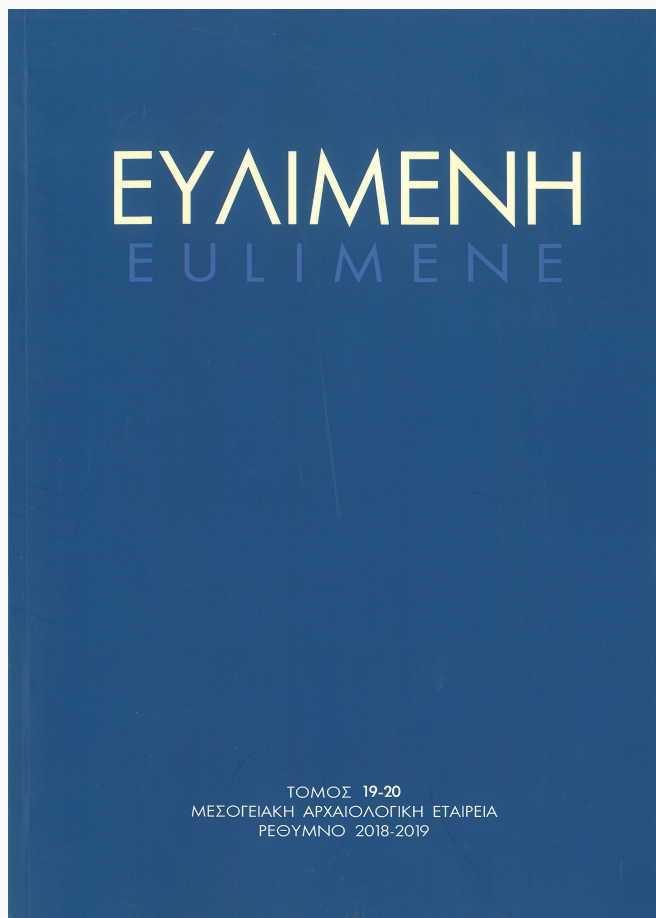


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Lunisolar Calendars, the Antikythera Mechanism, the Halieia of Rhodes and some thoughts on the Calendars of Rhodes and Kos

Paul A. Iversen

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ΕΥΛΙΜΕΝΗ

ΜΕΛΕΤΕΣ ΣΤΗΝ ΚΛΑΣΙΚΗ ΑΡΧΑΙΟΛΟΓΙΑ,
ΤΗΝ ΕΠΙΓΡΑΦΙΚΗ, ΤΗ ΝΟΜΙΣΜΑΤΙΚΗ ΚΑΙ ΤΗΝ ΠΑΠΥΡΟΛΟΓΙΑ

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Ρέθυμνο 2018-2019

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Περίληψεις / Summaries / Zusammenfassungen /

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Νεραντζής Νεραντζής – Στρατής Παπαδόπουλος, Η μεταλλουργία της Πιστύρου και της περιοχής της κατά τους ιστορικούς χρόνους: η έρευνα και τα πρώτα πορίσματα, *EYAIMENH* 19-20 (2018-2019), 1-24.

The metal production at Pistyros and the surrounding area in the historical period: Reserach and first results. This article focuses on metal production at the Thasian colony of Pistyros in Aegean Thrace during the Classical/Hellenistic periods. Evidence for mining activity in the Lekani Mountains, that was mentioned by ancient authors is also under examination. Mining shafts and galleries, mineral processing areas and slag heaps represent direct evidence for the organization and running of large-scale metal production in this region. With the foundation of Thasian colonies and emporia in the coastal zone, the output in metals increased and this became possible through the involvement of Thracian manpower as they were more numerous and better suited to exploit these resources. On the other hand, the Greeks of the colonies traded finished products in exchange for raw materials. This reciprocal relation is corroborated by recent evidence for metal production deriving from the ongoing excavation at Pistyros, namely large volumes of metallurgical slag. The archaeological findings reveal that primary smelting of iron/manganese ores bearing precious metals and argentiferous lead ores were smelted at Pistyros for the extraction of silver and possibly also gold. The coexistence of slag, speiss and litharge at Pistyros provide clues to the potential workflow for precious metals extraction. Thus, it is being suggested that three liquid layers formed within the same furnace: a) slag floating on the top, b) speiss separating in the middle and c) a layer rich in Pb/Ag collected at the bottom. The next stage would involve further treatment of the Pb/Ag product through cupellation for the separation of lead from silver during which platy litharge was formed, characteristic examples of which were found during excavation. The supply of raw materials, i.e. minerals and timber for charcoal, from the mining zone in the Lekani Mountains was a matter of negotiation and exchange between the indigenous Thracian miners and the Thasian populations of the colonies.

Αγγελική Λεμπέση, Το προβάδισμα των κρητικών εργαστηρίων στη διαμόρφωση εικονογραφικών τύπων κατά την πρώτη χιλιετία π.Χ., *EYAIMENH* 19-20 (2018-2019), 25-38.

The precedence of Cretan workshops in the formation of iconographic types during the 1st millennium B.C. The discussion of the entitled subject demonstrates the leading contribution of Cretan workshops to the shaping of six iconographic types from the 10th century BC on, which appear later in the iconography of the rest of Greece. The innovative creation of these types is due to the continuous manufacture of anthropomorphic artefacts from the 2nd to the 1st millennium BC and to the dynamic Minoan past of Crete.

Paul A. Iversen, Lunisolar Calendars, the Antikythera Mechanism, the Halieia of Rhodes and some thoughts on the Calendars of Rhodes and Kos, *EYAIMENH* 19-20 (2018-2019), 39-122.

This paper will discuss the logic, history and development of lunisolar calendars, including the *octaëteris*, the Metonic Cycle and Callippic Cycle periods (particularly how the latter two are employed on the Antikythera Mechanism), as well as the years, season, history and events of the Halieia games of Rhodes (which are also attested on the Antikythera Mechanism). It will also discuss the order and seasons of the months and the day-nomenclature of the calendars of Rhodes and Kos as well as their semester systems. Here it will be argued that there were two separate calendars in operation with different starting points at both these city-states — an Eponymous Calendar-Year and a Bouleutic Calendar-Year. The paper will also discuss the intercalary month Πάναμος δεύτερος at Rhodes along with various theories concerning the Διπανάμια festival there.

Finally, the paper will conclude by analyzing the years in which several Rhodian festivals were celebrated, based upon which several Rhodian inscriptions will be redated.

Μέλπω Ι. Πωλογιώργη, Αγαλμάτιο νεαρής ανδρικής μορφής των ρωμαϊκών χρόνων, *EYAIMENH* 19-20 (2018-2019), 123-132.

Roman statuette of a young male figure. The sculpture published here, kept in the Archaeological Museum of Piraeus (inv. no 1212), is a freestanding, smaller than life-size (max. preserved height: 0.415 m) statuette of a nude young man, preserved from the waist up. Evidence concerning its provenance does not exist, as the date at which the statuette was handed over to the Archaeological Museum of Piraeus remains unknown and no further information is available. Around 1971-72, the late Professor Giorgos Despinis, who served as Curator of Antiquities at the time, entered a brief description of the object into the Museum's Inventory. The statuette is made of white, fine-grained marble, possibly Pentelic, covered with light brown patina. Aside from the lower body and the legs, the right upper limb is missing from the middle of the arm down. Similarly, the largest part of the left upper limb, which was possibly raised, is missing, also from the middle of the arm down. Traces of a round socket, intended for the insertion of a dowel, are preserved in the centre of the broken surface of the left arm. One more circular socket is found on the left shoulder connected to a shallow, narrow groove. On the left side of the torso, the remains of an integral rectangular support (*puntello*) survive, whose broken surface indicates that it was angled, leaning forward. Rasp marks are visible on either side of the neck, the area covered by the curls, as well as the left side of the torso, from the armpit to the *puntello*. Extensive use of drill is evident in the rendering of the hair. The figure's hair that features "anastole" above the forehead, consists of rich curls that grow unevenly, framing the beardless youthful face, covering the ears completely. Based on stylistic grounds, the statuette is datable around the mid-2nd century AD or shortly later. The preserved evidence leads to the assumption that the figure held most likely a cornucopia in his raised left hand. The statuette depicted possibly a daemon or personified a benevolent force or a river.

LUNISOLAR CALENDARS, THE ANTIKYTHERA MECHANISM, THE HALIEIA OF RHODES AND SOME THOUGHTS ON THE CALENDARS OF RHODES AND KOS

This paper will: (I) provide a brief introduction to the logic, history, and development of Greek lunisolar calendars. Here it will be argued that by the end of the 3rd century BC many Greek city-states were using the Metonic Cycle to regulate their calendars, which is best exemplified by the calendar on the Metonic-Calendar Spiral of the Antikythera Mechanism (c. 200-50 BC). It will also be shown that the *octaëteris* had long since been abandoned, if it was ever used at all, so that it is extremely unlikely that it was still being used in the 1st century BC by the Rhodians to regulate their calendar, as has been argued by Hiller von Gaertringen (1929) and more recently by Badoud (2015). (II) I will reiterate (Iversen 2017 and 2020): that the Great Halieia of Rhodes, which are the sixth set of games on the Games Dial of the Antikythera Mechanism, were definitely celebrated in the same summer as the Nemea one year prior to the Olympia, thus 205, 201, 197... BC, and not two summers before the Olympia (or 206, 202, 198...) as Badoud (2015) argues; that these games likely fell at the end of Rhodian Πάναμος, not at the beginning of Rhodian Δάλιος, as Badoud (2015) argues; and that the Metonic-Calendar Spiral on the Antikythera Mechanism was likely originally built for the Rhodian calendar, so that the first month in the Bouleutic Calendar-Year of Rhodes, Καρνείος (which is related to Κρανεῖος on the Mechanism), normally began with the fourth new moon after the summer solstice. I will also discuss the history and competitive events of the Halieia. (III) I will discuss the names of the days and the order/seasons of the months of the calendars of Kos and Rhodes. Here it will be argued that the order of the months in the calendar of Kos (whose order of months is secure) can be used to reconstruct the order of months in the Rhodian calendar. In the end it will be argued that the order of Rhodian months advocated by Bischoff (1894) and Börker (1978) is to be preferred over that proffered by Trümpy (1997) and Badoud (2015). It will also be argued that Καρνείος generally began shortly after the fourth new moon after the summer solstice (\approx Athenian Πυανοψηών), as is consistent with the arguments of Börker (1978) and Trümpy (1997), but not with those of Badoud (2015), whose analysis suggests it instead began with the fifth new moon after the summer solstice (\approx Athenian Μαιμακτηριών). (IV) I will discuss the semester-system at Kos and Rhodes. Here it will be argued that the winter semester at Kos began with the month Καρνείος -the same month as at Rhodes- as argued by Segre (1944-1945), and not with Θευδαίσιος, as argued by Bosnakis and Hallof (2005). It will also be argued that there were two calendar-years in operation at both Kos and Rhodes, an Eponymous Calendar-Year (based on the *monarchos* at Kos beginning with Θευδαίσιος as Bosnakis and Hallof, 2005,

argue; and based on the priest of Helios at Rhodes beginning with Πάναμος as Badoud, 2015, argues), and a Bouleutic Calendar-Year divided by winter and summer semesters, (beginning with Καρνείος at both Kos and Rhodes). The theory of Börker (1978) that there were also separate calendar-years in operation at Rhodes for the *prytanies* and *boula* will be rejected. (V) I will discuss the intercalary month Πάναμος δεύτερος at Rhodes as well as various theories concerning the Διπανάμια festival. Here it will be shown that Πάναμος δεύτερος was inserted directly after Πάναμος, as one would expect and as Zimmer and Baïrami (2008) and Badoud (2015) argue, and not after Θεσμοφόριος as Paton (Paton and Hicks 1891) argued, nor between Πεδαγείτνυος and Διόσθυος and then later after Θεσμοφόριος as Börker (1978) argued. I will also argue the month name Πάναμος is derived from πανῆμαρ (πᾶν + ἡμαρ, ἡματος) and means “all day long”, as Schwyzer argued¹, and that the Διπανάμια were just a double all-day-long festival, and not a festival for the intercalated month Πάναμος δεύτερος as Dittenberger (1887) suggested and Hiller von Gaertringen (1894) and Badoud (2015) have championed. Finally, (VI) I will discuss the years of various Rhodian festivals. Here it will be shown that Badoud’s (2015) years for many Rhodian festivals are wrong because he misunderstood the year of the Great Halieia, which is the key to determining the years of the others. Based upon this, I will also redate some Rhodian inscriptions, most importantly *IG XII.1 730* (= Badoud 2015, 316, no. 6), *Pugliese Carratelli 1952-1954, 259, no. 5* (= Badoud 2015, 311, no. 2), and *IG XII.1 46*.²

I. Introduction to lunisolar calendars and the Antikythera Mechanism

A. Brief history of the development of Lunisolar Religious Calendars

The city-states of ancient Greece, like the Babylonians of old or the traditional calendars of the Jews and Chinese, employed what are known as lunisolar calendars, that is calendars whose months in principle were supposed to track closely the phases of the moon while generally staying in line with the solar or ‘tropical’ year. Thus, the first day of the month was ideally the day on which a crescent moon could be seen waxing visible on the western horizon at sunset, the middle of the month was supposed to be the day of the full moon, and the last day of the month ideally fell at conjunction, or what is also called the new moon, that is when the moon was between the earth and sun so that its face was occluded.

Since all Greek month names were adjectival and almost always named after one of the important festivals that fell in them, such as the Karneia in the month of Karneios or the Sminthia in the month of Sminthios, and since these festivals were often tied to agricultural activities, it was also felt important to keep the months aligned as closely as possible to the tropical year so that the gods would have their proper sacrifices at the due season. Thus, having a well-regulated calendar not only served the practical needs of agriculture, sea-faring, military campaigning, and political organization, it also guaranteed proper religious observance. Any student of Greek religion and history, therefore, must

¹ Schwyzer (1953, 437; 518).

² I want to thank Jan-Mathieu Carbon for reading a draft of this paper and making many useful comments, as well as an anonymous reviewer. I also want to thank John D. Morgan, with whom I have had many discussions concerning many of the issues in this paper and with whom I am working on a book that covers some of this same ground.

have a firm grasp of lunisolar calendars. Since many are not familiar with their basic history and logic, I will give a brief overview here.

How the Greeks initially developed their lunisolar calendars is not clear, as our sources for the earlier periods are usually late and often unreliable. Apart from days, undoubtedly the moon was initially chosen as a time-keeping device because it was easy to see in the night sky for at least part of most nights and it has a regular pattern of waxing and waning. Over time, those who lived north or south of the equator would have also seen that the cycle of the seasons repeated in close conjunction with various stars or star clusters and given the importance of agricultural activity or sea-faring, it would have been seen as advantageous to tie these two naturally occurring units of time together, along with days. This was, however, something that had to be learned by close observation and trial and error, as the cycles of the heavens have some variation that only smooths out over longer periods. In particular, a synodic lunar month,³ can vary by as much as about 6.5 hours from its mean value of 29.53 days from month to month. The challenge, therefore, was to find a regularly recurring alignment of these three naturally occurring time-keeping phenomena, that is an integer number of days, an integer number of lunar months, and an integer number of solar years.

The earliest extant Greek evidence for month names comes from the Mycenaean era, which imply these were lunar.⁴ The next evidence is found in Homer, who in describing Odysseus' sojourn with Circe says '*When a year had passed, and the seasons turned, the moons waned, and the long circuit of days had gone around...*' In this passage are found all the ingredients that make up an effective lunisolar calendar, namely days, moons/months, and seasons/years, with the months seemingly being measured from one conjunction to the next (μηνῶν φθινόντων).⁵ The next earliest evidence comes from Hesiod, who associates the Ionic month Lenaion with the winter (*Erga* 504), which means that already in his day the Ionians were keeping this lunar month aligned with a particular season. Hesiod (*Erga* 479, 564, 663) refers to the solstices as the ἡλίοιο τροπαὶ or τροπαὶ ἡλίοιο, 'turning points of the sun' (i.e., the dates on which the rising or setting sun reached its northernmost and southernmost points on the horizon), and he says the spring equinox marked the completion of a year (*Erga* 561-2). In other words, he recognized the solstices and equinoxes as important markers to keep track of what we now call the tropical year. His didactic poem also reflects a keen awareness of an already well-developed tradition of recognizing the seasonal repetition of various annual stellar events (i.e., the sidereal year), which was a rudimentary, but reasonably effective, way of keeping track of the tropical year. So, for instance, in conjunction with agricultural activity Hesiod explicitly mentions or alludes to the evening rising of Arcturus in early March (*Erga* 565-7), the morning rising of the Pleiades in mid-May (*Erga* 571-2), the morning rising of Sirius at the end of July (*Erga* 587), the morning rising of Orion in late August (*Erga* 598), the morning rising of

³ In this paper a "lunar month" or "month" refers to a synodic month as opposed to a sidereal, draconitic, tropical or anomalistic month.

⁴ On the Mycenaean month names, see Palmer 1963, 235; 238. Also see Trümpy 1989 and 1997, 2-3, §2.

⁵ An enigmatic passage in Homer (*Od.* 15.403-404) says there is an island Syrie, above Ortygia, where are the τροπαὶ ἡλίοιο. While some take this to be a direction on the horizon and thus a reference to a solstice, others take this to be purely mythical, perhaps the place in the extreme west where the sun daily turned back his steeds.

Arcturus around September 10 at his latitude in his day (*Erga* 609-14), the morning setting of the Pleiades and Hyades in early November (*Erga* 615-619), and the evening rising of Orion (*Erga* 619) also in early November. We will see that this tradition of naming and ordering a specific set of stellar events to keep track of the sidereal year, which at this time was equated with the tropical/solar year, will continue to be refined throughout antiquity and is found on the front of the Antikythera Mechanism.

Further refinements in measuring and predicting the solstices are attributed to Thales of Miletos (*c.* 624/3-546/5 BC),⁶ and yet more to Thales' student Anaximander (said to be 64 years old in Ol.58.2 = 547/6 BC) following his invention of the gnomon, which he set up in Lakedaimon to indicate solstices and equinoxes.⁷

According to a controversial passage concerning the history of Greek calendrical practice found in Geminus (8.25-49), who probably worked on Rhodes in the 1st century BC,⁸ the Greeks initially reckoned all years to have 12 months of 30 days (Geminus does not say this directly, but it seems to be the logical implication). Eventually the Greeks recognized that over time synodic lunar months average 29.53 days, while tropical years are 365.2422 days. Keeping in mind the principle of integers, it was recognized that 29.53 was nearly equivalent to 29.5 days, and thus when multiplied by two was nearly equivalent to the integer number of 59 days, so lunisolar calendars generally adopted a scheme of months that alternated between 'full' months of 30 days, and 'hollow' months of 29 days, which together yielded 59. A sequence of 12 such alternating months, however, results in a year of only 354 days, which is 11.2422 days short of a solar year. To make up this shortage of days, so Geminus says, every other year the ancients decided to insert an extra month of 30 days called an 'intercalary' month (μὴν ἐμβόλιμος),⁹ which meant that the years alternated between 'ordinary years' of 12 lunar months of 354 days and 'intercalary years' of 13 months of 384 days.

It should be noted here, that as far as we know, all Greek calendars doubled one of their existing 12 months in an ordinary year, and inserted it directly after its homonymous month (as did the Babylonians), sometimes but not always qualifying it with an adjective such as δεύτερος (second), ὕστερος (later), or ἐμβόλιμος (inserted), or at Argos ἐπόμενος (following). Some city-states, such as Athens, showed variation in the month chosen to double (usually they doubled their 6th month, Posideon, but sometimes instead the first, Hekatombaion, and at least once the 2nd, Metageitnion, the 7th, Gamelion, and the 8th, Anthesterion), others were more consistent, such as Delphi, where in the 2nd century BC only Ποιτρόπιος ὁ πρῶτος and Ποιτρόπιος ὁ δεύτερος are attested on manumission decrees from 12 different intercalary years. At least in the Hellenistic and Roman periods Rhodes seems to have had a consistent intercalary month, as only a Πάναμος δεύτερος, a doubling

⁶ Diogenes Laërtius 1.23, citing Eudemos of Rhodes.

⁷ Diogenes Laërtius 2.1-2, citing Favorinus of Arelate.

⁸ The assignment of Geminus to Rhodes comes from his proclivity to use Rhodes as an example in making some astronomical point, as well as his writing a commentary on Poseidonios of Rhodes' *Meteorology*. For his probable date in the 1st century BC, see Jones 1999 and Evans and Berggren 2006, 15-22. To their arguments we may add that Geminus makes no mention of the Julian calendar, instituted in 45 BC, which perhaps would be odd, if he were writing after this date.

⁹ Herodotus (1.32) has Solon claim that a typical Greek calendar intercalates every other year. Some think Geminus may have been using this passage as his evidence for intercalations every other year.

of the 10th month in its Bouleutic Calendar-Year, is attested on over 100 stamped Rhodian amphora handles from at least 20 different years, but never a doubling of any other month.¹⁰ As far as we know, all the sacrifices due in the regular month had to be repeated in the intercalary month, which, as we just saw, fell directly after the month of the same name, and there is no certain example of a festival designed solely for an intercalary month,¹¹ nor is there a certain example of an intercalary month inserted at some other point than directly after the month of the same name, except at Athens where the intercalary month Ποσιδεών δεύτερος was renamed Ἀδριανιῶν to honor the Roman emperor Hadrian in AD 124, and possibly on an unknown calendar that may come from Arkadian Orchomenos,¹² where there are apparently names for 13 months, thus a different name for the intercalary month. We will return to these points at the end of this paper (see Section V) when we consider the placement of the intercalary month Πάναμος δεύτερος as well as the Διπανάμια festival at Kos and especially Rhodes, which some have argued was a festival celebrated only in Πάναμος δεύτερος.

In any case, Geminus tells us that the Greeks quickly discovered that even with alternating months of 30 and 29 days and inserting an embolismic month every other year, their days and months still did not harmonize with the phases of the moon or the yearly cycle of the sun over time ($354 + 384 = 738$ days, which is $7\frac{1}{2}$ days greater than two years of $365\frac{1}{4}$ days, or $730\frac{1}{2}$ days). They then, according to Geminus,¹³ turned to another period known as the ὀκταετηρίς,¹⁴ in which they inserted three extra μῆνες ἐμβόλιμοι of 30 days in an eight-year period to yield a period of 2922 days, over 99 lunar months (apparently with 51 months of 30 days and 48 months of 29 days), over eight tropical years. Keeping in mind that the solar year was about $365\frac{1}{4}$ days and the lunar month about $29\frac{1}{2}$ days, again this meant that their normal year of 12 lunar months (alternating between 30 and 29 days) had only 354 days, about $11\frac{1}{4}$ days short of the solar year. They, therefore, sought an integer number of years divisible by $11\frac{1}{4}$ and realized that 8 years \times $11\frac{1}{4}$ days was equal to 90 days, which was nearly equivalent to three lunar months. It was for this reason they inserted three extra μῆνες ἐμβολιμοί of 30 days in an eight-year period,

¹⁰ Paton's (Paton and Hicks 1891, 328-29) inference from *IG XII.1 4* that Πάναμος δεύτερος at Rhodes was inserted not immediately after Πάναμος, but at the end of the year, is now disproven by Zimmer and Baïrami 2008, 159, no. E2611. Similarly, the pre-Julian Roman calendar preserved by the *Fasti Antiatres Miores* (*ILLRP* 9) displays the intercalary month at the end of the year after December rather than after February. See p. 92.

¹¹ I have not found any such example myself, nor does Angelos Chaniotis know of any either.

¹² D.M. Robinson 1958 = *SEG XVII* 829 and *BE* 1959.43.

¹³ Neugebauer 1975, II.619-620 discusses other early cycles, including that of Philolaos the Pythagorean as well as an earlier version of the ὀκταετηρίς.

