. The chronographic tradition cannot be understood on hypotheses of generation-counting alone.

(2) The age of forty is not the only one of which students of the biographical tradition should be suspicious. The belief that Anaximander's age at the time of the alleged publication of a book is an autobiographical report should be abandoned. Even the hypothesis that the traditional date of Euripides' first presentation derives from documentary evidence is open to challenge.

(3) Greek chronologists such as Apollodorus had recourse to mathematical devices with internal symmetry. The theory could, however, accommodate a range of chronological implications already present in the traditional material. The application of a mathematical device was the last step in the construction of an absolute chronology. Such devices were employed only if they provided a suitable representation of the available evidence. Apollodorus' use of the set 25-40-64 is a case in point of what should become a generally recognized truth. Every detail of traditional Greek chronology invites suspicion and debate, but the structure as a whole must stand.