¹⁴ On the ὀκταετηρίς, see Samuel 1972, 35-42. Boeckh (1855, 11-17) attributed the invention of the ὀκταετηρίς to Solon based on the extremely flimsy evidence that Diogenes Laërtius (1.59) credits him with teaching the Athenians to reckon days according to the moon and Plutarch (*Solon* 25) credits him with recognizing conjunction and inventing the backwards count of days in the last decade of the month from it. Censorinus (*de Die Natali* 7.21), on the other hand, reports that some credit its invention to Eudoxos (c. 390 - 337 BC), but he adds more plausibly that it is also attributed to Kleostratos of Tenedos, who Pliny (*H.N.* 2.6.31) informs us worked after Anaximander's discovery of the obliquity of the zodiac in Ol. 58 (548-544 BC). Censorinus also mentions other astronomers who played with it, including Harpalos, Nauteles, Mnesistratos, and Dositheos. Censorinus also implausibly ties the four-year cycle of the Olympic games to the ὀκταετηρίς via an earlier cycle called the τετραετηρίς, but most scholars today suspect this history to be Censorinus' own invention to present a smooth transition from earlier (non-astronomical) to later (astronomical) calendars. See Samuel 1972, 35, n. 1.

being sure that the extra three months were evenly distributed across the eight years. The even distribution was important, as Geminus (8.32) explains: “Therefore, they arranged the embolismic months so that they were, as much as possible, evenly distributed (μάλιστα δι’ ἴσου). For one ought not to wait until a difference of a month arises with respect to the visible heavenly cycles (τὰ φαινόμενα), nor anticipate a whole month with respect to the course of the sun. For this reason they arranged the embolismic months to be reckoned in the third, fifth and eighth year.” He adds (8.33), however, that other years of this eight-year cycle could be selected for intercalation, as long as they had the same arrangement (τὴν αὐτὴν διάταξιν) of being evenly spaced (μάλιστα δι’ ἴσου), meaning such years as 1, 4, and 6, or years 2, 4, and 7. What was not allowed were two contiguous years with intercalations or an interval of intercalation greater than two years, either of which would have defeated the entire purpose of intercalating with the ὀκταετηρίς. Geminus then goes on to describe the shortcomings of the ὀκταετηρίς and successive attempts to make it work, which I will not describe in detail here. Suffice it to say, Geminus demonstrates how the ὀκταετηρίς failed as an intercalation scheme and thus it was abandoned at some point in the hoary past. We will return to these points in Section V below, as it has recently been suggested¹⁵ that the Rhodians were still using the ὀκταετηρίς to regulate their calendar and festivals in the 1st century BC, and not only that, in their version of it, they employed an intercalation scheme in years 1, 4 and 5, and thus had back-to-back intercalations at one point, and three years between intercalations at another point and thus violated Geminus’ principle of μάλιστα δι’ ἴσου. Both assertions, which Badoud acknowledges are a “double particularisme”, are highly unlikely.¹⁶

After experiments with the ὀκταετηρίς, Geminus (8.50-58) goes on to say that a nineteen-year period called the ἐννεακαίδεκαετηρίς was introduced at Athens in which 6940 days was equivalent to 235 lunar months, which was nearly equivalent to 19 solar years (only short by about two hours!). While Geminus associates this discovery with Euktemon, Philip and Kallippos, the late Hellenistic universal historian Diodoros (writing c. 60-30 BC) (12.36.2) ascribes it to Meton of Athens, whom he says introduced this cycle during the archonship of Apseudes (433/2 BC) beginning on the 13th of the Athenian month Skirophorion (June/July). In the ἐννεακαίδεκαετηρίς, one inserts seven extra intercalary months at regular intervals over 19 years to yield the figure of 235 lunar months (19 years x 12 lunar months + 7 intercalary months = 235 lunar months). Geminus also tells us that since 235 x 30 days = 7050 days, which is 110 days more than the required 6940 days, in this period of 19 years the Greeks had 125 full months of 30 days and 110 hollow months of 29 days to yield 6940. He also says, in a garbled passage, that since 6940 / 110 ≈ 63, rather than remove the 30th day of every other month, as seems to have been the common practice, a day should be removed once after every 63 days (that is the 64th day).¹⁷ This

¹⁵ Badoud 2015, 138-139.

¹⁶ Badoud (2015, 139), in placing his intercalations in years 1, 4 and 5, misunderstands Geminus’ statement that “it makes no difference if someone were to make the same arrangement of the intercalary months in other years [of the ὀκταετηρίς].” Again, the key words are *the same arrangement* (τὴν αὐτὴν διάταξιν), which means intercalations that are evenly distributed (μάλιστα δι’ ἴσου) – a point Geminus made just before this statement.

¹⁷ While the calendar on the Antikythera Mechanism does observe this rule, probably most Greek cities did not, as its application would have resulted in several days on which festivals fell being omitted. For instance on the preserved parts of IG XII.1 4 (an inscription bearing a calendar-year from Rhodes dating to the 1st century AD on which see below, Section III.C), the 30th day of every other month is omitted.

period of the integer number of 6940 days, coupled with the integer number of 235 months, coupled with the integer number of 19 years, was successful at keeping the days of the month in line with phases of the moon while at the same time tethering the months of the year as closely as possible to particular seasons, and is still today called the Metonic Cycle, so named after its homonymous founder in the West, although it is clear the Babylonians had discovered and employed this method by *c.* 500 BC.

Although the years chosen for intercalation within the Metonic Cycle could vary, like the *ὀκταετηρίς* it was absolutely essential that they be spaced out evenly, otherwise the months would drift too far from their seasons between intercalations. Thus years 1, 3, 6, 9, 11, 14, and 17 of the Metonic Cycle would be acceptable for intercalation, or years or 2, 5, 8, 10, 13, 16, and 18, and so on. Again, what was not acceptable in any known ancient intercalation scheme were years with back-to-back intercalations or more than 2 years between intercalations, although we have several attested instances where religious and civil calendars were manipulated to meet some emergency or political exigency,¹⁸ but these were often considered sacrilegious anomalies and undoubtedly were corrected as soon as possible.¹⁹

In conjunction with Meton's and Euktemon's announcement of the nineteen-year cycle, they are also said to have set up sophisticated equipment on the Pnyx to accurately measure the summer solstice, which another source tells us fell on Skirophorion 13 of Apseudes' archonship (= 27 June, 432 BC).²⁰ It is not unlikely that, in part, this measurement was meant to serve as the starting point for the Athenian calendar so that the first month of the Athenian calendar, Hekatombaion, would ideally commence with the first new moon after the summer solstice.

By the end of the 5th century BC, Greek astronomers borrowed another invention of the Babylonians to keep track of the solar year, that is dividing it up by the sun's entry into the 12 zodiacal signs and assigning to these a total of 360 degrees.²¹ In conjunction with this, Euktemon is said to have fashioned a *parapegma*,²² which laid out in chronological order an annually repeating cycle of stellar events, which featured the first and last visibility of several stars or constellations in the morning or the evening and the solstices

¹⁸ For instance, in the Spring of 334 BC Alexander is reputed (Plut., *Alex.* 16.2 and Arrian 1.11-12) to have intercalated a second month of Artemitios, even though one was not due, to get around the Macedonian injunction of not taking to the battlefield in the month of Daisios. Or in 241 BC, the Spartan Ephor Agesilaos is said (Plut. *Agis* 15-16) to have inserted an extra month into the Spartan calendar when one was not due, but this was extremely controversial. Both these stories indicate there was supposed to be a regular and predictable cycle of intercalations.

¹⁹ The Moon's complaint at Aristophanes' *Nubes* 615-616 (423 BC) that the Athenians did not observe the days rightly, although demonstrating that manipulation of the festival lunar calendar was frequent at Athens, especially during the Peloponnesian War, nevertheless also indicates that this was considered in some quarters a religious affront to the gods.

²⁰ Diehls and Rehm 1904, lines 1-6 = Bevan, Jones and Lehoux 2019.

²¹ Pliny *H.N.* 2.6.31 seems to assert that Kleostratos was the first Greek to use the zodiacal signs. In this same passage he dates him after Ol. 58 (548-544 BC). Most place him at the end of the 6th century BC.

²² As Bitsakis and Jones (2016a, 90) explain, the term *parapegma*, or "beside-pegging", originally referred to any artefact that had a series of holes drilled into it that stood for repeating units of time, especially days. Often these objects were accompanied by inscriptions or pictorial representations. Later, any text that laid out in chronological order an annually repeating cycle of days and associated celestial phenomena or "stellar events" (that often featured the first and last visibility of stars or constellations in the morning or the evening), was also known as a *parapegma*, even if it had no drill holes to accompany it.

and equinoxes, as in Hesiod. These stellar events were then associated with the sun's position at a specific degree within one of the 12 zodiac signs. The *parapegma* appended to the end of Geminos (known as the Geminos *parapegma*),²³ for instance, tells us that Euktemon placed the morning rising of Sirius at the 27th degree of Cancer and the autumnal equinox at the 1st degree of Libra. The Greeks eventually developed a repertoire of about 50 such stellar events. Although these represented a reasonable way of keeping track of the tropical year, the biggest problem with these is that they were very particular to location (one's latitude and altitude affect these greatly) and local visibility conditions. A third problem, as noted by the Rhodian astronomer Hipparchos in his star catalogue completed in 129 BC, is that because of the precession of the equinoxes (which we now know is caused by the sun's gravity pulling on the Earth's poles), the position of stars shift over time so that the sidereal year is not precisely equal to the tropical year.

Another notable development in the history of astronomically based calendars, as Geminos (8.59) tells us, included the invention of the Callippic Cycle, so named after Kallippos of Kyzikos, who studied at Athens in the last half of the 4th century BC and is said to have first begun his cycle at the summer solstice of 330 BC (which would have been 28 June in the proleptic Julian calendar). By removing one day after every fourth Metonic cycle, *i.e.*, every 76 years, it yielded more accurate values for the tropical year of $365\frac{1}{4}$ days rather than $3655/19$ days ($((4 \times 6940) - 1) \text{ days} / (76 \text{ years}) = 365\frac{1}{4} \text{ days/year}$) and for the mean synodic lunar month of $((4 \times 6940) - 1) \text{ days} / (4 \times 235 \text{ months}) = 29.53085 \text{ days/month}$). Kallippos' calendar was subsequently used for dating astronomical events by Timocharis in the early 3rd century BC and also in later centuries,²⁴ and the Callippic cycle was almost certainly employed to regulate the calendar on the Antikythera Mechanism, which dates at some point between the end of the 3rd and middle of the 1st centuries BC.

As a part of studying the regular cycle of the sun and moon, by the last three centuries of the Hellenistic period, if not earlier, the Babylonians had also discovered what is known as the 'Saros Cycle',²⁵ or what Ptolemy (*Almagest* 4.2) calls ὁ περιοδικὸς χρόνος, a period of 223 lunar months that can be used to predict or describe lunar and solar eclipse possibilities. This is the period where the Sun, Moon and Earth return to approximately their same geometrical position so that a similar eclipse occurs. The period is actually 18 years, 11 days, and a variable number of hours that over time averages about eight. Since eight hours is not an integer number of days, it is not ideal, but conveniently it is $1/3$ of day, so the Babylonians, as Geminos (18.4-19) tells us, developed a more accurate period called the Exeligmos Cycle (ἐξελιγμός = "turning of the wheel") to describe eclipse possibilities, which is a triple Saros of 669 lunar months, or 54 years and 33 days. Ptolemy (*Almagest* 4.2) informs us that Hipparchos (*c.* 190-*c.* 120 BC) knew of this period (Ptolemy apparently did not appreciate the extent to which Hipparchos relied upon the Babylonian tradition for his numerical parameters),²⁶ but as far as we know this was never used to

²³ See Evans and Berggren 2006, 231-240 and 275-289.

²⁴ Van der Waerden 1960, 168-176 and 1984; Jones 2000.

²⁵ This is a modern term apparently first applied to an eclipse cycle by Edmond Halley in 1691. See Neugebauer 1975, I.497, n. 2.

²⁶ See Neugebauer 1975, I. 309-312; Toomer 1988.

regulate any Greek calendars. It does, however, appear on the Antikythera Mechanism.

By the 3rd or 2nd centuries BC Greek astronomers also found the Egyptian calendar a useful tool to keep track of the tropical year.²⁷ Early on the Egyptian calendar was lunar, but eventually, as Geminus explains (8.16-24), they developed a civil calendar of 12 months of 30 days each plus 5 “epagomenal” days added at the end of the year to bring the total to 365 days.²⁸ This was about ¼ day short of the tropical year so that the Egyptian months slowly wandered through the seasons. In 238 BC, however, King Ptolemy III “Euergetes” and Queen Bernike held a synod of Egyptian priests in Kanopos,²⁹ who advocated reforming the Egyptian calendar to keep the heliacal rising of Sothis (Sirius) fixed on Payni 1 and to keep the other Egyptian festivals in their proper seasons by inserting every four years a sixth epagomenal day (in the manner of a leap year), on which the festival of the Theoi Euergetai would be held.³⁰ As Chris Bennett recognized,³¹ some of the double dates in Euergetes’ reign suggest this reform may have been implemented at least for the rest of his reign and possibly also during the reigns of his successors Ptolemy IV, V, and VI. Although after this the Egyptians appear to have resumed using only their traditional wandering calendar, nevertheless the Egyptian calendar plus leap year every fourth year was a very useful tool for Greek astronomers to keep track of the tropical year –a much easier tool than the myriad of Greek lunisolar calendars.

Geminus’ historical account of Greek calendrical history is very controversial, as most scholars consider him prone to anachronistic historical reconstructions to explain the astronomy of his time.³² Another related problem or question, is how many Greek city-states actually incorporated any of these astronomical findings into their civil and religious calendars? For instance, many doubt whether any Greek city-state ever even employed the ὀκταετηρίς,³³ rather this may have been a problem discussed mainly among astronomers.

We are on firmer ground with the Metonic Cycle, although how soon after 432 BC the Athenians and most of the rest of the Greeks adopted it to regulate their religious and civil calendars is subject to debate. Conclusive evidence for almost all city-states is lacking,

²⁷ The earliest Greek astronomer known to us, through the reporting of Ptolemy (*Almagest* 7), to use the Egyptian calendar is Timocharis of Alexandria with dates between 295-283 BCE. But this was his local calendar. The earliest Greek astronomer outside of Egypt using the Egyptian calendar for the dating of celestial observations is once again reported by Ptolemy (*Almagest* 3) –this is Hipparchos (with a date of 162 BCE).

²⁸ For a description of the Egyptian calendar, see Bickerman 1980, 40-43 and Table III on pp. 115-122 for a list of dates of Thoth 1; and Jones 2017, 70-72.

²⁹ The synod and reform are attested on the Canopic Decree (*OGIS* 56), which is inscribed in hieroglyphic and demotic Egyptian and in Greek, for which see Pfeiffer 2004 and *SEGLV* 1816. Pfeiffer argued that this reform was instigated by the Egyptian priests themselves, but as Morgan points out me, that does not account for its abandonment by the Egyptians in the following centuries. It seems much more likely that this reform was instigated by Eratosthenes of Kyrene, the head of the Museum in Alexandria, as was first suggested by Cantor (1880, 328) and has been maintained by subsequent scholars such as Dragoni (1979, 54-56) and Geus (2002, 209-210). Eratosthenes, who in the 260s BC was a student of the Stoic philosopher Zenon of Kition in Athens, whose civil calendar had been regulated in accordance with Meton’s 19-year cycle since around 350 BC, must have known about the Metonic Cycle and its refinement in 330 BC by Kallippos of Kyzikos, who was an adherent of Aristotle in Athens. Thus Eratosthenes could well have known the Callippic Cycle’s period relation 76 solar years = 940 lunar months = 27759 days, from which it follows that 1 solar year = 365¼ days.

³⁰ *OGIS* 56A, lines 44-45, ἀπὸ τοῦ νῦν μίαν ἡμέραν ἑορτὴν τῶν Εὐεργετῶν Θεῶν ἐπάγεσθαι διὰ τεσσάρων ἐτῶν ἐπὶ ταῖς πέντε ταῖς | ἐπαγομέναις πρὸ τοῦ νέου ἔτους.

³¹ Bennett 2011, 179-186 (“Detecting Canopic Dates”).

³² See Jones 2000, 154.

³³ Samuel 1972, 38, n. 2 or Jones 2000, 154.

although it has been demonstrated that at least from the middle of the 4th century BC until well into the Roman period the Athenians almost always followed the rule of having their year begin with the first new moon after the summer solstice,³⁴ an ideal advocated by Plato (*Laws* 767C) for a fictitious new city on Crete. As John D. Morgan points out to me, following this rule automatically required that Athenians were employing the Metonic Cycle, with intercalary months inserted in seven specific years in each 19-year cycle. The Macedonians in the east adopted the ἔννεακαιδεκαετηρίς by assimilating their calendar to that of the Babylonians no later than 245 BC. In the 2nd century BC, the other Phokians and the Aitolians and the cities of Ozolian Lokris (including Amphissa, Physkos, Chaleion, Oianthea, Tritea and Tolophon) were all inserting intercalary months at the same time as the Delphians to keep their calendars in line with the Delphic calendar.³⁵ It is most likely they were all using the Metonic Cycle to do so.

We have a reasonable amount of evidence, at least, that several city-states were using a lunar calendar (κατὰ θεόν = σελήνη) and that they made a clear distinction between the political calendar(s) and the lunar calendar when they diverged. For instance, at Athens we have a well-preserved example (*IG* II² 967 = *Agora* XV 238) from the spring of 144 BC of a triple-dating by the archon's calendar, the lunar calendar, and the prytany calendar:

1 [ἐπ]ὶ Μητροφάνου ἄρχοντος ἐπὶ τῆς Ἀκαμαντίδος δεκάτης πρυτανείας, ἥι Ἐπιγένης Μοσχίωνος Λαμπτρεὺς ἐγραμμάτευσεν· ἀντιγραφεὺς Δημοκράτης Δημοκράτου Κυδαθηναίευσ· Ἐλαφηβολιῶνο[ς] ἐνάτει μετ' εἰκάδας κατ' ἄρχοντα, κατὰ θεόν [δ]ὲ Μουνιχιῶνος δωδε[κά]-
5 τει, δωδεκάτει τῆς πρυτανείας· κτλ.

Here the date of the archon's calendar was 22 Elaphebolion, the date of the lunar calendar, κατὰ θεόν, was 12 Mounichion (the month succeeding Elaphebolion), and both were equivalent to the 12th day of the 10th prytany. While this was at a time when there were 12 Athenian tribes and the prytany calendar was coterminous with the lunar calendar so that we are not surprised to see that in an ordinary year of 12 months, the 12th day of the 10th month, Mounichion, was also the 12th day of the 10th prytany, nevertheless in this example we see the archon's calendar was lagging 20 days behind the natural lunar and prytany calendars. A similar example (*IG* VII 517, with correction at *SEG* XXXII 483 = *c.* 245-210 BC) of there being a large divergence between the archon's calendar and the

³⁴ Morgan 1996 and 1998. Meritt (1961, 72-134 and 1964, 212-228) convincingly surveyed the calendar equations in the preserved and restored prescripts of Athenian decrees from 346/5 to 319/8 BC to yield ordinary and intercalary years in accordance with Plato's rule of beginning the year with the first new moon after the summer solstice. Mattingly (1971, 39-46) emphasized that between 140 and 100 BC the epigraphical and numismatic evidence for intercalary and ordinary years corresponded closely with that predicted by a Metonic Cycle employing this rule. In the fall of 1993 Morgan recognized that all the supposed counterexamples between 300 BC and 140 BC in the archon lists published by Meritt (1977 and 1981), and by Osborne (1989), resulted from erroneous restorations or interpretations of calendar equations and/or misdatings of Athenian archons – most notably, all archons linked to the Secretary Cycle from 240 to 200 BC had been dated one year too early. Morgan promptly communicated his discovery to Christian Habicht and other scholars working on Athenian chronology in the Hellenistic period. Morgan's discovery was subsequently used by Osborne (2009) to reconstruct the Athenian archon list in the 3rd century BC in a manner which is still not completely settled.

³⁵ See Samuel 1972, 75-77.

lunar calendar is found at Tanagra in Boiotia:

1 Ἀριστοκλίδας ἀρχοντος, μείνος Θουίω νευμεινίη,
κατὰ δὲ θιὸν Ὀμολωίω ἐσκηδεκάτη, ἐπεψάφιδδε Ἀγάθαρ-
3 χος, Εὐνοστος Μελίτωνος ἔλεξε· δεδόχθη τῷ δάμυ, κτλ.

Here, the first day of the Boiotian month Thouios in the archon's calendar is synchronized with the 16th day of the succeeding month Homoloios in the god's calendar, which means that at this date the archon calendar was running a full 45 days behind the natural lunar calendar. What both these examples show, is that while the political calendar could be manipulated, even so the lunar calendar was maintained, undoubtedly for traditional religious purposes. Also worth noting are examples that give a date between different calendars, such as the following example (*IG II² 951*) with a triple synchronization:

1 ἐπὶ Νικοσθένου ἀρχον[τος, μηνὸς Μεταγειτνιώνος]
πέμπ[τ]ει <ἀ>πιόντος ὡς [Ἀθηναῖοι ἄγουσιν, ν ὡς δὲ Ἀμ]-
βρακιῶται ἐπὶ γραμμ[ατιστοῦ ... 7-8... μ]ηνὸς [Φοι]-
νικαίου πέμπτει ἀπ[ιόντος, νν ὡς δὲ Ἀκα]ρνᾶνε[ς]
5 ἐπὶ στρατηγοῦ Χρεμᾶ [μηνὸς ...8-9...]νου τετρά[δι]
ἀπιόντος.

Here we see the 5th day from the end of an Athenian month (restored as *Metageitnion*³⁶) coincided with the 5th day from the end of *Phoinikaios* in the Ambrakian calendar, and with the 4th day from the end of some month in the Akarnanian calendar. The (nearly) identical dates in each of the calendars of these three independent states indicates that they were all regulating their calendars *κατὰ θεόν*, which almost surely meant using the Metonic Cycle.

In any case, by the Late Hellenistic Period we have direct evidence from Diodoros Siculus, in a passage about Meton's discovery of the *έννεακαιδεκαετηρίς*, that most of the Greek city-states down to his day (writing *c.* 60-30 BC) were employing the Metonic Cycle to regulate their calendars (12.36.3: διὸ μέχρι τῶν καθ' ἡμᾶς χρόνων οἱ πλεῖστοι τῶν Ἑλλήνων χρώμενοι τῇ έννεακαιδεκαετηρίδι οὐ διαψεύδονται τῆς ἀληθείας). Diodoros' wording 'down to our times' strongly implies that he, at least, felt that most Greeks for many generations had employed the Metonic Cycle. With so many great astronomers coming from, or working on, Rhodes, such as Hipparchos, Poseidonios, and probably also Geminos, and the worship of Helios there so intense that the 3rd century BC perigete Herakleides Kritikos (see below, Section II.B) singled out how at Rhodes 'the solar year drives me crazy', it seems highly unlikely that the Rhodians would not have also been employing the Metonic Cycle by the 1st century BC, if not much, much earlier, although it is not clear by what principle they were regulating their calendar (such as by making the first month of their civil year start with the fourth new moon after the summer solstice, which usually meant the year began with the first new moon after the autumn equinox, but occasionally it could have begun with a new moon shortly before the autumn equinox). In addition, as we will see in a moment, the Antikythera Mechanism, which was possibly built on Rhodes in the

³⁶ On the supplement *Metageitnion*, see Iversen 2017, 185-188. J.-M. Carbon perspicaciously points out to me that the participle *ἀπιόντος* was not used for dating by the Athenians, who instead preferred *φθίνοντος*. This suggests *IG II² 951* was inscribed by foreigners.

first half of the 1st century BC for a client from Epiros, also employs the Metonic Cycle for use with an actual calendar.

In addition to months and years, several Greek city-states also divided their years into two semesters (ἑξάμηνοι). Examples of this include Delphi, Rhodes and Kos. At Delphi, abundant epigraphical evidence indicates that while the archon served for an entire year of two semesters, which were called ἁ πρῶτα ἑξάμηνος and ἁ δευτέρα ἑξάμηνος, the βουλευταὶ (councilors) and the secretary of the *boule* served for only one semester. It is also clear at Delphi that these semesters were coterminous with the same 6 lunar months of the calendar, or in the case of an intercalary year, 7 of the months (and nothing was done to distinguish between a ἑξάμηνος and a ἑπτάμηνος). At Rhodes and Kos, the eponymous officials served for an entire year, but the πρυτάνιες at Rhodes and ἄρχοντες at Kos served for only one semester (in Sections III and IV below we will see that at both these states two calendar-years were in operation, one for the eponymous official and some religious offices, and a bouleutic one for other office holders such as the *prytanies*). One Rhodian inscription (*IG XII.1 53*) attests an ἑπτάμηνος,³⁷ presumably in an intercalary year of 6+7 = 13 months, with a second Πάναμος in the summer. These semesters were most commonly known as ἁ θερινὰ ἑξάμηνος and ἁ χειμερινὰ ἑξάμηνος, although in one late example at Rhodes there is a reference to the οἱ θερινοὶ βουλευταὶ. On the semester systems at both Kos and Rhodes, see Section IV.

B. The Antikythera Mechanism

We now turn to the Antikythera Mechanism,³⁸ so named after the Greek island in whose waters it was salvaged in 1901³⁹ from a shipwreck datable to *c.* 70-60 BC.⁴⁰ The Mechanism itself was constructed (possibly on Rhodes)⁴¹ sometime between the very end

³⁷ Μοσχίωνα Ἐκάτωνος | τὸν Βράσιον, πρύτανιν | ἁ βουλὰ ἁ βουλευούσα | τὰν ἐνεστακυῖαν ἑπτὰ|μηνον εὐνοίας ἕνεκεν θεοῖς. Other evidence that the Rhodian *boula* sometimes served for 7 months in an intercalary year include Zimmer and Baïrami 2008, 159, E2611 (= Badoud 2015, 409, no. 37) and Peek 1969, 10, no. 4 (= Badoud 2015, 397, no. 30) on which see below (Section V.A).

³⁸ The best, comprehensive discussion of all aspects of the Antikythera Mechanism is Jones 2017.

³⁹ For early accounts of the discovery and excavation of the shipwreck, see Svoronos 1903, 1-18; Staïs, Tsountas, Kourouniotis and Kavvadias 1902 [this article has no author attached to it, but Svoronos (1903, 16) indicates that V. Staïs, Chr. Tsountas and K. Kourouniotis, were responsible for it under the oversight of the national ephor P. Kavvadias]. For later accounts in English, see Karo 1965, 35-39; Price 1974, 5-10; Jones 2017, 1-14. For a vivid account that includes interviewing the last surviving witness and relatives of the sponge divers on Syme, see Throckmorton 1970, 113-168.

⁴⁰ For the contents and date of the shipwreck, the best resource is Kaltsas *et al.* 2012 (with both English, German and Greek versions). Other noteworthy studies include: Staïs *et al.* 1902; Weinberg *et al.* 1965. A coin hoard recovered from the site is particularly important for dating the shipwreck, but was not actually a part of the salvaging operations of 1900-1901, rather it was recovered in 1976 when Jacques Cousteau led a dive to the site (on this expedition, see Kolonas 2012). The hoard includes 32 silver Pergamene cistophoric tetradrachms issued between 105 and 67 BC (this dating is based on the work of Kleiner 1978), as well as Ephesian bronze coins dateable *c.* 70-60 BC (see Oikonomidou 2001, 544, especially n. 13, who cites a personal letter from the expert on Ephesian coinage, Stefan Karwiese, for the date, but notes that Head, 1892, 69, nos. 179 and 18, dated these 48-27 BC). For the coins, also see Yalouris 1990 and Tselekas 2012.

⁴¹ For the Mechanism's possible connection to Rhodes, see Price 1974, 13, 57-62; Iversen 2017, 159 (where it is also argued it was built for a client from Epiros); Jones 2017, 93-94; Iversen 2020.

of the third and the middle of the 1st century BC.⁴² In 2005, a group of researchers known as the Antikythera Mechanism Research Project (AMRP) examined the 82 fragments of this badly corroded and brittle device with two recent technologies called Micro-Focus X-Ray Computed Tomography (CT) and Polynomial Texture Mapping (PTM, now more widely known as Reflectance Transformation Imaging or RTI).⁴³ In addition to being able to see the outer surface inscriptions and the inner gear work with enhanced clarity, these technologies also unexpectedly uncovered finely engraved inscriptions on its inner surfaces that had not been seen in over 2,000 years.⁴⁴ Through these new technologies, and prior work, it is now known that this ingenious device computed and displayed celestial, calendrical, and athletic festival information – all of it based on the astronomy of lunisolar calendars as recounted by Geminus that I have just described in the previous sections. In fact, Geminus Book 8 provides the best commentary on the astronomy that underwrites the Mechanism.

For instance, the front of the Mechanism was primarily concerned with computing the tropical year, which was equated with the sidereal year for convenience's sake, and displaying the movements of the Sun, Moon and 5 visible planets in antiquity. It prominently featured The Front Dial, which consisted of two scales, the outer of which was a moveable ring known as the Egyptian Calendar Scale.⁴⁵ Around the inner edge of this moveable ring were incised 365 short radial marks, each representing one day of the Egyptian calendar year. These 365 radial marks were undoubtedly divided into 13 sectors, 12 sectors of 30 radii each representing the 30 days of an Egyptian month, and a smaller sector of 5 radii representing the 5 “epagomenal” days. 365 holes were also drilled into the underlying Front Dial Plate of the Egyptian Calendar Scale. These would have operated with a peg so that the Egyptian Calendar Scale could be rotated to keep track of the *annus vagus* (“wandering year”) of the Egyptian calendar with respect to the Zodiac Dial (see the next paragraph for a description of the Zodiac Dial). The Egyptian Calendar Scale may have a preserved Fiducial Mark opposite Libra 17.7° on the Zodiac Dial to indicate where Thoth 1, the first day the Egyptian calendar, fell at the Mechanism's start-up date. If there, this would indicate the Mechanism's start-up epoch fell sometime between 214 and 198 BC.⁴⁶ Since the Egyptian calendar was about ¼ day short of a tropical

⁴² There is a controversy about the date of the construction of the Mechanism. Some scholars such as Carman and Evans 2014 or Freeth (with input from Charles Crowther) 2014, think it was constructed close to the epoch start-up date of the Saros Eclipse Dial of 29 April, 205 BC, while others, including me, (Jones 2017, 93 and 157; Iversen 2017, 182-183; and Iversen and Jones 2019, 486-489) think it was closer in time to the shipwreck, *c.* 70-60 BC. Some have continued to maintain that the Mechanism is a forgery that was constructed much later. For a complete refutation of this, see Jones 2020.

⁴³ For the AMRP, see <<http://www.antikythera-mechanism.gr>> last accessed 08/07/2021.

⁴⁴ For the most comprehensive edition of the inscriptions, see Allen *et al.* 2016. For a new edition of what is called the “Back Plate Inscription” see Iversen and Jones 2019.

⁴⁵ Rehm 1906, 19 (and reported by Rediadis 1910, 167 and Rados 1910, 34) was the first to recognize the presence of an Egyptian month inscribed on the Antikythera Mechanism, while Price (1974, 16-20) was the first to recognize that this was part of an Egyptian Calendar Scale. See also Jones 2017, 27-28 and 58-60.

⁴⁶ The Fiducial Mark was first noted by Price 1974, 19-20. On the existence and date of this Fiducial Mark, see Evans and Carman 2014, 155-157 and Carman and Evans 2014, 760-761; Jones 2017, 76. As Carman and Evans note, if real, the range of possible dates for which Thoth 1 corresponded to Libra 17.7°, with reasonable room for error, is between 214 and 198 BC and encompasses the date of the start-up of the Saros Eclipse Cycle on the back of the Mechanism, which fell in the month beginning 29 April, 205 BC. In 205 BC, Thoth 1 was

year, it may have also been used in conjunction with the four-year Games Dial on the backside of the Mechanism (see below) to keep track of the necessary leap years in a fashion similar to the Julian calendar. It is also worth noting here, that of the city-states in Greece, Rhodes had some of the closest ties to Egypt, and in particular was the only place in the ancient world where Helios enjoyed an important cult, which in past scholarship was widely believed to have been imported from Egypt.⁴⁷

Inside the Egyptian Calendar Scale there was another circular scale –this one fixed/inscribed into the Front Dial Plate– called the Zodiac Dial. This second dial featured 360 short radial marks incised around the inner edge of its circumference, which, it has been compellingly argued, were inscribed nonuniformly to display the variability, or anomaly, in the angular motion of the Sun.⁴⁸ These 360 radii were undoubtedly divided into 12 sectors, each with 30 gradation/radial marks, to represent the longitude of the 12 signs/360° of the zodiac, which, as we saw above, was ancient Greek astronomers' other preferred way (borrowed from the Babylonians)⁴⁹ to keep track of the tropical/sidereal year – a preference that continues even after the introduction of the Julian calendar.

At the center of the Egyptian Calendar Scale and the Zodiac Dial there was a kind of Portable Cosmos that resembled a planetarium,⁵⁰ which probably displayed the earth at the center around which circled, on pointers, images representing the Sun, Moon (the phases of the moon were also displayed with a Moon Ball),⁵¹ and almost certainly also the five visible planets in antiquity (Mercury, Venus, Mars, Jupiter and Saturn) as they moved through the Zodiac Dial (which again represented the tropical year). On the front there

on October 13 (see Bickerman 1980, 118, Table III), and the Sun's longitude on that date, according to modern theory and the tables in Ptolemy's *Almagest*, was about Libra 17° (see Jones 2017, 158, n. 56). On the other hand, in lines 1 and 2 of the Parapegma Inscription, Libra 1 is equated with the autumnal equinox, which in 205 BC fell on September 26, exactly 18 days before October 13.

⁴⁷ See Nilsson 1906, 427-428; Farnell 1909, V.417-420; Jessen 1912, 66-69. For the plethora of Egyptian or Egyptianizing finds at Rhodes, see *Lindos I*, 336-355; Martelli 1988, 109-110; Jacopi 1932-1933, 321-328 (M.-J. Carbon points out to me that such Egyptian material is also ubiquitous throughout the Greek world in places that did not have a cult of Helios). Wilamowitz-Moellendorf (I.1931, 84), on the other hand, felt the cult of Helios was indigenous to Karia (but most of this evidence was probably from the time when Rhodes controlled parts of Karia and disseminated the cult). For the argument for the Doric roots of the cult of Helios, see Larson 2007, 68.

⁴⁸ Evans, Carman and Thorndike 2010. Wright (2002a and 2002b) was the first to propose that the Antikythera Mechanism modeled the solar anomaly, but he posited two pointers to do this, one for true Sun and one for the mean Sun, rather than a simpler, nonuniform scale. On this, also see Jones 2017, 117-119.

⁴⁹ For how the Zodiac Dial on the preserved portion of the Antikythera Mechanism comports with what is known as "System A of Babylonian Solar Theory", see Evans and Carman 2019.

⁵⁰ See Bitsakis and Jones 2016b, 241-242 and Jones 2017. Rediadis originally proposed (in Svoronos 1903, 44-52) and later (1910) defended the idea that the Antikythera Mechanism was an astrolabe – a device used by mariners to ascertain a ship's longitude. Rehm (1905, 1906 and 1907, 470), however, rejected the idea of an astrolabe, and conjectured that the Antikythera Mechanism was a kind of planetarium/orrery like the *sphairai* of Archimedes or Poseidonios. The view that the Antikythera Mechanism was a kind of planetarium was adopted by the following scholars who also propose gear train schemes: Price (1974, 13; 27-28; 55-60); Morgan 2000; Edmunds and Morgan 2000; Wright 2002a, 170-171 and Wright 2002b; Freeth 2002, 56-57; Wright 2005; Carman, Thorndike and Evans 2012; Wright 2012; Freeth and Jones 2012; Wright 2013; Jones 2017, 209 and 216-218. See Freeth *et al.* 2021 for a reconstruction that uses rings rather than pointers for the planets.

⁵¹ On the Moon Ball display, see: Wright 2006; Freeth *et al.* 2008, Supplementary Material, 22, fig. 14; Freeth and Jones 2012, section 2.4.1, fig. 6; Carman and Di Cocco 2016; Jones 2017, 59; 125-126.

was also what is known as the Parapegma Inscription, which was split up into four seasons, each season in one the four corners of the Front Plate around the Zodiac Dial, but also arranged in semesters so the cold part of the year was on the left-hand side, and the warm part of the year on the right-hand side. Finally, there was also what is known as “The Front Cover Inscription”,⁵² an inscription on a thin bronze plate that was probably located on the inside of the door that protected the front of the Mechanism. The preserved portions record data on the synodic cycles for the Sun and the five visible planets, and probably it also described the movement of the Moon (in the order of proximity from Earth, thus the Moon, Mercury, Venus, Sun, Mars, Jupiter, and Saturn, which would have also been the order of the spheres on the putative planetarium display).

The back of the Mechanism, on the other hand, was more concerned with the calculating and displaying of lunar months – the other important half of any effective lunisolar calendar. As on the front, there was a thin, bronze cover to protect the back of device. On the inner surface of this was inscribed what is known as the Back Cover Inscription.⁵³ This text served as user’s manual, giving a systematic description of the dials, pointers and features on both the front and back of the Mechanism. The lower part of the back of the Mechanism featured the Saros Eclipse-Possibility Spiral of 223 cells (representing 223 lunar months) within some of which there are Glyphs indicating at what hour day or night an expected lunar or solar eclipse would occur. This dial computed and displayed a sequence of lunar and solar eclipse possibilities through a Saros Cycle that, it has been persuasively argued by two different groups of scholars, began shortly after the new moon of 28 April, 205 BC.⁵⁴ Inside the Saros Eclipse Dial there is also what is also known as the Exeligmos Dial, which, as we saw above was a triple Saros. The purpose of the Exeligmos Dial was to keep track of the necessary eight-hour adjustments to the expected eclipse hours found in the Glyphs through successive Saros Cycles.

The top half of the back of the Mechanism prominently featured a Metonic-Calendar Spiral (see **Figure 1**) of 235 cells representing the 235 lunar months of the Metonic Cycle. Inside each of these cells was inscribed the name of a month from an actual Greek calendar, and since parts of 10 years are preserved, the entire calendar can be reconstructed with absolute certainty as: Phoinikaios, Kraneios, Lanotropios, Machaneus, Dodekateus, Eukleios, Artemisios, Psydreus, Gameilios, Agrianios, Panamos and Apellaios. This calendar was almost certainly that of Korinth or a Korinthian colony in northwestern Greece or of Epiros whose epoch start-up date I have argued to begin shortly after the new moon of 23 August, 205 BC.⁵⁵ From the preserved portions we can deduce that the intercalations took place in years 1, 3, 6, 9, 11, 14 and 17. Only the intercalation in year 11 is preserved, where the fourth month of the calendar, Machaneus, is doubled. The calendar also excluded every 64th day, as Geminus described, rather than the last day

⁵² For the Front Cover Inscription, see Anastasiou *et al.* 2016b.

⁵³ For the Back Cover Inscription, see Bitsakis and Jones 2016b.

⁵⁴ On the start-up epoch of the Saros Eclipse Dial with the lunar month beginning 29 April, 205 BC, see Carman and Evans 2014 and Freeth 2014. For the same dating using a different argument, see also now Jones 2020.

⁵⁵ On the calendar and its provenance, see Iversen 2017. Since I believe the Mechanism dates close in time to *c.* 70-60 BC, I think it likely to belong to a colony of Korinth (possibly Ambrakia) rather than Korinth itself, since Korinth was mostly in ruins between the sack of Korinth of Lucius Mummius in 146 BC and Julius Caesar’s refounding of the city as the Colonia Laus Iulia Corinthiensis in *c.* 44 BC.

every other month. The excluded days start on Phoinikaios 1 of year 1, hence on the Antikythera Mechanism there was no New Year's Day in the first year of the Metonic Cycle.

Inside the Metonic-Calendar Spiral there was probably also a Callippic Dial of 76 years (now lost but the figure 76 is referred to on Fragment 19 of the Mechanism), which we recall was 4 Metonic Cycles less one day. There was also a preserved Games Dial (see **Figure 1**) indicating the years of several Panhellenic athletic/religious festivals. The presence of the Games Dial within the Metonic-Calendar Spiral on the Antikythera Mechanism reminds us of the fundamental role that religious festivals played in the history and development of lunisolar calendars. These festivals included the four greatest games of antiquity -the Isthmia, Olympia, Nemea and Pythia- as well as the more minor Naa of Dodona, and, through my own work, the Halieia of Rhodes.⁵⁶

Having established the nature of Greek lunisolar calendars as well as the fact that by the end of the 3rd century BC it is likely that most Greeks were using the Metonic Cycle to regulate their calendars, including Rhodes (contrary to the opinion of Hiller von Gaertringen and Badoud, who hold that the Rhodians were using the *octaëteris* as late as the 1st century BC), I will now turn to the season and history of the Halieia (Section II), which will impact my discussion of some aspects of the calendars of Rhodes and Kos that follow.

II. The Halieia of Rhodes

A. The Years and Season of the Rhodian Halieia

The Games Dial of the Antikythera Mechanism is divided into four quadrants labeled as follows (again, see **Figure 1** on page 121):

ΛΑ ⁵⁷	ΛΒ'	ΛΓ'	ΛΔ'
Ἴσθμια	Νέμεα	Ἴσθμια	Νέμεα
Ὀλύμπια	Νᾶα	Πύθια	Ἀλῆια
Year 1	Year 2	Year 3	Year 4
Isthmia	Nemea	Isthmia	Nemea
Olympia	Naa	[P]yth[i]a	Halieia

I have elsewhere discussed extensively the years and season of the Halieia,⁵⁸ so I will only give a summary of those points here. From the Antikythera Mechanism and other evidence (mostly the Pindaric Scholiasts who were almost certainly relying on the 3rd century BC historian Istros' work entitled *περὶ τῶν Ἡλίου ἀγώνων*),⁵⁹ we now know that the Great Halieia took place shortly after the Nemea in odd years BC in the summer prior to the Olympia, thus 205, 201, 197, 193, etc. Note that Badoud⁶⁰ apparently misunderstood this evidence when he states that the Halieia, along with the Nemea, fell within the third

⁵⁶ On 11 June, 2011 I presented my reading of Halieia to several members of the AMRP who had gathered in Athens to watch the total lunar eclipse on the Acropolis later that same evening. See Iversen 2017, 141-146 and Iversen 2020. See also Zafeiropoulou 2012, 247 and Anastasiou *et al.* 2016a, 175, especially n. 76.

⁵⁷ The symbol Λ is a common abbreviation on inscriptions for ἔτος, which is usually somewhat misleading when translated "year" since it normally represents 12 or 13 lunar months. On the Games Dial, however, the symbol Λ stands for a true solar year.

⁵⁸ Iversen 2017, 141-146 and 192-197.

⁵⁹ See *BNJ* 334 F 49.

⁶⁰ Badoud 2015, 129.

year of an Olympiad, which is probably true, but he goes on to say “*dans la série 774, 770...98,*” which is wrong. Olympiad years ran from roughly August to July, so the third year of the Olympiad ran from roughly August of 774 to July of 773, hence the Halieia, along with the Nemea, fell in the summer of 773, 769...97.⁶¹ This means the dates of his festivals in his tables are often off by at least 1 year. For instance, in the table on pages 133-134, he lists the pentaeteric Dipanamia as taking place in 91/0,⁶² 87/6, 83/2... (with the Dipanamia falling in the summer of 90, 86, 82...) and the Halieia as taking place in 90/89, 86/5, 82/1... (with the Halieia also falling in the summer of 90, 86, 82...), when both of these would have been celebrated in the summers of 89, 85, 81...BC. I will have more to say about his Rhodian festival dating in Section VI below, which also impacts his arguments about the dates of the terms of certain priesthoods and officials, as well as the dates of numerous inscriptions.

I have also argued that the Halieia took place in the Rhodian month of Panamos and finished on Panamos 24, which was normally coincident with Argive Panamos (where the Nemea finished six days earlier on Panamos 18), and that both months are closest in time to Gorpaios in the fixed calendar of Alexandria (after 30 BC)⁶³ as well as Athenian Hekatombaion and occasionally to Skirophorion (that is the month the month beginning with the first new moon after the summer solstice or occasionally the month in which the summer solstice fell).

It is worth noting here that Badoud⁶⁴, relying in part on Perlman’s (1989) arguments about the season of the Nemea being late in the summer and Lambert’s (2002) contention that a sacrifice to Zeus Nemeios took place in Athens in the Athenian month of Metageitnion (Aug./Sept.), believes that the Halieia took place in the Rhodian month of Dalios. I have shown elsewhere that both Perlman’s and Lambert’s arguments about the season of the Nemea are unlikely to be correct and that all the evidence points to a celebration one or occasionally two months earlier.⁶⁵ Badoud’s other evidence for placing the Halieia in this month comes from an inscription (Segre and Pugliese Carratelli 1949-1951, 258, no. 152 = Badoud 2015, 446, no. 67) that shows that the Kameiran *damiourgos* was to sacrifice a cow to Helios every year on the 1st and 20th of Dalios. Evidently, he believes this to mean that such a sacrifice to Helios is most likely to occur in the month of the Halieia. Clearly this is not a valid assumption, since this same inscription indicates that the *hieropoioi* were also to sacrifice three goats to this god every year in Panamos by the 20th of the month (which would have the sacrifices completed just before when I argue the Halieia finished).⁶⁶ Furthermore, *IG XII.1* 892, which was found in the territory of

⁶¹ Of course neither the Halieia nor the Nemea were in existence in the 8th century BC. Hieronymus, *Chronicle* (Fotheringham 1923, 179) states that the Nemea were founded in 573 BC, and as many have pointed out, the Halieia were probably not in existence until after the synoikism of Rhodes in 408/7 BC.

⁶² Confusingly, he gives only single years, such as 91, 90..., but it is clear from his arguments he means 91/0, 90/89....

⁶³ On the assimilation of Macedonian Γορπαιός to the Egyptian calendar so that its first day fell on Epeiph 1 at some point between 145 and 119/18 BC, see Samuel 1972, 150 and 177. In 119/18 BC Δίος 1 = Thoth 1 = Sept. 22, so Ὑπερβερεταίος 30 = Mesore 30 = Sep. 16, Γορπαιός 30 = Epeiph 30 = Aug. 17, and thus Γορπαιός 24 = August 11. At some point in or shortly after 30 BC, however, Thoth 1 = August 29, thus Γορπαιός 30 and Epeiph 30 were equated to July 24 and thus Γορπαιός 24 = July 18.

⁶⁴ Badoud 2015, 116; 127.

⁶⁵ Iversen 2017, 142, n. 54; 174, n. 174.

⁶⁶ Badoud (2015, 21-23) makes the argument that it is significant that the *damiourgos* makes the sacrifice

Lindos, indicates that the Lakoi –probably a subgroup at Lindos like the Pantoreioi at Ialysos– were to sacrifice a white kid or red kid to Helios every year on the 14th of Hyakinthios, the same color of victim as at Kameiros, although here a kid and not a cow. As J.-M. Carbon suggests, it is more likely that all these inscriptions, as well as others of the same type found around the island,⁶⁷ are extracts from the general sacrificial calendar of Rhodes that were disseminated to the local communities, and as such they cannot be used to pinpoint a particular sacrifice for a particular festival in a particular month.

In addition, elsewhere Badoud also argues that the fifth month of the Rhodian calendar, Badromios, was normally the month within which the spring equinox fell.⁶⁸ Since the order of the Rhodian months from Badromios to Dalios, the 11th month in the Bouleutic Calendar-Year but the first month in the Eponymous Calendar-Year (on this see below, Section IV.C), are certain, if the spring equinox normally fell within the month Badromios, which would often be equivalent to Athenian Elaphebolion (March/April), it would mean Dalios would necessarily be the month that was often coincident with Athenian Böedromion (September/October), and thus normally the month within which the autumn equinox fell. On the Antikythera Mechanism, however, the years on the Games Dial almost certainly run from autumnal equinox to autumnal equinox and the Mechanism indicates the Halieia fell before this seasonal marker. That the lines demarcating the years on the Games Dial are equivalent to the autumnal equinox is probable not only by the likely start-up date of the month Phoinikaios I within the Metonic Spiral as August 24, 205 BC, but also by the layout of the Zodiac Dial on the Front of the Mechanism, which has the autumnal equinox as the first stellar event of the year pointing down at 180°. This is the same orientation that the start of the Metonic Spiral on the back of the Mechanism has, and the same orientation that the Games Dial on the back of the Mechanism would have, were it not rotated about 7.27° counter-clockwise, or about one lunar month, probably to account for the fact that Phoinikaios I in the start-up year started about one month before the autumn equinox (see **Figure 2** for proposed orientation of all dials on the back of the Mechanism at start-up). In addition, the last stellar event of the year on the Zodiac Dial is now conclusively known to be at gradation 19 of Parthenos/Virgo,⁶⁹ which surely must refer to the heliacal rising of Arcturus just before the autumnal equinox. If, however, the Halieia were in the month of Dalios, and this month were normally coincident with Athenian Boëdromion (the logical conclusion from Badoud’s book),⁷⁰ then most of the time the 24th of Dalios would occur after the fall

in Dalios, whereas only the “modestes hiéropes”, as he writes, sacrifices in Panamos. And from here he jumps to the conclusion that the Halieia also took place in Dalios.

⁶⁷ *Lindos* II 26, 181, and 182; Pugliese Carratelli 1955-1956, 169, 20a and 20b (all from Lindos). *Lindos* II 680 (from Ialysos). Segre and Pugliese Carratelli 1949-1951, 148, 149, 151, and 153 (all from Kameiros). Note that many of these sacrifices are made on 1 Dalios, which as we shall see below (Sections III.C and IV.B-C), was likely the first day of the Eponymous Calendar-Year at Rhodes.

⁶⁸ Badoud, 2015, 14.

⁶⁹ I am preparing a new edition of all the inscriptions of the Antikythera Mechanism and I have now clearly read the Index Letter Ω – the last stellar event of the year – at gradation 19 in the CT on the Zodiac Dial scale. Bitsakis and Jones 2016a previously thought they could read this at gradation 21, but I have shown Jones the CT evidence and he agrees with me.

⁷⁰ Badoud’s seasons for the months are internally inconsistent. For instance in his table on p. 16, fig. 11, he lists Karneios as “octobre/novembre”..., but the rest of his book suggests that, in fact, his Karneios should

equinox, and this would appear to contradict the evidence of the time of the Halieia on the Antikythera Mechanism.⁷¹

The assertion that the Halieia took place in Rhodian Panamos and that this was the month normally coincident with Athenian Hekatombaion inevitably leads to a discussion of the seasons and order of the months of the Rhodian calendar, for which there is not yet full agreement. I will address this issue in the next section of this paper (Section III.C), but first I want to discuss the evidence concerning the history of the Halieia and its events.

B. The History and Competitive Events of the Halieia

As for the evidence of when the Halieia were instituted, Homer's (heavily interpolated) Catalogue of Ships tells us that the three major cities of Rhodes, Kameiros, Lindos and Ialysos were founded and led under the unified command of Tlepolemos son of Herakles after he fled his native land of Ephyra near Elis for having killed his uncle Likymnios.⁷² By the 5th century BC the Rhodians themselves apparently believed that Kameiros, Lindos, and Ialysos were the three grandsons of Helios and the nymph Rhodos who divided their paternal inheritance into to three equal shares,⁷³ while Thucydides tells us the Rhodians were Dorians of Argive decent (Pausanias adds that Tlepolemos married Polyxo of Argos and the tribe Argeia and deme Argeios are attested at Lindos).⁷⁴ On the Athenian Tribute Lists the three cities appear as three separate entries in the years 454-414 BC,⁷⁵ but there is ample evidence that by the second quarter of the 5th century BC the Rhodians at times took collective action and that they themselves and other Greeks considered Rhodians in some sense to have been a single ethnic.⁷⁶ For instance, Pindar in his encomium for Diagoras for his victory in boxing at Olympia in 464 BC lists his origin as Rhodian, while Thucydides usually lumps them together as a single people.⁷⁷

Pindar's ode to Diagoras in 464 BC also makes it clear that by this date Helios was considered to be the preeminent deity of the land who had plucked the island as a jewel

be "novembre/décembre". For instance, on p. 17 he talks about how the first six months of the Rhodian calendar correspond roughly from November to April (thus Karneios \approx November). The truth is that in an earlier draft I had seen he had simply labelled Karneios as "novembre" and Badromios as "mars" and Dalios as "septembre", and when it was pointed out to him all his months were one month too late, it appears he just relabeled these as "octobre/novembre", "février/mars" and "août/septembre" in his table on p. 16, but he did not adjust his underlying analysis, which results in a book that is internally at variance with itself.

⁷¹ It should be noted here that Badoud (2015, 127) ignores the testimony of the Scholiasts that the Halieia were completed by the 24th of the month, which should mean they started perhaps up to five days before this, and instead seems to assume the Halieia began to be celebrated on or shortly after 1 Dalios.

⁷² Homer *Iliad* 2.653-669.

⁷³ Pindar *Ol.* 7.73-75; see also Diodoros Siculus 5.57.8 (= Zenon *FrGrH* 523 F1 = *BNJ* 523 F1) and Strabo 14.2.6. For the cult of Helios at Rhodes, see Zusanek 1996.

⁷⁴ Thucydides 7.57.6; Pausanias 3.19. For the Lindian tribe Argeia, see *Lindos* II 199, line 6. The tradition that Rhodes was connected to Argos seems to be alluded to by Pindar (*Ol.* 7.19), and an inscription found at Argos (Vollgraff 1916) confirms that in the late fourth century BC both Argos and Rhodes cultivated an identity of $\sigma\upsilon\nu\gamma\acute{\epsilon}\nu\epsilon\iota\alpha$.

⁷⁵ *ATL* I, lines 290-291, 296-297, 334-335. Four other Rhodian communities are also listed separately: Lindian Oiiatai (*ATL* I, lines 360-361), Pedies from Lindos (*ATL* I, lines 370-371), Diakrioi on Rhodes (*ATL* I, lines 262-263), and Brikinarioi on Rhodes (*ATL* I, lines 248-249; 513).

⁷⁶ For a thorough review of the evidence, see Gabrielsen 2000, 180-187. For an argument for a much earlier date in relation to the colonisation of Naukratis in Egypt, cf. Malkin 2011, 66-96.

⁷⁷ Thucydides 3.8.2; 6.4.3; 6.43.1; 7.57.6; 7.57.9; 8.44.2; 8.55.1. The exception is at 8.44.2.

out of the sea, but in this ode Pindar mentions that Diagoras had won two times at games in honor of Tlepolemos (presumably the Tlepolemeia), not at any games in honor of Helios. Later Scholiasts, in a garbled passage, claimed that

ψεύδεται ὁ Πίνδαρος· οὐ γὰρ Τληπολέμῳ ὁ ἀγὼν ἐπιτελεῖται, (τῷ δὲ⁷⁸) Ἥλίῳ, ὡς Ἴστρος φησὶν ἐν τῷ περὶ τῶν Ἥλιου ἀγώνων· Ῥόδιοι τιθέασιν Ἥλιου ἐν Ῥόδῳ γυμνικὸν τε στεφανίτην· ἐν γὰρ Ῥόδῳ ἄγεται τὰ Τληπολέμια.⁷⁹

The Scholiasts also claim that

ἔστι δὲ αὐτοῦ ἱερὸν καὶ τάφος ἐν Ῥόδῳ· οἱ γὰρ συστρατευσάμενοι αὐτῷ διήγαγον τὰ ὀστᾶ ἀπὸ τῆς Ἥλιου εἰς τὴν Ῥόδον...τελεῖται δὲ καὶ ἀγὼν ἐπιτάφιος ἐν τῇ πόλει Τληπολέμου, κατὰ δὲ ἑτέρους Ἥλιῳ ἀγωνίζονται δὲ παίδων ἡλικίαι καὶ στέφονται ἐκ λεύκης.⁸⁰

Naturally, there are numerous different ways to interpret these scholia. Boeckh noted the impossibility that Pindar could have made the glaring *faux pas* of alluding to the wrong games before his Rhodian audience, so he theorized the games originally in honor of Tlepolemos were transformed at later date, when there was less emphasis at Rhodes on the Herakleidai, into the Halieia.⁸¹ Wilamowitz-Moellendorf, however, points out that the Tlapolemeia were still attested as a distinct set of games alongside the Halieia on an inscription found at Kedreai in the Rhodian Peraia that dates to the middle of the 2nd century BC,⁸² plus the Halieia did not even exist before the foundation of Rhodos city in 408/7,⁸³ hence, so he argued, the Scholiasts were just ignorant of the Tlapolemeia and thus plain wrong. Jacoby (*FrGrH* 334 F 49⁸⁴) expanded on this idea by suggesting the Scholiasts only cited Istros based upon a wrong inference (i.e., that games that were more important in Istros' day necessarily must have been more important 200 years earlier in Diagoras' day), and besides in Istros' book on the games in honor of Helios, so he argued, there would have been no scope to bring up the Tlapolemeia. He also believes the inscription found at Kedreai certainly means the Tlapolemeia existed in Pindar's time as well. Farnell argues, on the other hand, that the Tlapolemeia may have been observed amongst a larger celebration to Helios in Diagoras' day,⁸⁵ while Jackson (1999) argues that the Scholiast was accurately quoting Istros, who himself claimed the games were not in honor of Tlepolemos in order to promote the older myth of Helios and Rhodes along with its stronger link to Egypt and thus Ptolemaic Alexandria where he worked. Such are the differing views of the Scholiasts' testimony and on the Tlapolemeia games.

More importantly, in 1975 Frel published a large bronze hydria dating *c.* 450-425

⁷⁸ The text reads οὐ γὰρ Ἥλιῳ = (τῷ δὲ) Ἥλίῳ, corr. Schröder.

⁷⁹ Schol. Pindar *Ol.* 7.146b, lines 18-21 (Drachmann, p. 229).

⁸⁰ Schol. Pindar *Ol.* 7.36c, lines 13-18 (Drachmann, pp. 209-210). Johannes Tzetzes (*ad* Lychophr. 911) repeats much of this.

⁸¹ Boeckh 1821, 174.

⁸² Wilamowitz-Moellendorf 1922, 366, n. 2. For the inscription, *SIG*³ 1067, line 8 = Moretti 1953, 127, no. 50 = *IK Rhod. Peraia* 555 (middle of the 2nd century BC). For the widespread use of the name Tlepolemos in Karia, see Bresson 1999, 99-100.

⁸³ Pugliese Carratelli (1951, 80-81) expands on this idea. Bernardini's (1977) position is basically that of Wilamowitz-Moellendorf.

⁸⁴ For Jacoby's commentary, see *FrGrH* IIIb (Supplement), vol. I (Text), 651-652.

⁸⁵ Farnell 1932, 56.

BC inscribed with the note that it served as an “*Athletic prize from Rhodes from Helios*”.⁸⁶ This bronze hydria shows beyond any doubt whatsoever that games in honor of Helios were already in existence by the third quarter of the 5th century BC, but apparently, they were not as prestigious as those in honor of Tlepolemos, where Diagoras had won two times by 464 BC. They did, however, apparently already attract international competitors, as the phrase ἐγ’ Ῥόδῳ assumes this prize will be carried abroad as a trophy (and this inscription also provides more evidence of collective Rhodian identity in the 5th century BC). It is likely, therefore, that already by the end of the 5th century BC the Rhodians were celebrating the Halieia at a sanctuary that would eventually become a part of the city of Rhodos.

This brings up the issue of prizes at the games. The Pindaric Scholiasts (again who were probably relying on Istros) tell us that the Halieia were γυμνικός and στεφανίτης.⁸⁷ The second term, στεφανίτης, refers to games in which the prize was a crowning wreath of only symbolic worth as opposed to a material prize such as a bronze hydria, and furthermore the Scholiasts identify this crown at the Halieia as being made of white poplar (ὁ δὲ στέφανος λεύκη δίδοται).

Confirmation that the prize was white poplar also comes from a fragment of the Περὶ τῶν ἐν Ἑλλάδι πόλεων of Herakleides Kritikos (*FrGrH* 2022 F 2.5 = *BNJ*369A F 2.5), who probably wrote his *periegesis* c. 279-267 BC before the start of the Chremonidean War.⁸⁸ The passage is worth quoting in full:

αὕτη πόλις ἔσθ’ Ἑλληνίς ἢ ῥόδοις ἴσην
εὐωδίαν ἔχουσα χᾶμ’ ἀηδίαν.
τὰ γὰρ Ἀλῖεια τὰ μεγάλα⁸⁹ εἰς χολὴν μ’ ἄγει,
τὸ δ’ ἀλιακὸν ἔτος με μαίνεσθαι ποιεῖ.
ὅταν δὲ τὴν λεύκην τις αὐτῶν πράεως
ἀλιακὸν εἶναι στέφανον εἴπη, πνίγομαι
οὕτως ἐπ’ αὐτοῖς, ὥστε μάλλον ἂν θέλειν
ἀποκαρτερεῖν, ἢ ταῦτ’ ἀκούων καρτερεῖν.
τοιούτο τῶν ξένων τι καταχεῖται σκότος.

This city is Greek and like roses fragrant,
but at the same time also flagrant.
For the Great Halieia are quite galling,
And the solar year⁹⁰ so appalling.
And whenever any of them gives me a polite brief,
That the heliacal crown is made of white-poplar leaf,
I choke on this, so that I’d rather all food abjure,
Than listen to this and endure.
Such is the kind of trivia arcane, which on visitors is
rained.

An inscription also records that the Haliastai and Haliadai (the members of the *koimon* of Helios at Rhodes) are attested as honoring someone with a crown of white poplar (λευκαίας στεφάνω).⁹¹ Both the passage in Herakleides and this unique epigraphical attestation of such a crown lends strong support to the Pindaric Scholiasts’ assertion that

⁸⁶ The inscription reads ἄθλον ἐγ’ Ῥόδῳ παρ’ Ἀλίῳ; see Johnston 1977 and J. and L. Robert *BE* 1976.513 (who simultaneously corrected the *editio princeps* of Frel 1975). Also see Amandry 1980, 211, n. 4 and 250 for the date.

⁸⁷ *Ol.* 7.146a (Drachmann p. 229). Other 3rd century BC evidence includes *IG* II² 3779, line 21 (from Athens) and *IG* IV,1387, line 1 (from Thouria in Messenia). *SEG* XXXIX 760 of Rhodes (c. 100-50 BC) also refers to the games as στεφανίτης. For the technical meaning of the term στεφανίτης and its evolution, see Remijnsen 2011.

⁸⁸ Arenz 2006, 51-56 and *FrGrH* 2022 F 2.5 (Introduction). McInerney (= *BNJ* 389A), on the other hand, dates his work between 262 and 229 BC.

⁸⁹ ἀλιεῖτα μεγάλην, cod.; Ἀλῖεια μεγάλην εἰς χολὴν *legunt multi*.

⁹⁰ For the possible connection of the phrase τὸ δ’ ἀλιακὸν ἔτος to the annual ceremony of throwing a quadriga into the sea per Sextus Pompeius Festus (*De verborum significatu, s.v. October Equus*), see Section III.C.2 below under the month of Thesmophorios.

⁹¹ *IG* XII.1 155 face III, line 79 and face IV, line 118.

the victory crown at the Halieia was white poplar.

The most likely explanation for the earlier hydria, then, is that an earlier more local set of games in honor of Helios were reorganized and elevated to be the preeminent games of the island of Rhodes sometime after the city of Rhodos was founded in 408/7 BC.⁹² Such a reorganization and renaming of games is exactly paralleled with the Hekatomboia/Heraia at Argos (at which Diagoras also competed and was victorious), including that the earlier prize of a bronze hydria was changed to a crown.⁹³ Meanwhile, the games in honor of Tlepolemos continued, and are possibly the same games as are eventually attested on inscriptions found on Rhodes proper as the Ἐπιτάφια (hence the Scholiast's claim that these were an ἀγῶν ἐπιτάφιος).⁹⁴

Be that as it may, the next possible evidence for the Halieia is adduced by Konstantinopoulos and Zervoudaki, who have argued that oil amphorae dating to the 4th century BC replaced the bronze hydriae as prizes in the Halieia from the 4th century BC onward in a fashion similar to the famous Panathenaic vases.⁹⁵ These few, very fragmentary, examples have scenes depicting a dark-haired Helios dressed in a white chiton driving his four-horse chariot with sun-beams coming out of his head. Perhaps these vases were somehow connected to the Halieia, or the pre-cursor to the Halieia, but as we saw above, it is likely they would have been ancillary, since Herakleides and Istros both tell us the prizes were made of white poplar and the Haliastai are known to have awarded a crown of white poplar.

The earliest certain attestation of the games come from the fragment of Herakleides Kritikos quoted above, which dates *c.* 279-267 BC and seems to indicate that the games were well known and well established by then. An Athenian stele in honor of the kitharode

⁹² For the date, see Diod. Sic. 13.75.1. Diodoros was probably relying on Timaios of Tauromenion for this information (see Christesen 2007, 283-284). For the elevation of the cult of Helios, see Pugliese Carratelli 1951, 80-82.

⁹³ For the Ἐκατόμβοια, see Boëthius 1922, 56-65 and Amandry 1980 (especially for the various bronze hydria inscribed παρ' Ἑράρας Ἀργείας ἐμὶ τῶν ἀφέθλων or something similar), the latter who argued that these games were known as the Ἐκατόμβοια ἐν Ἀργεὶ *c.* 460 – before the end of the 3rd century BC, then by the end of the 3rd century BC the name was changed to the Ἡραῖα τὰ ἐν Ἀργεὶ, and then at the end of the 1st century of our era the name was changed again to ἡ ἐξ Ἀργους Ἀσπίς (for these last games, see especially Amandry 1983 = *SEG* XXX 296). Moretti 1991 (= *SEG* XLI 1750) also argues the Ἡραῖα changed their name to the ἡ ἐξ Ἀργους Ἀσπίς before the end of the 1st century of our era, probably *c.* AD 85. However, the games are still called the Ἡραῖα in AD 134 (Petzl and Schwertheim 2006, 8-16, line 65) and at the end of the 2nd century AD (*IG* IV 590), so either the change of name occurred at the end of the 2nd century AD or later, or the games had two names concurrently, or possibly the ἡ ἐξ Ἀργους Ἀσπίς was a different set of games. Moretti 1953, 21, no. 10 suggests a victor's dedication at Argos that he dates *c.* 500-480 BC, which alludes to a “public set of games” (τοῖς δαμ|οσίοις ἐν ἀέθλο|ις), may refer to the Ἐκατόμβοια.

⁹⁴ Pugliese Carratelli 1952-1954, 267, no. 18, line 9 (*c.* 200-150 BCE), where Pugliese Carratelli reads ἐπιτάφια Ἀλῖεια, which should either be changed to Ἐπιτάφια, Ἀλῖεια (i.e. asyndeton), or το Ἐπιτάφια (καὶ) Ἀλῖεια; Pugliese Carratelli 1952-1954, 268, no. 19, line 8 (*c.* 200-150 BCE); *Lindos* II 222, line 6 (*c.* 150 BC); Maiuri 1925, 19, no. 18, line 15 (shortly after 88 BC); *Lindos* II 707, line 4 (*c.* 40-30 BC).

⁹⁵ Konstantinopoulos 1966, 444, Πιν. 483 β and Zervoudaki 1975 (for a good color photo of this vase, see Hoepfner 2003, 30, Abb. 3). Also see Zervoudaki 1983, who suggests that an inscribed vase with a fragmentary inscription was in honor of Maussollos in gratitude for his support during the Social War of 357-355 BC, or a special Halieia in honor of Maussollos after he died in 352 BC. If correct, these would have to be the celebrations of 353 BC (the year of the first Great Halieia after the end of the Social War), or those of 349 BC (the year of the first Great Halieia after Maussollos' death), but see Sève *BE* 1992.145. Also see *SEG* XL 669.

Nikokles dates to around the same time too,⁹⁶ as does Istros' *περὶ τῶν Ἡλίου ἀγώνων*. In addition, sometime between the poorly attested Battle of Ephesos (*c.* 258 BC?)⁹⁷ during the Second Syrian War (*c.* 260/59-253 BC)⁹⁸ and the Rhodians' War on Byzantium in 220 BC,⁹⁹ an inscription records that the people of Ios had an alliance with Rhodes and sent a crown to the Halieia and there publicly thanked the Rhodians for their help.¹⁰⁰ If the Battle of Ephesos was in 258 BC, as has been argued,¹⁰¹ we now know these Halieia would have been celebrated in 257 BC, but of course this is an open question, and so these Halieia may be any of those celebrated between 257 and 221 BC. The next we hear of the games is in 172 BC. In this year Appian relates how Eumenes II Soter,¹⁰² before the Roman Senate, accused the Rhodians of aiding and abetting Perseus against Roman interests. The Rhodians immediately attempted to get a Roman audience to object to Eumenes' accusations while Eumenes was still in Rome, but they were at first rebuffed and only admitted after Eumenes had already left. Having been granted an audience, apparently they only succeeded in annoying the Romans further so that the Romans began plotting war against them and Perseus, which eventually became the Third Macedonian War of 171-168 BC. After this incident, the Rhodians were so furious at Eumenes they retaliated by barring his representatives alone of all the kings from the Halieia, which, because of the Antikythera Mechanism, we can now pinpoint as the Great Halieia in the summer of 169 BC, one year before the Olympia in the summer of 168 BC.¹⁰³ This affair indicates that by 169 BC the games were important enough so that the kings of the time sent representatives to them.

The games are particularly well-attested on inscriptions in the late second and first centuries BC – the probable date of the Mechanism. In the middle of the 2nd century AD the fiction writer Xenophon of Ephesos in his *Ephesian Tales* has his protagonists reunited by chance at the Halieia, which from his description took place around the temple of the

⁹⁶ *IG* II² 3779, lines 15-16 (Dithyramb?; middle of the 3rd century BC) in honor of Nikokles son of Aristokles. Köhler (1884, 297-299) identified this Nikokles with the Nikokles of Taras mentioned by Pausanias (1.37.2), whom he argued was the father of the famous kitharode Aristokles mentioned by Athenaios (13.603a) and thus dated this inscription *c.* 310 BC. Klaffenbach (1914, 14-16), however, argued that this Nikokles was the son of the famous Aristokles and he received confirmation from Kirchner that the letter forms do not date earlier than the second half of the 3rd century BC (Kirchner would later date the inscription to the middle of the 3rd century BC at *IG* II² 3779).

⁹⁷ Plut. *Moralia* 45B; Athenaios 5.209e ad 8.334a. For date and discussion, see Grainger 2010, 125, n. 24.

⁹⁸ See Grainger 2010, 117-136.

⁹⁹ Polybios 4.47-52.

¹⁰⁰ *IG* XII.5 8/1009 and XII.5 Addend., p. 303; *IG* XII.8 Suppl., p. 96 (which dates this inscription to 257 BC?).

¹⁰¹ For the date of 258 for the Battle of Ephesos, see Reger 1994, 33-34. Compare also *IG* XII.5 1010, which honors the Rhodian Antisthenes son of Aristonikos, at the same time for the same conflict (a good photo of this stone can be found in Marthari 2000, 36-37). See also *SEG* XXXIX 856.

¹⁰² Appian, *Makedonika* 1.1.3.

¹⁰³ Blinkenberg (1938, 23) thought that the Halieia must have been in 172 BC on the erroneous assumption that they fell in the same year that Eumenes slandered the Rhodians in Rome. As noted above, from the Antikythera Mechanism, however, we now know the Great Halieia fell in the summer before the Olympia, thus the first Halieia after this event were in the summer of 169. Badoud's (2015, 134) date of 170 BC is also one summer too early.

sun god.¹⁰⁴ The last testimonia are found in the early 3rd century AD on inscriptions.¹⁰⁵

As for the periodicity, from the evidence of the Mechanism one might assume the games were only pentaeteric, but as inscriptions make clear, there were both Great and Small Halieia.¹⁰⁶ One inscription dating before the First Mithridatic War 89-85 BC has the curious phrase Θεα[ῖδ]ητον Αὐτοκράτεως / νικάσαντα Ἀλῖεια τὰ πρῶτα τεθέντα ἄρμασι πωλικῶι,¹⁰⁷ possibly implying these were the first celebration of the Halieia, but this is clearly impossible. It has been suggested that these were the first Great Halieia,¹⁰⁸ but earlier inscriptions also mention the Great Halieia.¹⁰⁹ It is probable, therefore, that these were the first games that featured a chariot being pulled by young horses (ἄρμα πωλικός) as opposed to a chariot being pulled by mature horses (ἄρμα τέλειον).¹¹⁰

This brings up the issue of what events were held at the Halieia. The inscriptional evidence tells us the athletic events, which clearly evolved over time, included the *stadion* (one stadium length),¹¹¹ *diaulos* (two stadium lengths),¹¹² *dolichos* (long distance),¹¹³ *hoplitodromos* (race in hoplite armor),¹¹⁴ torch race,¹¹⁵ wrestling,¹¹⁶ boxing,¹¹⁷ pankration,¹¹⁸

¹⁰⁴ Xen. Eph. *Ephesiaka* 5.11.2-3.

¹⁰⁵ *SEG* XXXVI 258, line 11 (AD 131/2 or 240, from Athens); *FD* III,4 476, VII.4.26 (AD 175-225); *FD* III,4 477, III.2.7 and III.3.7 (AD 175-225). *Sardis* 77,1 79, line 12 (AD 212-217).

¹⁰⁶ *IK Rhod. Peraia* 555, line 14: [Α]λῖεια τὰ μεγάλα καὶ τὰ μικρὰ δις (middle of 2nd century BC). Numerous other inscriptions mention the Great Halieia: Jacopi 1932, 190, no. 19, line 15 (early 1st century BC); Jacopi 1932, 188, no. 18, line 16 (1st century BC?); Jacopi 1932, 210, no. 48, line 4 (c. 100-50 BC); Maiuri 1925, 46, no. 36 (Roman period); Pugliese Carratelli 1952-1954, 253, no. 4, face b, line 3 (AD 4/5?); Segre and Pugliese Carratelli 1949-1951, 215, no. 75 (undated).

¹⁰⁷ *IG* XII.1 75, b, lines 1-2. Theaidetos was *hierothytas* in 86/5 BC (*Lindos* II 293, c, col. II, line 21 and priest of Athena Lindia in 62/1 (*Lindos* II 1, fr. G, col. III, line 21). He also served in the First Mithridatic War 89-85 BC (*IG* XII.1 75, b, lines 5-6). He was probably at least 30 years old by 86/5 BC and *IG* XII.1 75 implies that he won at the Halieia before the First Mithridatic War. I would place his victory in 101, 97, 93, or 89. I believe the games of 85 BC were cancelled –see Section VI, **Table XI**, Year 4.

¹⁰⁸ Ringwood 1936, 433.

¹⁰⁹ Pugliese Carratelli 1952-1954, 268, no. 19, b, line 8 (c. 200-150 BC); *IK Rhod. Peraia* 555, line 14 (middle 2nd century BC).

¹¹⁰ Also the view of Blinkenberg, see *Lindos* II 188.

¹¹¹ *IDidyma* 201, lines 11-12 (Imperial, probably 2nd century AD).

¹¹² *IG* IV²,1 629, line 6 (2nd or 1st century BC); *IEphesus* 1132, lines 15-16 (2nd or 3rd century AD).

¹¹³ Pugliese Carratelli 1952-1954, 290, no. 66, ll. 7-8 (c. 75-85 AD); *ISmyrna* 662 + II2, p. 376 (2nd or 3rd century BC).

¹¹⁴ *IDidyma* 201, lines 11-12 (Imperial, probably 2nd century AD); *IEphesus* 1132, lines 15-16 (2nd or 3rd century AD); Erim *et al.* 1989, 184 and Dever 1993, 37 both report that an architectural block preserves a victory in the hoplite race (ὀπλίτης) at the Halieia on an inscription from Sardis of Roman date.

¹¹⁵ Maiuri 1925, 29, no. 19, lines 7-10 (c. 200 BC); *IK Rhod. Peraia* 555, lines 13-14 (middle of 2nd century BC). For the torch-race, see Gauthier 1995, 584-585.

¹¹⁶ *BE* 1972.366 = Barth and Stauber 1993, no. 76, line 7 (1st century BC); *SEG* XXXIX 762 (1st or 2nd century AD); *SEG* XLI 1407 (AD 161-180); *INapoli* I.49 (= *IG* XIV 739), wreath 17 (c. 161-200 AD); Kantzia 1989, 480 reports that a statue base found in the modern city of Rhodes dating to the first half of the 2nd century BC records that an athlete named Pythion won victories in the pankration, wrestling and boxing at various games, including the Halieia, but she does not specify in what events Pythion's specific victories were.

¹¹⁷ Zimmer and Baïrami 2008, 150; Probably also *IEphesus* 1615, line 2 (Hadrianic, probably post AD 134).

¹¹⁸ *IGUR* I.240, face b, line 33 (c. 200 AD).

and pentathlon.¹¹⁹ The equestrian events, which were particularly prominent given the association of Helios with the chariot, included the *keles* (single-horse race) with a young horse,¹²⁰ probably *keles* with a mature horse,¹²¹ *synoris* (two-horse race) with young horses,¹²² chariot (undoubtedly a quadriga as the sun god himself) pulled by mature horses,¹²³ and chariot pulled by young horses (which, as we saw above probably began in the early 1st century BC).¹²⁴ The acting, musical, and voice events included tragedy,¹²⁵ kitharode,¹²⁶ pythaulas (one who plays a song expressing the battle between Apollo and the Python),¹²⁷ rhetor,¹²⁸ and heraldry.¹²⁹ There apparently was also an award for general manliness.¹³⁰ There is also evidence that at least one woman, Hagesagore daughter of Lysistratos, competed in the *synoris*.¹³¹ The known boys' events included the *stadion*,¹³² *dolichos*,¹³³ wrestling,¹³⁴ and boxing.¹³⁵

¹¹⁹ *IG XII.1* 73,b, lines 3-6 (middle of the 2nd century BC; *IG* dates this text to the early 1st century BC, but the sculptor Θέων Αντιοχεύς is attested as working in the year of Polyaratos priest of Athena Lindia in 148 BC, *Lindos II* 224, col. II, line 39).

¹²⁰ *SEG XXXIX* 760 (c. 100-50 BC).

¹²¹ *IG XII.1* 58, line 19 (AD. 80/81; the Halieia should have been in AD 80). I suggest the correct reading is καὶ νεικήσαντα Ἄλεια ἵππων {σ} τ[ελείω] or perhaps ἵππων {σ} τ[ελείω δῖς].

¹²² *IG XII.1* 1039 (undated); Hiller von Gaertringen and Saridakis 1900, 107, no. 106 (c. 200 BC); possibly *IG XII.1* 75, a (before the beginning of the 1st century BC); *Lindos II* 392,b, line 8 (erected AD 10, but the victory alludes to one at the Great games of AD 8 or earlier). The fact that the *synoris* with young horses is specified probably means that there was also a *synoris* with mature horses.

¹²³ *IG XII.1* 72a, line 2 (datable by sculpture Charinos Laodikeus to c. 100-50 BC); *IG XII.1* 935 (early 1st century BC); *SEG XLIII* 527 (85BC or after); *Lindos II* 392, b, line 8 (erected in AD 10).

¹²⁴ *IG XII.1* 75, b, lines 1-2 (c. 101 – 89 BC); *Lindos II* 322 (erected in 56/5 BC for the priest of Athena Lindia, but the victory was earlier).

¹²⁵ *SEG XXXIX* 759, lines 15-17 (dated to Kleuthemis priest of Athena Lindia in 53/2 BC, but referring to an earlier date, possibly before the First Mithridatic War); *IGUR I* 223/227/229 (see Segre and Pugliese Carratelli 1949-1951, 282, no. 22 and *IG XII.1* 125) probably refers to a poetic contest at the Halieia (Roman).

¹²⁶ At *IG II/III*³, 4 1 594, line 21 (mid 3rd century BC) Koumanoudes suggested restoring [Ἡ]αία in line 13, but Koehler doubted the restoration could be correct because Crown XI and Crown XIV appear to be different; *Ismyrna* 659, line 18 (2nd century AD).

¹²⁷ *FD III,4* 476, VII.4, lines 26-29 (c. 175-225 AD).

¹²⁸ *Iephesus* 4114, line 10 (2nd century AD). He claims he is the first to win this event.

¹²⁹ *FD III,4* 477, III.3, lines 7-9 (AD 175-225).

¹³⁰ Maiuri 1925, 29, no. 19, lines 7-10 (c. 200 BC).

¹³¹ Hiller von Gaertringen and Saridakis 1900, 107, no. 106 (with some corrections at Segre and Pugliese Carratelli 1949-1951, 282, no. 23a), where in line 1 they read ...α.γόρην Λυσιστράτο[υ Π]ειδιάδα. Given that relative rarity in which females appear on inscriptions, and that line 5 of this inscription indicates the *laudanda* was honored by the Lindians with golden crowns, it is virtually certain this should be restored as [Ἀγ]ησ[α]γόρην Λυσιστράτου with the space between the first extent alpha and gamma ignored, the same woman who is honored by the Lindians with a golden crown at Pugliese Carratelli 1955-1956, 167, no. 17. In column II of this last inscription, the second honorand should probably be restored as Hagesagore's cousin, Andronika daughter of Andronikos (= Λίνδιο[ι] ἐτείμασαν Ἀν[δ]ρον[ί]καν Ἀνδρονίκου), who is known from *IG XII.1* 214 (for the family stemma, see Hiller von Gaertringen and Saridakis 1900, 107). Hiller von Gaertringen and Saridakis date their inscription to c. 200 BC, but the spelling ἐτείμασαν on Pugliese Carratelli 1955-1956, 167, no. 17 probably indicates a date in the second half of the 1st century BC or later. In fact, Hagesagore's father Lysistratos son of Hagesandros may be the same Lysistratos son of Hagesandros attested at *Lindos II* 440, which Blinkenberg dates AD 50-70.

¹³² Pugliese Carratelli 1955-1956, 173, no. 25, line 2 (undated).

¹³³ *IG XII.6* 1.290, line 3 (2nd/1st century BC).

¹³⁴ *IG XII.1* 73,a, line 3 (middle of the 2nd century BC – see Footnote 111); *IG XII.1* 74 (undated); *Lindos II* 707, line 2 (c. 40-30 BC).

By the Hellenistic period, help organizing the games may have been provided by an association (*koinon*) that consisted of both men and women called the *Haliastai* and *Haliadai*,¹³⁶ who had at their head an official called *archeranistas*,¹³⁷ as well as an *epistates*, an *hierokeryx*, *logistai*, and a *grammateus*.¹³⁸ The *koinon* of the *Haliastai*, *Athanistai*, *Hermaistai*, and *Aristeideioi* built the Hippodrome of Rhodos, undoubtedly to be used at the Halieia.¹³⁹ Other regular office holders were also keen to advertise the fact that they held office during the Halieia. These include *tamiai*,¹⁴⁰ gymnasiarchs,¹⁴¹ and phylarchs.¹⁴² In the Roman Imperial period an *agonothetes* of the Halieia is attested.¹⁴³

III. Thoughts on the Rhodian and Koan Calendars.

Here I want to turn to discuss the order of the Rhodian months and their seasons, particularly in light of the version of the Rhodian calendar put forth by Trümpy¹⁴⁴ and Badoud (2015), which is different than that suggested by Bischoff (1894) and Börker (1978). Before discussing the order and seasons of the months, a few comments on dating formulae in the Koan and Rhodian calendars and how they relate to lunisolar calendars will be helpful.

A. Rhodian and Koan Day Nomenclature

Below (in the table I) I give a full list of the count of days for both cities along with their acrophonic abbreviations on inscriptions.¹⁴⁵

As noted above, it is universally agreed that a lunisolar calendar was designed to track closely the phases of the moon so that the first of the month was when the moon could first be seen waxing, the middle of the month was that of the full moon, and the last

¹³⁵ Maiuri 1925, 45, no. 34, line 3 (Roman period); probably also *IEphesos* 1615, line 2 (Hadrianic, probably post AD 134).

¹³⁶ Hoepfner 2003, 43-49 has identified a structure in the city of Rhodes as the “House of the Haliastai”, but I understand that this complex is to be fully published by S. Skaltsa and M. Michailidou, who dispute this identification. For the Haliastai, also see Pugliese Carratelli 1939-1940, 177-178; Gabrielsen 1994.

¹³⁷ *IG XII.1* 155, face II, line 40, face IV, lines 107-108, face I, lines 6-8 (2nd century BC); Maiuri 1925, 55, no. 46, face B, line 5 (2nd century BC); *IG XII.1* 156 (undated); *IG XII.1* 162 (undated); *Lindos II* 292, line 5 (88-85 BC); *Maiuri* 1925, 50, no. 39 (1st century BC); Pugliese Carratelli 1955-56, 158, no. 3 (undated); Pugliese Carratelli 1939-40, 151, no. 6, line 21 (early 1st century BC); *IK Rhod. Peraia* 571 (Hellenistic). For the term ἀρχεραμιστής, see Arnaoutoglou 1994, especially pp. 109-110.

¹³⁸ *IG XII.1* 155, face I, lines 30-31; face II, line 54; face II, line 62.

¹³⁹ Pugliese Carratelli 1955-1956, 157, no. 3 (undated by editor).

¹⁴⁰ Jacopi 1932, 188, no. 18, line 16 (before 85 BC; the honorandus’ son, Πασιφῶν Πασιφῶντος τοῦ Πασιφῶντος, was a *hierothyas* in 85/4 BC, *Lindos II* 294, col. II, line 28, and this inscription implies the *honorandus* was a *tamias* before the First Mithridatic War); *SEG XXXIX* 759, line 5 (dated to Kleuthemis priest of Athena Lindia in 53/2, but referring to an earlier date, possibly before the First Mithridatic War). As Blinkenberg (1938, 17) suggests, probably [ταμειύ]σας ἐν τῷ ἄστει κατὰ μεγάλα Ἀλίεια should be restored at Jacopi 1932, 210, no. 48, line 4.

¹⁴¹ Jacopi 1932, 190, no. 19, line 15 (early 1st century BC); Maiuri 1925, 19, no. 18, lines 5-6 (erected after First Mithridatic War 89-85 BC, but referring to earlier office); Maiuri 1925, 46, no. 36 (Roman period); Maiuri 1925, 48, no. 38, lines 5-8 (2nd century AD?) lists a gymnasiarch.

¹⁴² *SEG XXXIX* 759, lines 15-16 (dated to Kleuthemis priest of Athena Lindia in 53/2 BC, but referring to an earlier date, possibly before the First Mithridatic War).

¹⁴³ *Lindos II* 465, h, lines 6-8 (c. 180 AD); Maiuri 1925, 48, no. 38, lines 5-7 (2nd century AD?).

¹⁴⁴ Trümpy 1997, 167-179.

¹⁴⁵ See also Samuel 1972, 110 and 113.

day of the month was ideally at conjunction.¹⁴⁶

1. α' νευμηνία or νουμηνία	16. ις' ἕκτα ἐπὶ δέκα (R); ἑκκαιδεκάτα (K)
2. β' δευτέρα [ισταμένου] ¹⁴⁷	17. ιζ' ἑβδόμα ἐπὶ δέκα (R); ἑπτακαιδεκάτα (K)
3. γ' τρίτα [ισταμένου]	18. ιη' [ὄγδᾶ ἐπὶ δέκα] (R); ὀκτωκαιδεκάτα (K)
4. δ' τετράς (ισταμένου)	19. ιθ' ἑνάτα πρὸς ἱκάδος ¹⁴⁸
5. ε' πέμπτα (ισταμένου)	20. κ' (ε)ἱκάς
6. ς' ἕκτα ¹⁴⁹ (ισταμένου)	21. κα' ἀμφεικάς
7. ζ' ἑβδόμα ἱσταμένου	22. κθ' ἑνάτα ἐξ ἱκάδος ¹⁵⁰
8. η' [ὄγδᾶ] ¹⁵¹ (ισταμένου)	23. κη' ὄγδᾶ ἐξ ἱκάδος ¹⁵²
9. θ' ἑνάτα (ισταμένου)	24. κζ' ἑβδόμα ἐξ ἱκάδος (R); ἑβδόμα ἀνομένου/ἀπιόντος (K)
10. ι' δεκάτα	25. κς' ἕκτα ἐξ ἱκάδος (R); ἕκτα ἀνομένου/ἀπιόντος (K)
11. ια' ἑνδεκάτα	26. κε' [πέμπτα ἐξ ἱκάδος] (R); πέμπτα [ἀνομένου]/ἀπιόντος(K) ¹⁵³
12. ιβ' δ(υ)ωδεκάτα ¹⁵⁴	27. κδ' [τετράς ἐξ ἱκάδος] (R); τετράς ἀνομένου/ἀπιόντος (K) ¹⁵⁵
13. ιγ' τρίτα ἐπὶ δέκα (R); τρεῖςκαιδεκάτα (K)	28. κγ' τρίτα ἐξ ἱκάδος (R); τρίτα ἀνομένου/[ἀπιόντος] (K) ¹⁵⁶
14. ιδ' τετράς ἐπὶ δέκα (R); τεσσαρεσκαιδεκάτα ¹⁵⁷ (K)	29. προτριακάς
15. ιε' διχομηνία ¹⁵⁸	30. τριακάς

Table I: The Count of Days at Rhodes and Kos/Kalymna

¹⁴⁶ It should be noted, however, that Geminus tells us in the normal operation of a lunisolar calendar because of the anomalous motion of the moon, the new crescent moon might not be sighted until the 3rd day of the month (presumably if there was bad weather, even later). Similarly, because of the moon's anomalous motion he says a half-moon occurs at the earliest on the 6th day and at the latest on the 8th day, a full moon at the earliest on the 13th and at the latest on the 17th, and the second half-moon at the earliest on the 21st and at the latest on the 23rd.

¹⁴⁷ As J.-M. Carbon points out to me, the word ἱσταμένου *may* not be necessary here as at both Rhodes and Kos it appears there was no confusion with the terminology for the 29th of the month. This observation can be supported at Kos by *IG* IV.4,1 298, lines 15-17, which give the date ἐμ μὲν τοῖς ἄλλοις μ(η)σὶ τετράδι ἱσταμένου, τοῦ δὲ Ὑακινθίου τῆς δευτέ[ρ]αι καὶ τοῦ Ἀλσειοῦ τῆς δεκάται. On the other hand, in lines 31-32 and line 64 and line 127 of this same inscription, ἱσταμένου is left off with τετράδι. We also have no extant examples of ἱσταμένου with τρίτα or ὄγδ(ό)α.

¹⁴⁸ At Segre and Pugliese Carratelli 1949-1951, 257, no. 149, lines 4-5, undoubtedly the correct restoration is [ἑνάτα] πρὸς ἱκά[δος...], as the number ἕκτα πρὸς ἱκάδος is nowhere else attested and would equal 15, which is known as the διχομηνία.

¹⁴⁹ Apparently one time spelled ἕκτα at Kos (*IG* XII.4,1 278, line 62).

¹⁵⁰ ἑνάτα με[τ' ἱκ]ᾶδος is attested one time at Kos (= *IG* XII.4,1 278, line 58).

¹⁵¹ The ordinals for day eight and 18 are not completely attested at either Rhodes or Kos (see below note 142), but the 23rd of the month is (as ὄγδᾶ ἐξ ἱκάδος). I, therefore, assume the eighth was spelled ὄγδᾶ, although it could have been spelled ὄγδᾶ = ὄγδᾶ.

¹⁵² At Maiuri 1925, 7, no. 4, line 8 (= Hiller von Gaertringen 1926, 195), the date should probably be restored [- - - μηνὸς Πανᾶμου ὄγδᾶ[ι ἱσταμένου], or [- - - μηνὸς Πανᾶμου ὄγδ[ᾶ] ἐπὶ δέκα], or [- - - μηνὸς Πανᾶμου ὄγδᾶ[ι ἐξ ἱκάδος] rather than just ὄγδᾶ[ι], as the spacing of this line, which serves as a header, will be more centered.

¹⁵³ πέν[πτα ἀπιόν]τος is attested at *IG* XII.4,1 100, lines 22-23.

¹⁵⁴ The spelling is δωδεκάτα at Rhodes and δυωδεκάτα at Kos.

¹⁵⁵ τετάρται ἐξ ἱκάδος occurs one time at Segre 1944-1945, 97, no. 79 (the spelling τετάρται and the number four plus ἐξ ἱκάδος are unique at Kos/Kalymna), but this is a Knidian arbitration text (= *IK Knidos* 1 221) and was probably inscribed at Knidos, hence the unique numeral. τετράς ἀπιόντος is found at *IG* XII.4,1 100, line 2 and [τετ]ράς ἀνομένου at *IG* XII.4,1 279, line 58.

¹⁵⁶ At *IG* XII.4,1 266, lines 2-3 (from Kos), the editors restore ...μῆνος Πανᾶμου δευτέ[ρ]αι ἐξ ἱκάδος..., but on the unlikelihood of this at Kos, see below on p. 85.

¹⁵⁷ Also one time as τετορεσκαιδεκάτα at *IG* XII.4,1 279, face B, lines 41-42 (in the calendar of Phyxia).

¹⁵⁸ The form πεντεκαιδεκάτα is attested one time at Kos (*IG* XII.4,1 315, line 40).

We see that these ideas are reinforced by the names of some of the days of the calendars at both Kos and Rhodes. For instance, at both city-states the first day of the month was called the νευμηνία, which name suggests it was ideally the day on which a new crescent moon would first be seen waxing visible. The middle of the month was called the διχομηνία, because it divided the month, but from its usage in numerous passages we know it was synonymous with “full moon”.¹⁵⁹ Finally, the second-to-the-last day of the month was called the προτριακάς (“day before the 30th”, i.e. the 29th) and the last day of the month called the τριακάς (literally “30th”, but it could also refer to the 29th of a hollow month). While these last terms do not imply anything about conjunction, it necessarily must be near the day of conjunction since the name for the first of the month indicates it comes at the first crescent moon and the name for the middle of the month indicates it comes at the full moon. We see the idea that the last day of the month ideally fell at conjunction more clearly expressed in the Athenian calendar, where the 30th was called the ἔνη καὶ νέα,¹⁶⁰ or the “old and the new”, that is the day that partakes in the waning moon and also the waxing moon.¹⁶¹

The rest of the days of the months at these two city states were just ordinary ordinal numbers, although they did have what seem to us to be “peculiarities” that were shared among several other Greek calendars. One, for instance, is that the ordinals second (δευτέρα) to ninth (ἐνάτα) often were qualified by the participle ἰσταμένου (understand μηνός), meaning at the month’s “standing up” or waxing (which covered the first 10 days also known as the first decade of the month), while the last 10 days of the month (known as the last decade) were often qualified by participles such as ἀπίντος (“going away”),¹⁶²

¹⁵⁹ Cf. *LSJ*⁹.

¹⁶⁰ The terminology ἔνη καὶ νέα is the subject of an extended comical exchange between Pheidippides and his father Strepsiades in verses 1178-1200 of Aristophanes’ *Clouds*, where this phrase is attributed to Solon (cf. Plutarch, *Solon* 25.3). It also appears on two Athenian financial documents dated to 408/7 and 407/6 BC (*IG I*³ 476 and 377), and is wholly or partially preserved or plausibly restored on several dozen decrees of the Athenian state in the Classical and Hellenistic periods. For details, see the 30th day of Athenian months throughout Mikalson 1974.

¹⁶¹ As Haslam’s publication in 1986 of *P. Oxy.* LIII 3710, a fragmentary commentary on Book XX of Homer’s *Odyssey*, indicates, Aristonikos of Samos, who observed the summer solstice in 280 BC, noted that some Greeks called the day of the conjunction the τριακάς and others the νουμηνία. Thucydides’ statement (2.28), in connection with the solar eclipse on 3 August 431 BC, that a solar eclipse can occur only νουμηνία κατὰ σελήνην is a good example of the latter. A good example of the former is Geminus (8.1 and 8.14), who says explicitly that conjunctions and solar eclipses fall on the τριακάς, and in 9.13-15 he takes it for granted that Greek lunisolar calendars were schematic, so that the day following the conjunction was the νουμηνία. Geminus’ terminology will be maintained throughout this article.

¹⁶² The most widespread participle for designating days in the last decade of the month was ἀπίντος, which is attested in the Boiotian federal calendar, in the Ionic calendars of Oreos (Hestiaia), Karystos, Keos, Andros, Delos, Paros, Samos, Ephesos, Magnesia on the Maeander, Herakleia under Latmos, and Kyzikos, in the Aiolian calendar of Kyme, in Pergamon, in the Doric calendar of Kos, and in the Macedonian calendar.

φθίνοντος (“waning”),¹⁶³ or at Kos through the 4th century BC ἀνομένου (“ending”),¹⁶⁴ or rarely by participles such as ἐξιόντος (“outgoing”)¹⁶⁵ or λήγοντος (“ceasing”),¹⁶⁶ all meaning at the month’s waning. A second peculiarity, that is perhaps confusing for moderns, was that the last eight days were counted backwards from the 30th rather than forward from the 20th. Thus while the 20th of the month at both Rhodes and Kos was known as the ικάς and the 21st as the ἀμφεικάς, the 22nd was not known as the δευτέρα ἐξ ικάδος and the 23rd was not known as the τρίτα ἐξ ικάδος, as one might expect, but these were known as the ἐνάτα ἐξ ικάδος and the ὄγδᾶ ἐξ ικάδος and both required counting eight or nine backwards from 30, with the 30th included (for instance, the τρίτα ἐξ ικάδος meant the 28th). Even when day numbers 22 to 28 were expressed using acrophonic numerals, these were understood to require counting backwards from 30. Thus on Rhodian and Koan inscriptions the day expressed as κγ’ referred to the 28th of the month, while κθ’ and κη’ referred to the 22nd and 23rd respectively. We see this most clearly on *IG XII.1 4* (= Badoud 2015, 361, no. 18), a fragmentary text from Rhodes dating to the 1st century AD that lists all the months and days of an intercalary year.

We also know from this same inscription that the months in the Rhodian calendar this year alternated between “full months” of 30 days and “hollow months” of 29 days, undoubtedly to keep the calendar aligned with the phases of the moon. In this case, the excluded days did not occur every 64th day, as Geminus advised and as occurs on the Antikythera Mechanism, but the προτριακάς was omitted and the last day of a month with only 29 days was still called the τριακάς (30th) even though technically it was the 29th. The 29th was probably chosen to exclude rather than every 64th day in actual religious and civil calendar practice, because it would have been confusing and difficult for the average citizen to keep track of the removal of every 64th day, plus had every 64th day been excluded, it would have happened that numerous important festival-day dates would have been omitted. In addition, delaying an excluded day by up to 29 days would have only meant the moon’s phase was only off by one day at the most for a short period, which was undoubtedly seen as an acceptable trade-off for these other considerations.

B. The Koan Calendar

I turn now to the order of the months of the Koan calendar. **Table II** contains a history of the various suggested versions of the Koan calendar that includes the number of months each scholar got correct, as well as a comparison with the known order of several months in the Rhodian calendar (for more on the Rhodian calendar, see III.C below). Here, I want to thank John D. Morgan for pointing out to me some of this material. The

¹⁶³ φθίνοντος was commonly used in Attica in the 5th and 4th centuries BC. Elsewhere it was quite rare, with one attestation on the Parian Marble in giving the date of the capture of Troy as μηνὸς Θ[αρ]||[γηλιῶ]νος ἐβδόμη φθίνοντος, one at Eretria (*IG XII.9 189*), one in the Macedonian calendar at Amphipolis (*SEG XLIV 504*), two at Kyzikos (*IMT Kyz Kapu Dağ 1432* and *1433*), one at Miletropolis (*IMT LApollon/Milet 2260*), one at Alexandria (Breccia, *Alexandria Mus.* 164), two at Cyrene (*SEG XXXI 1576,4* and *LVII 2010*), and one at Antiocheia in Persia (*I. Magnesia 61 = OGIS 233 = Rigsby, Asyria 111*). It was also widely used in literary texts of the Roman period, such as Plutarch’s *Lives*.

¹⁶⁴ This is attested in the Doric calendar of Kos, in the Ionic calendars of Amyzon, Halikarnassos, Mylasa, Miletos, Priene, Klaros, and Ephesos, and the Aiolian calendar of Kyme.

¹⁶⁵ This is attested only on *I. Erythrai 201* (c. 300-260 BC) and in Athens on *IG II³.1 1313* (176/5 BC).

¹⁶⁶ This is attested only on Thera by *IG XII.3 325* (AD 149).

table begins with Paton's work (in Paton and Hicks 1891, with wrong placements of months in bold) all the way through the work of Segre, who in the early 1940s had worked out the calendar, but was arrested and deported to Auschwitz where he died on 24 May 1944 before he could publish his results. Some of the work he had completed was published posthumously as *Tituli Calymnii* in *ASAA* 22-23 (1944-45 [1952]), where on page 170 he indicated the order of the Koan and Kalyrnian calendars as given in the table II below.

Paton (1891) 10/12	Bischoff (1894) 10/12	Herzog (1928) 4/12	Giffler (1939) 7/12	Segre (1944-45) 12/12	Rhodes (known order)
Ἀλσεῖος	Καρνεῖος	Ἄγριάνιος	Ἄγριάνιος	Καρνεῖος	
Θευδαῖσιος	Θευδαῖσιος	Καρνεῖος	Καρνεῖος	Θευδαῖσιος	
Πεταγεῖτνος	Πεταγεῖτνος	Ἄρταμίτιος	Ἰακίνθιος	Πεταγεῖτνος	
Καφίσιος	Καφίσιος	Καφίσιος	Καφίσιος	Καφίσιος	
Βατρόμιος	Βατρόμιος	Βατρόμιος	Βατρόμιος	Βατρόμιος	
Γεράσιος	Γεράσιος	Γεράσιος	Γεράσιος	Γεράσιος	(6) Σμίνθιος
Ἄρταμίτιος	Ἄρταμίτιος	Ἰακίνθιος	Ἄρταμίτιος	Ἄρταμίτιος	(7) Ἄρταμίτιος
Ἄγριάνιος	Ἄγριάνιος	Θευδαῖσιος	Θευδαῖσιος	Ἄγριάνιος	(8) Ἄγριάνιος
Ἰακίνθιος	Πάναμος	Πεταγεῖτνος	Πεταγεῖτνος	Ἰακίνθιος	(9) Ἰακίνθιος
Πάναμος	Ἰακίνθιος	Δάλιος	Πάναμος	Πάναμος	(10) Πάναμος
Δάλιος	Δάλιος	Πάναμος	Δάλιος	Δάλιος	(11) Δάλιος
Καρνεῖος	Ἀλσεῖος	Ἀλσεῖος	Ἀλσεῖος	Ἀλσεῖος	(12) Θεομοφόριος

Table II: History of Reconstruction of the Koan Calendar (with wrong order of months in bold)

How was it that Segre arrived at his conclusion and how do we know he was correct, and how is that earlier scholars such as Paton and Bischoff got more right than later scholars such as Herzog and Giffler? To answer the second question first, the biggest reason was because both Paton and Bischoff used the Comparative Method to reconstruct the calendar of Kos -particularly using the calendar of Rhodes- whereas Herzog and Giffler both rejected this method.¹⁶⁷ In fact, both Paton and Bischoff would have placed all 12 correct, had Paton not relied on Plutarch's evidence that Karneios at Syracuse was coincident with Athenian Metageitnion, and had Bischoff also looked to nearby Rhodes for the order of Hyakinthios-Panamos rather than to the more distant Epidauros (which colonized Kos) for the order Agrianios-Panamos. It is particularly noteworthy that all the known homonymous months in the Rhodian calendar based solely upon Rhodian evidence are in the same relative position vis-à-vis the Koan calendar. We will return to this point in a moment when we consider the order of the months of the Rhodian calendar that are not as firm.

As for Segre's order, it was based on some information long since known, and some which he himself was planning to publish, but never did due to his untimely death, although it did later once again appear posthumously as *Iscrizioni di Cos* (1993). The details are as follows. As Paton long ago pointed out, *GIBM* II 299a, line 26 (= *SGDI* III.1 3591-3592 = *SIG*³ 953 = Segre 1944-1945, 97, no. 79), which dates to the early 3rd century BC before Kalymna was incorporated into the *politeia* of Kos, indicates that in one year Koan 27 Batromios was coterminous with Kalymnian 27 Kaphisios.¹⁶⁸ Since it has long since

¹⁶⁷ See the comments of Herzog (1928, 49): "Die Versuche von Paton und Bischoff den koischen Kalender durch Konkordanz mit dem auch noch nicht sicher festgelegten rhodischen wiederherzustellen, stimmen nicht zu meinem seither erweiterten Material und tragen schon in sich die Gefahr eines Zirkelschlusses."

¹⁶⁸ Paton and Hicks 1891, 327.

been observed that the calendars of Kos and Kalymna shared the same month names,¹⁶⁹ this means that Batromios and Kaphisios were contiguous, only in this year they were not coterminous with the same lunar month at each of the two cities apparently because of their different months or years of intercalation. Thus we have the order Batromios-Kaphisios, or Kaphisios-Batromios.

As Paton further pointed out, Paton and Hicks 1891, no. 27 (= *SGDI* 3627 = *SIG*³ 1012 = *IG* XII.4,1 326) records that the sale of the priesthood of Dionysos Thylophoros was to be made on the 16th of Batromios and was to be paid for in two installments, with the first payment due 14 days later on Batromios 30, and the second payment due on the 14th of Gerastios.¹⁷⁰ It seems highly likely the second payment, like the initial sale and first payment, was separated from the previous payment by 14 days, hence we can say with a high degree of confidence the order is Batromios-Gerastios. When combined with the evidence of the previous paragraph, we can thus say the order and contiguity was Kaphisios-Batromios-Gerastios.

Paton further pointed out that Paton and Hicks 1891, no. 36, lines 14-17 (= Segre 1993, ED 149 = *IG* XII.4,1 348) indicates that Theudaisios was almost certainly followed directly by Petageitnyos, thus Theudaisios-Petageitnyos.¹⁷¹ And Paton noted that from Paton and Hicks 1891, no. 29, lines 17-19 (= Segre 1993, ED 144 = *IG* XII.4,1 318), it appears that the three payments in Alseios, Batromios and Panamos for the sale of the priesthood of Adrasteia and Nemesis were made at regularly spaced intervals of 4 months¹⁷², thus

Ἀλσεῖος – x – x – x – x – Βατρόμιος – x – x – x – x – Πάναμος – x

Paton correctly noted, however, that this order said nothing of the start of the year (I will have more to say on the start of the year below).

Paton further noted that Paton and Hicks 1891, no. 367 (= *IG* XII.4,2 1103) indicated the relative order Hyakinthios – Dalios – Alseios and that these were fairly close to one another, but he said they were not necessarily contiguous¹⁷³, whereas Bischoff felt based upon the mention of a three-month period in line 31 of this inscription, they must be contiguous (this turns out to be wrong).¹⁷⁴ Finally, Paton noted that Paton and Hicks 1891, no. 43 (= *IG* XII.4,1 281) indicates that Artamitios could not be the last month of the calendar.¹⁷⁵ When combined with the previous evidence, Paton was therefore able to deduce the following order with the evidence of inscriptions from Kos and Kalymna he had before him (again, this evidence says nothing about the start of the year):

Ἀλσεῖος – x – x – x – Καφίσιος – Βατρόμιος – Γεράστιος – x – x – x – Πάναμος – x

When the unpublished inscriptions that Segre based his conclusions on were finally published in 1993, the following new evidence came to light (and was explicated by both Trümpy 1997 and Bosnakis and Hallof 2005). Most importantly, lines 40-42 of Segre's ED

¹⁶⁹ Bischoff 1894, 143-149 and Bischoff 1919, 1580.

¹⁷⁰ Paton and Hicks 1891, 327.

¹⁷¹ Paton and Hicks 1891, 328.

¹⁷² Paton and Hicks 1891, 327.

¹⁷³ Paton and Hicks 1891, 328.

¹⁷⁴ Bischoff 1894, 147.

¹⁷⁵ Paton and Hicks 1891, 328.

145 (= *IG* XII.4,1 298) indicates that the gymnasiarch was to make sacrifices during the winter semester in Theudaisios, Kaphisios and Gerastios, and in the summer semester in the months Agrianios, Panamos, and Alseios. Furthermore, lines 69-73 indicate that the *stratagoi* were to make a sacrifice to Hermes in the months Artamitios, Panamos, Karneios and Kaphisios. As Trümpy noted, it appears that the gymnasiarch was to make 6 sacrifices every other month, and the *stratagoi* every fourth month¹⁷⁶, or:

Θευδαίσιος – x – Καφίσιος – x – Γεράστιος – x – Ἀγριάνιος – x – Πάναμος – x – Ἀλσεῖος – x
and
Ἀρταμίτιος – x – x – Πάναμος – x – x – Καρνεῖος – x – x – Καφίσιος – x – x

Furthermore, lines 20-25 of this same inscription indicate that the *agonothetes* was to make sacrifices to Hermes in the preliminaries to the torch-race on the 10th, 16th and 20th of Dalios (ἐν ταῖς τρισὶ προλαμπάσι¹⁷⁷ ταῖς πράταις, Δαλίου δέκαται, ἑκκαιδεκάται, ἰκάδι), and he was also to make a sacrifice on the day of the actual torch-race on the 10th of Alseios (θύετω δὲ καὶ ἐν τᾷ λαμπάδι τοῦ μηνὸς Ἀλσειοῦ τᾷ δεκάται). In addition, in the next lines (26-30) of this same inscription, the *lampadarchoi* were also to make sacrifices to Hermes at three different preliminary ceremonies on the 25th of Dalios, as well as the 1st and 6th of Alseios (τοὶ λαμπάδαρχοι θυόντω τῶι Ἑρμῶι ταῖς τρισὶ προλαμπάσι ἕκται ἀπιόντος Δαλίου, καὶ νευμηρία Ἀλσειοῦ, ἕκται ἰσταμένου). Clearly the months Dalios and Alseios were contiguous and in that order, with the various preliminary sacrifices leading up to the torch race spaced every four to six days apart from one another starting in Dalios. Finally, lines 135-140 of this same inscription strongly suggest that the number of months between Gerastios and Hyakinthios was equal to the number of months separating Hyakinthios and Alseios.

When this newer evidence is combined with the older evidence, the following order (apart from the starting point) necessarily results:

Καρνεῖος-Θευδαίσιος-Πεταγεῖτνος-Καφίσιος-Βατρόμιος-Γεράστιος-
Ἀρταμίτιος-Ἀγριάνιος-Ἵακίνθιος-Πάναμος-Δάλιος-Ἀλσεῖος

Further evidence that this order is correct may be found on other Koan inscriptions. For instance, lines 1-6 of Segre 1993 ED 216 (= *IG* XII.4,1 304) strongly suggest that the month Alseios is followed directly by Karneios, while lines 14-16 of Bosnakis and Hallof 2005, 251, no. 23 (= *SEG* LV 956) strongly imply that Petageitnyos is followed directly by Kaphisios, and lines 1-15 of Segre 1993, ED 180 (= *IG* XII.4,1 320) indicate that Hyakinthios directly preceded Panamos. Other confirming evidence comes from lines 9-13 of *IG* XII.4,1 302 and lines 27-29 of *IG* XII.4,1 315, which both imply that Gerastios was the sixth month after Alseios. Finally, *IG* XII.4,1 279 indicates the order Gerastios-Artamitios-Agrianios-Hyakinthios.

As for the starting month of the Koan calendar year (which should not necessarily be equated with the start of offices such as the Koan *monarchos* or the start of the autumn semester – see more on these in section IV below), there is no firm evidence, apart from the fact that line 6 of *IG* XII.4,1 302 indicates that the Koan elections for offices took place in the month of Alseios and Segre 1944-45, 199, no. 196 indicates the *Monarchia*, which

¹⁷⁶ Trümpy 1997, 181-182.

¹⁷⁷ The term προλαμπάς is a hapax-legomenon, either meaning preliminary torch-race or preliminary ceremonies/sacrifices to the torch-race.

were presumably celebrated toward the beginning of the monarch's term of office, were celebrated on 11 Theudaisios. On the other hand, from *IG XII.1 4* (from Rhodes) and other evidence we can infer that Καρνεῖος was the first month of the Rhodian winter semester, and by analogy it seems likely it was also at Kos.

C. The Rhodian Calendar

1. The Order of the Months

We may now turn to the Rhodian calendar. The first thing to note is the obvious point that the Rhodian calendar clearly shows some affinities with the Koan calendar, the order of whose months is secure. In reconstructing the Rhodian calendar, I will therefore use the Comparative Method of reconstructing calendars and associating them with different families. Here it should be stressed that this method is valid only among families of calendars, such as Doric calendars, not between Doric and other calendars such as Ionic. Again, I also want to thank my collaborator John D. Morgan for pointing out to me some of what follows (and which will appear in a book co-authored by us).

Any discussion of the Rhodian calendar must begin with *IG XII.1 3* (= Badoud 2015, 360, no. 17) and *IG XII.1 4* (= Badoud 2015, 361, no. 18). *IG XII.1 4* is particularly important, because, as noted above, it is a partially preserved inscription comprised of two fragments that lists individuals by day and month of an entire year.¹⁷⁸ As Paton long ago observed, *IG XII.1 4* reflects an intercalary year with 6 months of 29 days, six months of 30 days, and a second Πάναμος of 29 or 30 days, thus bringing the total to 383 or 384 days, which were covered in four columns with roughly 96 days each.¹⁷⁹ The combination of the information gleaned from *IG XII.1 4* and *Lindos II 2*,¹⁸⁰ lines 1 and 11 (the latter which demonstrates that Artamitios was followed directly by Agrianios, so that fr. b of *IG XII.1 4* can be placed with confidence) results in the following secure order of the Rhodian months:

- (1)? – (2)? – (3)? – (4)? – (5)? – (6) Σμίνθιος –
 (7) Ἀρταμίτιος – (8) Ἀγριάνιος – (9) Ὑακίνθιος – (10) Πάναμος Α' – (11)? – (12)? – (13) Πάναμος Β'

In a moment, the question of the placement of the intercalary month Πάναμος Β' in the 13th place on the inscription will be addressed (Section V.A below), but for now it will be set aside and the normal order of the 12 months of the year will be analyzed.

We now turn to *IG XII.1 3*, a decree stating that the Rhodians were to draw up a list of individuals who would be designated to sell oil (probably at the gymnasium, although this is not certain). Unfortunately, this inscription is known only from a poor squeeze made by Collignon (1883), who reports the stone had been cut up before he was able to examine the single surviving piece.¹⁸¹ What remains indicates the list was to cover “month and day of the entire year so that each person (i.e., seller) is [listed - - - by months and] days

¹⁷⁸ Badoud (2015) habitually refers to this inscription as a *Héméroligion* throughout his book, but this is a technical term normally reserved for later schematic texts in tabular format that presented the equivalents of days of local calendars with the Kalends, Nones, and Ides of the Julian calendar.

¹⁷⁹ Paton and Hicks 1891, 328.

¹⁸⁰ On the deadlines contained in this inscription, which do not affect the order of the month Artamitios followed directly by Agrianios, see Ryan 2010 (= *SEG LX 887*).

¹⁸¹ Collignon (1883, 97) complains about the inadequacy of the squeeze to read iota adscripts with certainty.

throughout the year” (= lines 12-13 = [- - -]αὶ μῆνα καὶ ἀμέραν ὅλου τοῦ ἐνιαυτοῦ, ἵνα ἕκαστος κ[αταταχθῆ? - -]¹⁸² | [- - κατὰ μῆνας καὶ ἀ]μέρας τὸν ἐνιαυτόν). It is universally agreed, as far as I know, that *IG XII.1 4* is an example of the kind of list that *IG XII.1 3* demands. Furthermore, Collignon’s majuscule text of the inscription at lines 4-5 has the following:

4 [- - -].ΩΣΑΣ κα ἕκαστοι λάχωντι ἀμέρας ἀρξαμένο[- - - - -]
5 [- - -] μετὰ Εὐκράτη ἱερατεύη μέχρι Θεσμοφορίου ΤΡΙΤ[- - -]

which Hiller von Gaertringen read, with a suggestion from Kaibel (see *Corrigenda of IG XII.1* on p. 206), as:

4 [ἀναγράψαι] (ὁ)σας κα ἕκαστοι λάχωντι ἀμέρας ἀρξαμένο[υς ἀφ’ ἄς]
5 [κα ὁ ἱερέως ὅ] μετὰ Εὐκράτη ἱερατεύη μέχρι Θεσμοφορίου τρίτ[ας],

and which Badoud¹⁸³ reads as:

4 [ἀναγράψαι ὅ]π(ο)σάς¹⁸⁴ κα ἕκαστοι λάχωντι ἀμέρας ἀρξαμένο[υς]
5 [ἀφ’ ἄς κα ὁ ἱερέως ὅ] μετὰ Εὐκράτη ἱερατεύη μέχρι Θεσμοφορίου τρι(α)[κάδος],

While one could quibble with the supplements in all published versions to date, particularly the margins and the non-sensical dating-phrase ἀρξαμένο[υς ἀφ’ ἄς] | [κα ὁ ἱερέως ὅ] μετὰ Εὐκράτη ἱερατεύη,¹⁸⁵ what is important to note is that the inscription makes clear the year ends with Thesmophorios. As Badoud also argues, the end of line 5 of Collignon’s text should almost certainly be corrected to read μέχρι Θεσμοφορίου τρι(α)[κάδος].¹⁸⁶ This results in the following known order and placement:

(1)? – (2)? – (3)? – (4)? – (5)? – (6) Σμίνθιος –
(7) Ἀρταμίτιος – (8) Ἀγριάνιος – (9) Ὑακίνθιος – (10) Πάναμος – (11)? – (12) Θεσμοφόριος

Since there is only one month, the 11th month, missing from a stretch of months that belongs to a particular time of year, we may now turn to other important evidence concerning the seasons of various Rhodian months based on the frequency of their appearance on Rhodian amphorae handles, as well as other epigraphical and literary

¹⁸² Or possibly restore the aorist subjunctive passive κ[ατατεθῆ]. The editor of *IG XII.1 3* (Hiller von Gaertringen) restores the aorist subjunctive active εἰ[δῆ], or “so that each person may [see | by months and days] throughout the year.” However, the sellers are referred to in both line 4 and line 10 as “ἕκαστοι” and ἕκαστου, and it seems to me the point is rather “so that each seller may be assigned/listed by month and day throughout the year”.

¹⁸³ Badoud 2015, 360, no. 17.

¹⁸⁴ Badoud’s text gives [ἀναγράψαι ὅ]ποσας, but this reading is inconsistent with Collignon’s majuscule text – the only preserved evidence, which gives a trace of the first preserved letter that could be Γ, Ε, Ζ, Ξ, Π, Ρ, Σ or Τ and the second preserved letter as Ω. Hence, at a minimum Badoud’s text should read [ἀναγράψαι ὅ]π(ο)σάς... In addition, the spacing at the beginning of line 5 of Badoud’s text is inconsistent with the spacing of his other restorations, although this could be remedied by moving the ἀφ’ ἄς to the end of line 4.

¹⁸⁵ This phrase would be translated “from the day the priest, whoever he is, serves as priest after Eukrates”, which seems very awkward. In addition, we now know the priest of Helios took up his post four or five months into the Summer Semester at the beginning of Dalios (see Section V.A), so if this supplement were adopted, it would mean the list would cover only 3 months, not an entire year. The reality is that the margins of this text are unknown, and I would advocate for larger lacunae and restore something such as ...κα ἕκαστοι λάχωντι ἀμέρας, ἀρξαμένο[ν ἀπὸ τῆς νεμηνίας] | [τοῦ Καρνείου τοῦ ἐπὶ ἱερέως ὅς κα] μετὰ Εὐκράτη ἱερατεύη, μέχρι Θεσμοφορίου τρι(α)[κάδος - - - -]. Thus the first list would begin on 1 Karneios in the term of the priest after Eukrates and run through 30 Thesmophorios, and each successive list would also begin 1 Karneios and run through 30 Thesmophorios.

¹⁸⁶ Badoud 2015, 14.

evidence concerning the seasons of the months, particularly whether months fell in the summer semester, or the winter semester.

Ever since August Mommsen's¹⁸⁷ and Paton's¹⁸⁸ work, it has been widely recognized that the frequency of month-names on Rhodian amphora handles can be used as evidence to make arguments about the seasons of the Rhodian months, with the higher production numbers being in the warmer and dryer season. Especially noteworthy are Nilsson¹⁸⁹ and Börker¹⁹⁰, the latter who, as far as I know, was the last scholar to systematically count month names on Rhodian amphora handles and whose figures Badoud claims he uses.¹⁹¹ Börker gave the following numbers (6593 examples), which I list from lowest frequency to highest (with Panamos and Panamos B combined):¹⁹²

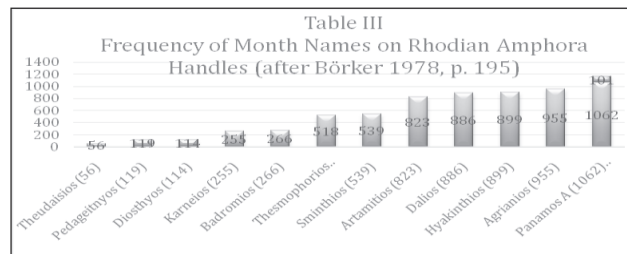


Table III. Frequency of Month names on Rhodian amphora handles (after Börker 1978, 195)

Although we can see from *IG XII.1* 3 and 4 that these frequencies cannot be used to precisely order the months (for instance there is no consistent progression from Agrianios to Hyakinthios to Panamos even though from *IG XII.1* 4 we know the order was Agrianios-Hyakinthios-Panamos), nevertheless the frequencies clearly fall roughly into three different categories: (1) *Theudaisios-Pedageitnyos-Diosthyos*, (2) *Karneios-Badromios-Thesmophorios-Sminthios*, and (3) *Artamitios-Dalios-Hyakinthios-Agrianios-Panamos*. We may

¹⁸⁷ Mommsen 1889, 429-437.

¹⁸⁸ Paton and Hicks 1891, 329.

¹⁸⁹ Nilsson 1909, 126-127.

¹⁹⁰ Börker 1978, 202.

¹⁹¹ Badoud (2015, 30) intended to reproduce Börker's figures, but he made three errors: his figure of 144 for Diosthyos is a typographical error for 114, his figure of 262 for Thesmophorios is actually Nilsson's (column I of Börker's chart) and is a mistake for 518, and his figure of 53 for Panamos B is also Nilsson's and is a mistake for 101. This confusion carries over into his tables. Thus on p. 31 in his Figure 19 his datum point for what he called month 2 (Θεσμοφόριος) is consistent with Börker's correct 518 but not with his own incorrect 262, and his datum point for what he called month 4 (Διόσθιος) is consistent with his typographical error 144, but not with the correct 114, and his datum point for what he called month 12' (Πάναμος δεύτερος) is consistent with his adjusted $53 \times (8/3) \approx 141$ (on the unlikely assumption that the Rhodians employed not the 19-year cycle but the *octaeteris* to regulate their calendar in the later Hellenistic period), but not with the correct $101 \times (8/3) \approx 269$. These last two errors have entered into his Figure 20 on p. 32.

¹⁹² We know that the Panamos B followed directly on Panamos A at roughly the same time of year (see Section V.A below), so I group them together. If all else were equal, we would expect a ratio of 27% of Panamos B stamps (7/26 months in a Metonic Cycle) to 73% of Panamos A (19/26 months in a Metonic Cycle), or 313 Panamos B handles to 850 Panamos A handles, but what we get is 101 to 1062, or 8.7% to 91.3%, which is roughly only 1/3 of what we would expect. While this is a clear discrepancy, most of it can probably be explained, as Badoud notes, by positing that several of the partially preserved Panamos A examples are actually Panamos B examples, plus probably sometimes the workers did not bother to make a new stamp for Panamos B, or they did not wait for the new stamp to be made and kept stamping with the old Panamos A stamp until the new stamp arrived.

further surmise that group 1 comprises months in the heart of one season, group 2 has months that lie at the transition between seasons, and group 3 comprises months in the heart of another season.

This naturally leads to any evidence for whether any of these months fell in the summer or winter semesters. Confirmation that Dalios fell in the summer semester comes from an inscription published by Reinach (1904, 203, III), which records that some interest was to be distributed to the *bouleutai* of the summer semester on the *noumenia* of Dalios (lines 7-8 = ὁ τόκος διανέμηται τοῖς θερινοῖς βουλευταῖς ἐπὶ τῇ γενεθλίῳ αὐτοῦ ἡμέρα Δαλίου νομηνία). This inscription also confirms that Pedageitnyos fell in the winter semester (lines 10-13 = ὁ τόκος ὁμοίως διανέμηται τῇ χειμερинῇ βουλή ἐπὶ τῇ γενεθλίῳ ἡμέρα τοῦ ἀδελφοῦ αὐτοῦ ...ἥτις ἐστὶν | Πεταγειτνίου Ἰθ). Further confirmation that Dalios fell in the summer semester may be found on *SIG*³ 644b lines 12-13, 17, 18-19 (= Badoud 2015, 358, no. 16), which records a Rhodian proxeny decree in honor of Eudemos of Seleukeia on the Kalykadnos in Kilikia, but which was inscribed at Seleukeia. The inscription indicates that there were three separate votes. The first, (a), was apparently a resolution brought before the *boula* alone that was passed at a meeting in Δάλιος when Damokles was priest of Halios and Astymedes son of Archokrates was head *prytanis*. The second, (b) was voted by the *damos* at one meeting of the *ekklesia* when Damokles was still priest of Halios and Astymedes was still the head *prytanis* in the month ΔΑΙΣΙΟΥ, which does not exist in the Rhodian calendar and is therefore an error of some type. Finally, a third vote in the month Βάδρομος, this also of the *damos* in a second *ekklesia*, was passed when Damokles was still priest of Halios, but now Iatrokles was the head *prytanis*. Thus the switch in *prytanies* happened sometime between ΔΑΙΣΙΟΣ (*sic*) and Βάδρομος.

Börker¹⁹³ agreed with Wilhelm's view¹⁹⁴ that on this inscription the month inscribed ΔΑΙΣΙΟΥ was an error for <ΘΕΥ>ΔΑΙΣΙΟΥ rather than Nilsson's¹⁹⁵ suggestion of ΔΑ<Λ>ΙΟΥ, and he further argued, based on this correction, that in the first semester the *prytanies* served from Πάναμος to either Διόσθου or Πεδαγειτνυος, whose order he had not yet determined. If correct, this would mean that the Rhodians had three different calendars in operation at various points in their history, one for the priest of Helios, one for the *boula* (organized by Winter and Summer semesters), and one for the *prytanies* (organized by First and Second semesters). For this last terminology of First and Second semesters, Börker pointed to a passage in Polybios (27.3-7) that indicates that in the winter of 172/1 BC (H)agesilochos was the *prytanis*, and in the spring of 171 BC Stratokles was the *prytanis* during the "second semester" (Στρατοκλέους πρυτανεύοντος τὴν δευτέραν ἔκμηνον).¹⁹⁶ Which is likely to be correct, <ΘΕΥ>ΔΑΙΣΙΟΥ or ΔΑ<Λ>ΙΟΥ?

¹⁹³ Börker 1978, 208-212.

¹⁹⁴ Heberdey and Wilhelm 1896, 112

¹⁹⁵ Nilsson's 1909, 131, n. 1.

¹⁹⁶ Pugliese Carratelli (1939-1940, 160, n. 1) suggested that Polybios took this terminology of the First and Second semesters from the Achaian calendar, which also began in the autumn. This theory cannot be easily dismissed since the first semester is now attested in the Achaian League calendar on *SEG* XL 394 (ταῖς πρώταις ἑξαμήνοι). The spelling ἔκμηνον, which Polybios also used at 6.34.3, is relatively rare but is found in Plato (*Leges* 916b3), Aristotle (*Hist. An.* Bekker 558a, line 17 and 562b, line 27), Cassius Dio (*Hist. Rom.* 42.20, 56.28 and 117.18), at Koresia on Keos on *IG* XII.5,1 647, lines 8-9, and at Eretria on *IG* XII.9 207, line 52 (in these last two spelled ἔγμηνον). Its use here rather than ἐξάμηνον also suggests Polybios was not using some official Rhodian source.

We first note that of all the many inscriptions found at Rhodes that mention *prytanies*, who numbered 5 in the 3rd century BC and 6 in the 2nd century BC but at whose head one stood out, none refers to a First (πράτα) or Second (δευτέρα) semester, only a Winter (χειμερινά) or Summer (θερινά) semester, and these inscriptions seem to indicate that the *prytanies* and *boula* served together for the same semester or term and shared the same secretaries and undersecretaries. The earliest of these is *Lindos II 16*, lines 1-3, which Blinkenberg dated to 411-408 BC before the synoikismos of 408/7 BC but which could instead be dated anytime at the end of the 5th or beginning of the 4th century BC.¹⁹⁷ On this inscription, the phrase [ἔδοξε τᾶι β]ολᾶ ἐπὶ π[ρ]||[υτανίων τ]ῶν ἀμφὶ Δει[ν]||[ἰαν...] occurs (and the phrase πρόξενον [ἦμ]εν Ῥο[δ]ίων πάντων in lines 5-6 seems to indicate this was a proxy decree of all the Rhodians, not just the Lindians). The phrase ἐπὶ π[ρ]||[υτανίων τ]ῶν ἀμφὶ Δει[ν]||[ἰαν] thus suggests that at this time, the terms of the *boula* and *prytanies* were coterminous, whatever the length those terms were.

The earliest certain evidence for the semester system at Rhodes is provided by a Rhodian decree inscribed at Magnesia ad Maeandrum, *I. Magnesia 55* (= Rigsby 1996, 247, no. 104) datable to the spring or early summer of 208 BC, when the Rhodians recognized the newly reorganized festival for Artemis Leukophryene. Lines 15-23 of this inscription read as follows:

- 15 ἀξιοῦντι ὅπως δὲ καὶ [συν]τ[ε]λῆται ὑπὸ τοῦ
 δάμου τὰ ἀξιούμενα ὑπὸ Μ[αγ]νήτων, τύχαι
 [ἀγαθᾶι οἱ] πρυτάνιες οἱ κα ἄρχωντι τὰν
 [...⁵⁻⁷...ἔξ]άμηνον ἐπὶ ἰ[ερ]έως Ἀριστωνί-
 [δα καὶ οἱ] αἰὶ ἔναρχοι εὖντες καθ' οὓς κα
 20 χρόνους σ[υν]τελῶντι Μάγνητες τ[ὰν] θυσίαν
 καὶ τοὺς ἀγῶνας τᾶι Ἀρτάμιτι τᾶι Λε[υ]-
 [κοφ]ρυηᾶι γράψαντες εἰσφερόντων ἐς τὰν
 βου[λᾶν] καὶ τὸν δᾶμον ἐμ μηνὶ Ὑακί[ν]θίωι,
 καθότι ἂ θυσία ἀποσταλησέι ὑπὸ τοῦ δᾶ-
 25 μου κατὰ τὰ νομιζόμενα

In line 18, Kern restored [πράταν ἐξ]άμηνον, but from other inscriptions we know the Magnesian envoys started contacting cities or organizations in the summer of 208 BC,¹⁹⁸ so this decree should be dated to either the spring or early summer of 208 or 207 BC, and the latter can be eliminated since in lines 17-25 the text says to “[Let the] *prytanies*, whoever are in office in the [- - -] semester in the priesthood of Aristonidas and whoever are in office at such times when the Magnesians shall celebrate the sacrifice and games to Artemis Leukophryene, draft and bring [a decree] before the *boula* and the *damos* in the month Hyakinthios, so that the sacrifice may be sent by the *damos* according to custom.”¹⁹⁹ Since in 207 BC the Leukophryena were celebrated in the Magnesian month Ἀρτεμισίων, which

¹⁹⁷ On the uncertain date of this inscription, see Gabrielsen, 2000, 179-180 = *SEG L 733*.

¹⁹⁸ We know that other Magnesian envoys were in Athens in the fall of 208 BC from *I. Magnesia 37* = Rigsby 1996, 215, no. 87 (with a confused discussion of the date of this inscription) = *IG II³.1 1170*, which is dated on the 6th day of Πυανοσιών and the 7th day of the 5th prytany in this intercalary year, in which an intercalary month, probably a second Ἐκατομβαιών, had been inserted earlier in the year. The corresponding date in the proleptic Julian calendar is approximately 1 November 208 BC, shortly before the evening setting of the Pleiades *c.* 6 November marked the end of the usual sailing season.

¹⁹⁹ This implies that Aristonidas' term as priest of Helios was in 209/8 BC, not 208/7 BC as Badoud (2015, 169 and 199) places him.

typically fell about two months earlier than Rhodian Ὑακίνθιος, if this were Ὑακίνθιος of 207 BC, it would mean the Rhodians did not vote to send a sacrifice to the first games that would have occurred a few months before.²⁰⁰ Furthermore, since the reference to Ὑακίνθιος in line 23 indicates this is late spring or early summer, and there is no evidence any Magnesian envoys set out prior to the spring of 208, accordingly, as Badoud²⁰¹ points out, at a minimum Kern should have supplied [δευτέρων ἐξ]άμηνον, but from photographs of the squeeze it is clear that in line 18 there is space for only 7-9 letters in the lacuna when compared with the beginnings of some better preserved lines above and below this line.²⁰² Hence [δευτέρων ἐξ]άμηνον can be eliminated, particularly since none of the letters in the lacuna would be an iota. Thus, as Badoud argues, the restoration [θερινῶν ἐξ]άμηνον, which has one iota, is the only one that both fits the spacing and makes temporal sense. With this, we can conclusively discard Wilhelm and Börker's theory that on SIG³ 644b the month inscribed ΔΑΙΣΙΟΥ was an error for <ΘΕΥ>ΔΑΙΣΙΟΥ rather than ΔΑ<Λ>ΙΟΥ, and with this also discard the Börker's theory of separate calendars for the *boula* and *prytanies*.

From *I. Magnesia* 55 (= Rigsby 1996, 247, no. 104), therefore, we see that Hykinthios was a month in the summer semester. Since we already know from Reinach 1904, 203, III that Dalios belonged to the summer semester, from SIG³ 644b we also know that Badromios belonged to the winter semester. Further confirmation that Badromios belonged toward the end of winter also comes from Athenaios (8.60, Steph. p. 358cd), who in quoting from Theognis Rhodius (= Theognis Rhodius *BNJ*526 F1), tells us that Rhodian children celebrated the impending coming of spring by greeting the return of the swallow in the month of Boëdromion, which is clearly an Atticizing mistake for Badromios.²⁰³ In a moment will examine this passage more closely (Section III.C.2), but suffice it to say for now that numerous ancient sources pinpoint the return of the swallow toward the end of winter.

The nice thing about this evidence is that it assures us that Pedageitnyos and Badromios were in the winter, and this gives us confidence that the entire low-production group Theudaisios-Pedageitnyos-Badromios belongs in the winter. It follows from this then that the methodology of grouping together months with similar frequencies of amphora handles is valid, which means that we are on firm ground when we place the grouping of Artamitios-Dalios-Hyakinthios-Agrianios-Panamos in the summer. We may remember that all these months, except Dalios, were attested more or less *seriatim* on IG XII.1 4 with one lacuna in the 11th spot. If there be any validity to the method of using frequency of amphora handles, then, as Börker saw, clearly this missing slot must belong to Dalios, or:

²⁰⁰ Although Rigsby's (1996, 248) discussion of the Rhodian calendar was confused, he made the valid point (p. 181) that the Magnesian envoys probably started in the spring of 208 BC and the first games were held in the spring of 207 BC (in the Magnesian month of Ἀρτεμισίων). For the dates of the visits made by the Magnesian envoys in the summer and fall of 208 BC, see Iversen 2017, 188-191.

²⁰¹ Badoud 2015, 24.

²⁰² I would like to thank Klaus Hallof and Jaime Curbera for sending photographs of the squeezes of this inscription.

²⁰³ There seems to be another tradition where this was a song to crows. See Athenaios 8.59 (Steph. p. 359d-360b = Hagnocles Rhodius *BNJ* 533 F7).

(1)? – (2)? – (3)? – (4)? – (5)? – (6) Σμίνθιος –
 (7) Ἀρταμίτιος – (8) Ἀγριάνιος – (9) Ὑακίνθιος – (10) – Πάναμος – (11) Δάλιος – (12) Θεσμοφόριος

At this point we may turn back to the Koan calendar and note that the five months in the Rhodian calendar that have both a known fixed order based on Rhodian evidence alone and also share the same name in the Koan calendar – that is Artamitios, Agrianios, Hyakinthios, Panamos and Dalios – *all five of these months share the same relative position in the two calendars*. This strongly suggests that the other homonymous months of these two calendars did as well, as Bischoff and Börker saw. But there has been disagreement about three of these months, as the following table shows:

Kos (known order)	Rhodes (known order)	Rhodes Nilsson (1909)	Rhodes Bischoff (1894), Börker (1976)	Rhodes Trümpy (1997), Badoud (2015)
Καρνεῖος		(1) Θεσμοφόριος	(1) Καρνεῖος	(1) Καρνεῖος
Θευδαῖσιος		(2) Διόσθιος	(2) Θευδαῖσιος	(2) Διόσθιος
Πεταγεῖτνος		(3) Θευδαῖσιος	(3) Πεταγεῖτνος	(3) Θευδαῖσιος
Καφίσιος		(4) Πεταγεῖτνος	(4) Διόσθιος	(4) Πεταγεῖτνος
Βατρόμιος		(5) Βαδρόμιος	(5) Βαδρόμιος	(5) Βαδρόμιος
Γεράστιος	(6) Σμίνθιος	(6) Σμίνθιος	(6) Σμίνθιος	(6) Σμίνθιος
Ἀρταμίτιος	(7) Ἀρταμίτιος	(7) Ἀρταμίτιος	(7) Ἀρταμίτιος	(7) Ἀρταμίτιος
Ἀγριάνιος	(8) Ἀγριάνιος	(8) Ἀγριάνιος	(8) Ἀγριάνιος	(8) Ἀγριάνιος
Ὑακίνθιος	(9) Ὑακίνθιος	(9) Ὑακίνθιος	(9) Ὑακίνθιος	(9) Ὑακίνθιος
Πάναμος	(10) Πάναμος	(10) Πάναμος	(10) Πάναμος	(10) Πάναμος
Δάλιος	(11) Δάλιος	(11) Δάλιος	(11) Δάλιος	(11) Δάλιος
Ἀλσειός	(12) Θεσμοφόριος	(12) Θεσμοφόριος	(12) Θεσμοφόριος	(12) Θεσμοφόριος

Table IV: History of Reconstruction of Rhodian Calendar

As one can see in **Table IV**, Trümpy has disrupted the order of Theudaisios and Pedageitnyos from their same positions in the Koan calendar, which required her also not to place Rhodian Diosthyos opposite Koan Kaphisios (i.e. she gives the order Karneios-Diosthyos-Theudaisios-Pedageitnyos-Badromios) – again an ordering of Rhodian months that Badoud (2015) also follows. Trümpy’s first argument as to why this is the order at Rhodes is because at Athens (and in Ionian calendars in general) Metageitnion and Boëdromion were consecutive months, which, Trümpy argues, is the same relative order that should also hold for Pedageitnyos and Badromios in Doric calendars.²⁰⁴ The second argument she makes is that at Megara, Pedageitnyos and Artemitios were separated by two months, and once again this is taken to be a valid analogy for Rhodes. Finally, relying on an argument made by Nilsson²⁰⁵, Trümpy argues that the Rhodian month Diosthyos, which (as the name implies) involved a sacrifice to Zeus, coincides in time to Athenian Maimakterion, a month so named after a rite involving sacrifices to Zeus Maimaktes – Zeus of the Storm.²⁰⁶ Needless to say, a sacrifice to Zeus can occur in just about any month, plus the appeal to analogy of more distant and non-related calendars instead of the closer and clearly related calendar of Kos makes no sense, particularly given that we can see the cognate months Badromios/Boëdromion and Pedageitnyos/Metageitnion at Rhodes and

²⁰⁴ Trümpy 1997, 173.

²⁰⁵ Nilsson 1909, 136.

²⁰⁶ Trümpy 1997, 174.

in Ionic calendars are not at the same time of year (and Kos has the order Karneios-Petageitnyos-Kaphisios-Badromios). This alone is reason to suspect Trümpy's and Badoud's order (and when I cover the seasons of the months below, I will provide more reason to doubt their order of these months).

In addition to Trümpy's arguments, Badoud makes one more argument to support the order Theudaisios-Pedageitnyos-Diosthyos.²⁰⁷ He points to a land lease contract (*SEG* LII 1029B = Badoud 2015, 451, no. 71) that indicates that the first payment was to be made in Theudaisios ([...ἀρχέτω δὲ τᾶς μισθῶ]σιος μεις Θευδαίσιος...), and each year's payments were to be completed by Diosthyos. Drawing a parallel from another example (*I.Rhod.Per.* 352 = Badoud 2015, 448, no. 69) where the contract was made in the month of Panamos during the priesthood of Aristeidias (line 1), and the first payment was to be made in Karneios in the year of the priest after Aristeidias (lines 8-90), which we both would agree would be two months later, and the final payment of each year of the contract was to be made beginning 9 months later in Panamos, Badoud argues the final payments in Diosthyos must be, like this other example, due approximately one year after the initial payment. As I pointed out elsewhere, this is just an assumption about the schedule of payments that need not be true.²⁰⁸

2. The Seasons of the Rhodian Months

That Bischoff's and Börker's order of Theudaisios-Pedageitnyos-Diosthyos rather than Trümpy's and Badoud's order of Diosthyos-Theudaisios-Pedageitnyos is more likely to be correct can also be supported by evidence concerning the seasons of the months of the Rhodian calendar. Below I give Bischoff's and Börker's order, and their proposed relationship to the Athenian calendar along with their Julian equivalents.

Rhodes Bischoff (1894), Börker (1978)	Athens	Julian
(1) Καρνείος	(3) Βοηδρομιών (4) Πυανοσιών	(Sep./Oct.) (Oct./Nov)
(2) Θευδαίσιος	(4) Πυανοσιών (5) Μαιμακτηρών	(Oct./Nov) (Nov./Dec.)
(3) Πεταγείτνυος	(5) Μαιμακτηρών (6) Ποσιδεών (ΑΒ)	(Nov./Dec.) (Dec./Jan.)
(4) Διόσθιος	(6) Ποσιδεών (ΑΒ) (7) Γαμηλιών	(Dec./Jan.) (Jan./Feb.)
(5) Βαδρόμιος	(7) Γαμηλιών (8) Άνθεστηριών	(Jan./Feb.) (Feb./Mar.)
(6) Σμίνθιος	(8) Άνθεστηριών (9) Έλαφηβολιών	(Feb./Mar.) (Mar./Apr.)
(7) Άρταμίτιος	(9) Έλαφηβολιών (10) Μουνιχιών	(Mar./Apr.) (Apr./Mai.)
(8) Άγριάνιος	(10) Μουνιχιών (11) Θαργηλιών	(Apr./Mai.) (Mai./Jun.)

²⁰⁷ Badoud 2015, 14-15.

²⁰⁸ Iversen 2017, 194-195.

(9) Ὑακίνθιος	(11) Θαργηλιών (12) Σκιροφοριών	(Mai./Jun.) (Jun./Jul.)
(10) Πάναμος (AB)	(12) Σκιροφοριών (1) Ἐκατομβαιών	(Jun./Jul.) (Jul./Aug.)
(11) Δάλιος	(1) Ἐκατομβαιών (2) Μεταγειτνιών	(Jul./Aug.) (Aug./Sept.)
(12) Θεσμοφόριος	(2) Μεταγειτνιών (3) Βοηδρομιών	(Aug./Sept.) (Sept./Oct.)

Table V: The Seasons of the Months in the Rhodian Calendar

The following evidence supports the proposed order and assigned seasons.

Karneios ≈ Athenian Boëdromion or Pyanopsion.

There is considerable evidence, as I have shown in another publication, that in other Doric calendars the month of Karneios and its attendant festival fell in the early autumn in the season normally coincident with either Athenian Boëdromion (3rd month after summer solstice ≈ September/October) or Pyanopsion (4th month after summer solstice ≈ October/November).²⁰⁹ On the Antikythera Mechanism, whose lunar months are precisely known because they are tied to a series of full moon cycles and lunar and solar eclipses, it is virtually certain that the month Kraneios (the Korinthian/Epirote calendar equivalent of the pan-Doric Karneios) was sometimes coincident with either Athenian Boëdromion (2/19 times in a Metonic Cycle), but usually with Athenian Pyanopsion (17/19 times in a Metonic Cycle). It is never as late as Athenian Maimakterion (November/December). Note that Trümpy also placed Karneios as generally equivalent to Athenian Pyanopsion²¹⁰, while Badoud has internally inconsistent statements. In his tables, for instance, he states that Karneios is equivalent to October/November (thus what most scholars would take to be Athenian Pyanopsion), but the rest of his book actually argues for Karneios to be equivalent to Athenian Maimakterion, and thus November/December. This is shown most clearly by having the spring equinox in March fall within the month of Badromios²¹¹, which means Badromios would normally be coincident with Athenian Elaphebolion (March/April), and therefore Karneios would usually need to be coincident with Athenian Maimakterion (November/December). For more on this, see under Badromios below.

Theudaisios ≈ Athenian Maimakterion.

There is also suggestive evidence for placing the season of the second month of the Rhodian calendar, Theudaisios, as normally coincident with Athenian Maimakterion (November/December), for an inscription found near Lindos tells us that a sacrifice of a pig was made to Poseidon Phytalmios (Φυτάλμιος) on 6 Theudaisios.²¹² Hiller von

²⁰⁹ Iversen 2017, 165-171.

²¹⁰ Trümpy 1997, 178.

²¹¹ Badoud 2015, 14.

²¹² *IG XII.1 905*. Another inscription from Kameiros (Segre and Pugliese Carratelli 1949-1951, 258, no. 153) states that a sacrifice of bull, ram, and pig were to be sacrificed to Poseidon (no epithet) on the 1st of Theudaisios, and a festival called the Theudaisia (which probably was in honor of Dionysos) is attested at Lindos (*Lindos II 604 and 609*). For the probability that the Theudaisia were trieteric, see Gabrielsen 2017, 22.

Gaertringen astutely suggested that the epithet Φυτάλμιος was related to the Greek word meaning to engender, φύειν,²¹³ which is confirmed by several literary sources, including Plutarch, who in a fictive dinner party has one guest refer to sacrifices to Demeter Proerosia (“before the plowing”) and Poseidon Phytalmios in the same sentence.²¹⁴ Themistios explicitly ties Poseidon’s epithet to the verb φύω.²¹⁵ Over 130 years ago Mommsen used these passages to infer that Rhodian Theudaisios should coincide with Athenian/Ionic Posideon²¹⁶, which Trümpy also has done.²¹⁷ Hiller von Gaertringen, on the other hand, sensibly suggested that this sacrifice may have been connected to the season of plowing and planting,²¹⁸ which the pairing of Demeter Proerosia and Poseidon Phytalmios strongly confirms, thus meaning it probably does not refer to any other time of the agricultural year. As Hiller von Gaertringen (*SIG*³ 1030, note 1), followed by Börker²¹⁹, recognized, further confirmation that this is the right time of year for Theudaisios comes from *ID* 1513 = *IC* xvi 4* = Chaniotis, *Verträge* 55A, a Delian inscription which records a treaty between the Cretan cities of Knosos, Lato and Olous in 116/15 BC. On this inscription the month Θιοδαίσιος at Lato coincided with Knosian Σπέρμιος, whose name indicates that it fell in the season of sowing seeds (σπέρματα). Hesiod and Aratos tell us plowing and planting should be done around the migration time of cranes,²²⁰ which Aristotle informs us took place in the Athenian month of Maimakterion,²²¹ and which season the famed bird specialist and classicist Arnott confirms as being the correct season for the migration of cranes in Greece.²²² Furthermore, Hesiod (*Erga* 479-482) also warns that ploughing around the winter solstice would result in a thin crop the following spring (and he further suggest that if you must plow late, it is best to do so at the time of the cuckoo’s cry in March). Again, Börker’s placement of Theudaisios right after Karneios as the second month of the Rhodian calendar makes it normally coincident with Athenian Maimakterion (Nov./Dec.), which puts it right during the ideal season of planting and plowing. On the other hand, Trümpy’s and Badoud’s placement as the third month makes Theudaisios one month later than this – a period that Hesiod warned was bad for plowing.

Pedageitnyos ≈ Athenian Posideon.

Other evidence from Rhodes concerning the third month of the calendar, Pedageitnyos, corroborates this picture. It comes in the form of a letter of Nero written to

²¹³ See *LSJ*⁹, p. 1965, φυτάλμιος.

²¹⁴ Plutarch, *Septem sapientum convivium* 158e5: ὀμβρίῳ δὲ Διὶ καὶ προηροσίᾳ Δήμητρι καὶ φυταλμίῳ Ποσειδῶνι ποῦ βωμός ἐστι, ποῦ δὲ θυσία; For Poseidon Phytalmios, also see Plutarch *Questiones conviviales* 675f and 730d; *Adversus Colotem* 1119e.

²¹⁵ Themistios 349a: καὶ ὅσα φύουσιν ἐκ τῆς γῆς ὦραι· εἰ δὲ καὶ Διόνυσον καλοῖμεν καὶ νύμφας καὶ Δήμητρος κόρην ὑπέτιόν τε Δία καὶ Ποσειδῶνα φυτάλμιον.

²¹⁶ Mommsen 1889, 434.

²¹⁷ Trümpy 1997, 173-174, n. 740.

²¹⁸ *SIG*³ 1030, *adn.* 1.

²¹⁹ Börker 1978, 203-204.

²²⁰ Hesiod *Erga* 448-451; Aratos *Phainomena* 1075-1076.

²²¹ Aristotle *Historia animalium* 596b.29-597a.9.

²²² Arnott 2007, 52 on cranes: “Aristotle correctly dates the migration times.”

the Rhodians.²²³ This letter informs us that the Rhodians had received a letter (which Nero refers to as a false letter) that alarmed them, and so they immediately dispatched envoys to Rome who were given admittance by Nero and who arranged for some sacrifices, and then who were sent back home with this letter, which was registered on Rhodes on the 24th of Pedageitnyos (here spelled in the more usual Koan manner Petageitnyos). The letter indicates that Nero had *δημαρχικῆς ἐξουσίας*, or *tribunicia potestas*, without any attending numeral, which, as far as I know, has been taken universally to mean that this was his first year in office.²²⁴ Since we know from Suetonius that Nero was one of the ordinary consuls in AD 55, an office which he held for two months and that undoubtedly began on the Kalends of January,²²⁵ the fact that there is no mention of any consular rank strongly suggests that Nero composed the letter before the Kalends of January in AD 55. Furthermore, Hiller von Gaertringen points out that Nero's predecessor Claudius died on 13 October AD 54,²²⁶ thus this letter is likely to have been written between 13 October and 31 December of AD 54.²²⁷

The beauty of lunisolar calendars is that their months are tied to the phases of the moon, so that unless there is a serious disruption or manipulation for some emergency or political exigency, the beginnings of the months should fall close to one day after new moons (which moderns can go back into time and calculate). In the fall of AD 54, there were new moons on 20 September, 19 October and 18 November (and the autumn equinox fell on 25 September). If, for the sake of argument, Karneios on Rhodes began the day after the new moon of 20 September (= the new moon just before what normally would be Athenian Boëdromion), taking into account whole and hollow months (30 + 29 + 24) and using Bischoff's and Börker's order of the months as Karneios-Theudaisios-Pedageitnyos, 24 Pedageitnyos would have fallen 83 days later on about 12 December of 54; if Karneios began on 20 October (= Athenian Pyanopsion), 83 days later, 24 Pedageitnyos would have been 10 January, AD 55; and if Karneios began on 19 November (= Athenian Maimakterion), 83 days later, 24 Pedageitnyos would have been February 9 of AD 55. December 12 is too tight a schedule after the death of Claudius on 13 October for a rumor to arise, a false letter to be written, for the false letter to reach Rhodes (presumably from Italy), for the Rhodian envoys to hasten to Rome, and for the Rhodians to return quickly to Rhodes. 10 January comfortably allows the requisite time for each of the three journeys required, at least one if not two made with great haste, and it also means the journey home would occur during the "halcyon days" around the winter solstice, when

²²³ Hiller von Gaertringen 1895, 386, no. 5 = *SIG*³ 810 = Badoud 2015, 443, no. 65. See also Pugliese Carratelli 1940, 255-256.

²²⁴ Numerals, however, were sometimes omitted in such cases, so this is not in and of itself definitive evidence that this inscription dates to his first year of Nero's rule. See *IKourion* 84; *IEph* 275; *SEG* XXIX 1156. See also Højte 2005, 74.

²²⁵ Suetonius *Vita Neronis* 14: *Consulatus quattuor gessit: primum bimestrem, secundum et novissimum semestres, tertium quadrimestrem; medios duos continuavit, reliquos inter annua spatia variavit*. For other details of Nero's reign, see Gallivan 1974.

²²⁶ *SIG*³ 810, adn. 7.

²²⁷ Tacitus, *Ann.* 12.69; Suetonius, *Divus Claudius* 45. Stobbe 1873, 23-30 argued that the anniversary of Nero's *tribunicia potestas* was not his *dies imperii* on 13 October, but 4 December. For a summary of the problem, see Hammond 1938, 26-32. However, Clay 1982, 7-17 has convincingly argued that throughout his reign, Nero dated his *tribunicia potestas* to October 13.

the seas between Sicily and Greece all the way to Crete were usually calm.²²⁸ It also is consistent with the fact that Nero had *tribunicia potestas* after October 13 but had no consular rank before 1 January of AD 55, if we assume the Rhodian envoys left Rome before the Kalends of January, which is a reasonable assumption since we can expect it to have taken more than 10 days to sail back to Rhodes. The last date, 9 February, is unlikely since it would have meant that the Rhodians took more than about 7 weeks to return to Rhodes from Rome when they knew that their countrymen were anxious to have news. In sum, in this particular year, the month beginning the day after the new moon of 19 October, which was the first new moon after the autumn equinox, is the clear favorite for the first month of the year, Karneios, which in this year would should have been coincident with Athenian Pyanopsion – the time of year that both Trümpy and Badoud claim for Karneios (although again, Badoud’s chronology is internally inconsistent and the logical conclusion of his arguments is that normally Karneios was equivalent to Athenian Maimakterion, which with his adopted order of the months would place 24 Pedageitnyos even one month later all the way into early March). In short, this evidence also supports the order Karneios-Theudaisios-Pedageitnyos, rather than Trümpy’s and Badoud’s order of Karneios-Diosthyos-Theudaisios-Pedageitnyos.

More confirmation that the order is more reasonably to be Karneios-Theudaisios-Pedageitnyos-Diosthyos-Badromios rather than Karneios-Diosthyos-Theudaisios-Pedageitnyos-Badromios perhaps comes from an inscription recording a sale of a house and a transfer of deed.²²⁹ The inscription informs us (face B, lines 8-16) that in the priesthood of Archinos on 5 Karneios, the Koinon of Hermogeneioi Aphrodisiastai agreed to pay 12,000 drachmas to a certain Sostratos for a house in the city, and they apparently promised to convey the entire 12,000 drachmas in the month of Pedageitnyos, still during Archinos’ tenure. By the 28th of Pedageitnyos,²³⁰ however, the Koinon apparently did not have all the money available, so they delivered only a down payment of 1000 drachmas to Sostratos and apparently asked for, and received, more time to pay the remaining balance of 11,000 drachmas. Finally on 2 Badromios they paid the final 11,000 drachmas, and the deed was transferred. Again, if the order were Trümpy/Badoud’s Karneios-Diosthyos-Theudaisios-Pedageitnyos-Badromios rather than Karneios-Theudaisios-Pedageitnyos-Diosthyos-Badromios, the Koinon for some reason would have only been able to come up with 1000 drachmas in 3 months and 23 days, but suddenly 4 or 5 days later they would have had 11,000 drachmas more. While it is possible that in 4 or 5 days they came up with a huge windfall of 11,000 drachmas, it seems more reasonable to assume the Koinon needed more than a month to come up with the remaining balance of 11,000 drachmas,

²²⁸ Cf. Aristotle *H.A.* 5.8 (542b), who talks of the calm of the “Sicilian Sea” (Σικελικός πέλαγος), which according to Thucydides (4.53.3) and Strabo (2.5.10) extended from the western shore of Sicily to the shores of the Peloponnese and Crete, around the winter solstice when the halcyon lays her eggs. See also Pliny *H.N.* 10.89-91.

²²⁹ Pugliese Carratelli 1939-1940, 156-161, no. 18 (with an additional note by Arangio-Ruiz pp. 161-165) = Badoud 2015, 387, no 26, B.

²³⁰ The Greek is τρίται ἐξ ἰκάδος, which means the 28th (see above Section III.A). Badoud’s translation of this as “le 13 Pédageitnuos”, like many of his translations of month days throughout his book, is wrong (for instance earlier in this inscription he translates Καρνείου πέμπται ἰσταμένου as “le 15 Karneios” when it is 5 Karneios).

but naturally this is debatable.

Badromios ≈ Athenian Anthesterion.

Other evidence from Rhodes also strongly and overwhelmingly supports placing the fifth month, Badromios, as normally coincident with Athenian Anthesterion, for (as mentioned above) in that month Athenaios, in quoting from Theognis Rhodius, informs us that Rhodian children, in a kind of ancient trick-or-treating, sang a song that welcomed back the swallows (Greek χελιδών, Latin *hirundo*),²³¹ whose return heralded the approach of Spring.²³² Hesiod reports that the swallows returned (presumably to his native Boiotia) 60 days after the winter solstice,²³³ or around 19 February. The *paraepagma* attached to Geminus' manuscripts, which Lehoux places before the late second century BC,²³⁴ quotes three different sources – an unnamed source,²³⁵ Eudoxos (from Knidos but who worked at Athens) and Kallippos (from Kyzikos but who worked at Athens) – in placing the appearance of the swallow about 61 days after the winter solstice, or 20 February.²³⁶ Ptolemy, citing Hipparchos (of Rhodes) and Euktemon (of Athens) as his authorities,²³⁷ places the return of the swallow on 27 Mechir in the Egyptian calendar of Alexandria, which in Ptolemy's day would have corresponded to 21 February. Ovid, in his description of the flight of Tarquin the Proud (*The Regifugium*), places the swallow's return (apparently to Rome) also at the end of February on the 24th,²³⁸ while Columella, quoting Caesar, places it on 21 February.²³⁹ Pliny places the return of the swallow (presumably to Rome) on 22 February when the Favonius wind began to blow,²⁴⁰ which wind he notes some call the Chelidonias after the swallows who make their appearance with it. Numerous ancient authors also associate the arrival of swallows with just before the arrival of spring,²⁴¹ hence the saying "One swallow does not a spring make".²⁴² The definition of Spring was somewhat flexible, but many Greeks, especially farmers like Hesiod, considered it to begin at the time of the evening rising of Arcturus around the end of February and beginning of March, depending on the longitude and altitude of the observer, and not the spring equinox as moderns do. The most common European swallow (*hirundo rustica*) winters in

²³¹ Athenaios actually says Boëdromion, but this is clearly an Atticizing mistake for Badromios, either made by Athenaios or a later copyist. Arnott (2007, 29) wrongly equates Theognis' passage with the season of Athenian Böedromion (Sept./Oct.), but there is no doubt this passage refers to spring.

²³² Athenaios 8.60 (Steph. p. 358cd = Theognis Rhodius *BNJ* 526 F1).

²³³ Hesiod *Erga* 565-570.

²³⁴ Lehoux 2007, 157-158.

²³⁵ Some attribute this to Meton, others to Euktemon; see Lehoux 2007, 230, n. 62.

²³⁶ Geminus p. 105, lines 11-15. Kallippos places the appearance on the 2nd day after the sun enters Pisces and Eudoxos the fourth, but this is the same relative position as can be gathered from where they place the winter solstice in Capricorn.

²³⁷ Ptolemy *Phaseis* 2.39.12. κη'. Ἰππάρχῳ καὶ Εὐκτῆμονι ὀρθίται ἄρχονται πνεῖν ψυχροί, καὶ χελιδόνι ὥρα φαίνεσθαι. 27 Mechir is the date in the fixed Alexandrian calendar that was established shortly after 30 BC. Euktemon and Hipparchos, therefore, must have expressed this date as a certain number of days after a fixed celestial event, probably the winter solstice as Kallippos and Eudoxos did.

²³⁸ Ovid *Fasti* 2.853-6.

²³⁹ Columella 11.2.21-22.

²⁴⁰ Pliny *NH* 2.47.3; 18.65.

²⁴¹ Stesichoros *PMGrF* 211; Simonides *PMG* fr. 92); Aristophanes *Knights* 419, *Peace* 800-801, *Birds* 713-14, and *Thesmophoriazusai* 1.

²⁴² Kratinos fr. 35.

South Africa before migrating north, either up the west or east coast of Africa – a migration that had gone like clockwork since time immemorial before global warming (see **Figure 3**).²⁴³

The difference between when swallows would have arrived in Rhodes as opposed to Boiotia or Italy is likely to have been nugatory, although those who migrated up the east coast of Africa may have arrived a bit earlier to Rhodes. In any case, Hipparchos of Rhodes in his *parapegma* apparently placed the return of the swallow to Rhodes on a date that later authors took to be equivalent to 21 February. Therefore, the only acceptable month for placing Rhodian Badromios during the return of swallows is clearly the month normally coincident with Athenian Anthesterion, which usually would have fallen 30 days on either side of February 17.²⁴⁴

As J.D. Morgan has pointed out to me, one can also use the dating of the return of the swallows to Rhodes some 60 or 61 days after the winter solstice in Badromios to determine the relationship of Karneios to the autumn equinox as follows. If one reckons 88 days from the autumn equinox to the winter solstice,²⁴⁵ as in Ptolemy's *Phaseis*, where the autumn equinox is dated to 28 Thoth and the winter solstice to 26 Choiak, the return of the swallows to Rhodes would have occurred 148 or 149 days after the autumn equinox. This interval of time corresponds very closely to 5 mean synodic months (147.65 days). Hence if in the Rhodian calendar the νομηνία of Karneios fell anywhere from 1 to 30 days after the autumn equinox, with 118 days in the four months Karneios, Theudaisios, Pedageitnyos and Diosthyos, the fifth month Badromios would have begun anywhere from 119 to 148 days after the autumn equinox, and ended anywhere from 148 to 177 days after this same temporal marker. This in turn means that the 148th day after the autumn equinox would always have fallen in the month Badromios. This piece of evidence is significant, for not only can it be interpreted as confirmation of the theory that in the Rhodian calendar Karneios was normally the first month after the autumn equinox, but also since the order of the Rhodian months from Badromios through Thesmophorios is secure, based upon this evidence their seasons are also relatively secure. It should be noted that Badoud's statement of this evidence that "*La fête du renouveau qui donnait lieu à ce rite étroitement associé à l'équinoxe de printemps était célébrée vers le 20 mars*"²⁴⁶ is not supported by any ancient evidence concerning the appearance of swallows in the Mediterranean – all say they appear almost exactly one month earlier. This means his statement that "*Le mois de Βαδρόμιος, quant à lui, correspondait approximativement au mois mars*"²⁴⁷ is also one month too late.

²⁴³ See G. Zink 1969; Huin and Sparks 1998.

²⁴⁴ Assuming Karneios is normally the first month after the autumn equinox (on the Antikythera Mechanism it starts a few days before the equinox only 2 times each Metonic Cycle), the following results: 30 (Karneios) + 29 (Theudaisios) + 30 (Pedageitnyos) + 29 (Diosthyos) = 118 days after the autumn equinox. Badromios (30 days) could therefore run anywhere from 118 + 29 + 30 days after the autumn equinox, or January 18 to March 18 with February 17 as the midpoint.

²⁴⁵ Hipparchos' more precise estimate of 88 $\frac{1}{8}$ days is mentioned by Geminus (1.15) and by Ptolemy, *Almagest* 3.4 (p. 237 Heiberg).

²⁴⁶ Badoud 2015, 14.

²⁴⁷ Badoud 2015, 15.

Sminthios ≈ Athenian Elaphebolion.

The sixth month of the Rhodian calendar was called Sminthios, so named in honor of Dionysos Sminthios, who received the epithet for his wiping out of a plague of mice who were eating up the vines.²⁴⁸ An inscription confirms that the Sminthia were in honor of Dionysos and involved dramatic contests.²⁴⁹ Hiller von Gaertringen (*SIG*⁹ 974, adn. 5) astutely notes that this month is most aptly paired with Athenian Elaphebolion (March/April), the month of the City Dionysia, and so it would normally be, as expressed in **Table V** above.

Panamos ≈ Athenian Skirophorion/Hekatombaion.

As noted above, the Pindaric Scholiasts claimed that the Halieia of Rhodes finished by the 24th of the same month as the Nemea of Argos, which the Pindaric Scholiasts claimed finished on the 18th of Argive Panamos – a month they claimed was roughly equivalent to Gorpiaios of some version of the Macedonian calendar. I have argued extensively elsewhere that the Halieia of Rhodes were also in Rhodian Panamos,²⁵⁰ which was normally coincident with Argive Panamos and generally the closest equivalent to Gorpiaios in the fixed calendar of Alexandria after 30 BC. Both Argive and Rhodian Panamos were normally coincident with Athenian Hekatombaion, but occasionally also Athenian Skirophorion. Note that lines 1-6 of *IG* XII.4 1266 (from Kos and dating 42-31 BC) indicate that a Roman decree known as the Lex Fonteia was passed in Rome at some point in the second half of June and it was recorded on Kos at some point after this in the month of Panamos, which I think it is safe to assume was normally at the same time of year as Panamos on Rhodes. The relevant lines of the inscription, which is fragmentary and also has some erasures, reads:

- 2 [-----] μηνὸς Πανάμου δευτέ-
 [-c. 12 ---- Γάϊος] Φωντήϊος Γαΐου υἱὸς Καπίτων ἱερεὺς
 [κατὰ τὸ δίκαιον τῶι δήμῳι προσανήνεγκεν ἐκ συνκλήτου γνώ-
 5 [μης, ὁ δῆμος κατὰ τὸ δίκαιον ἐψηφίσαστο ἐν τῇ ἀγορᾷ πρὸ τῶν
 [ἐμβόλων πρὸ ἡμερῶν ----- καλ]ανδῶν Ἰουλίῳν, ν φυλῆς Καμιλλίας

At lines 2-3 the editors restore δευτέ|[ραι ἐξ ἰκάδος υ Γάϊος], but the restoration is at best uncertain as this date would refer to the 29th of the month, not the 22nd (as the editors supposed in an earlier publication),²⁵¹ and as we saw above the only attested name of the 29th of the month at both Kos and Rhodes is the προτριακᾶς.²⁵² Bosnakis and Hallof (*IG* XII.4,1 266 at line 3) note that Herzog also suggested restoring μηνὸς Πανάμου δευτέ|[ρου - - c. 9 - - Γάϊος], thus in the intercalary month of Panamos, which is quite attractive (the intercalary month Πάναμος δεύτερος is attested on Kos at *IG* XII.4,1 337, face B, line 12). The only other possibility, not noted by Bosnakis and Hallof, is μηνὸς Πανάμου δευτέ|[ραι

²⁴⁸ Apion, S. 143,9 (= Neitzel 1977, fr. 122) and Apollonios Soph., *Lexicon Homericum* p. 143, lines 9-15. See also Athenaios Book 10, Kaibel paragraph 63, lines 28-35, which informs us that a certain Philomnestos wrote a work called *On the Sminthia* and makes it clear these were associated with Dionysos.

²⁴⁹ See *IG* XII.1 762.

²⁵⁰ Iversen 2017, 141-146 and 192-197. I was anticipated by Zusanek (1996, 55), who makes his argument purely based on the season of the year.

²⁵¹ Bosnakis and Hallof 2005, 235.

²⁵² *IG* XII.4,1 281, col. II, line 43 (= Segre 1993, ED 145, col. B, line 21); *IG* XII.1 4, col. II, line 22 and col. III, line 45.

ἰσταμένου Γάτος], or the 2nd of the month of Panamos A, which fits the spacing perfectly.²⁵³ The one question with this supplement, however, is whether the Koans used the word ἰσταμένου with the second of the month, which is not certain. If they did, this date would work fine at the times when Panamos A started after a new moon at the very end of June or the first half of July.²⁵⁴ In any case, whether it be at 2 Panamos *protos* or at some point in Panamos *deuteros*, it seems reasonable to assume the decree was registered on Kos within 2 to 6 weeks after it passed in Rome, thus it seems likely that part of Panamos A or Panamos B fell in July on Kos this year, and by extension this is the likely time of year for Panamos on Rhodes.

Thesmophorios ≈ Athenian Boëdromion.

Finally, the 2nd century AD author Sextus Pompeius Festus, in defining the term *Equus October* at Rome, describes various peoples who made horse sacrifices, including the Rhodians. Sextus reports that “*And also the Rhodians, who every year throws quadrigae that are consecrated to Helios into the sea, because he is said to circumnavigate the world in such a chariot*”.²⁵⁵ This almost certainly does not refer to a festival known as the Hippokathesia, which from inscriptions we know were celebrated in Agrianios and were in honor of Poseidon Hippios,²⁵⁶ apparently every eight years. I also do not think it refers to some other ceremony at the Halieia, as Blinkenberg and Zusanek suppose.²⁵⁷ While Sextus may not have meant to suggest that the Rhodians threw quadrigae into the sea around Julian October, he certainly indicates that the Rhodians held a ceremony to mark the point when Helios had completed his circuit, which at any time after the 5th century BC is likely to refer to a solstice or equinox. If we recall the fragment of Herakleides Kritikos quoted above (p. 16) in which the writer complains τὸ δ' ἄλιακὸν ἔτος μεμάλινεσθαι ποιεῖ – “*and the solar year drives me crazy*” – it seems likely that the Rhodians of all the Greeks were famous, or perhaps infamous, for being devoted to keeping track of the tropical year (and I would suggest Herakleides is possibly referring to the ceremony that Sextus describes). We would, therefore, expect Rhodes' last month, Thesmophorios, to fall around the time of a solstice or equinox. In the tables above, it is placed exactly around the time of the autumn equinox, and no other solstice or equinox is an acceptable alternative (and indeed, the end of Thesmophorios would have usually fallen in October, which may just be coincidence). In addition, on the Antikythera Mechanism, which was likely built on Rhodes, we saw that

²⁵³ For a good photo of the squeeze of this inscription, see Crawford *et al.* (ed.) 1996.I, 497, no. 36 and II: Plate XI.

²⁵⁴ In 41 BC the new moon that occurred before what was likely to be the month of Panamos fell on July 12, thus 2 Panamos would have been around 14 July, 41 BC and thus 2-4 weeks after the Julian date missing in the lacuna. Other possible years include 40 BC (new moon on 1 July), 38 BC (new moon on 9 July), 37 BC (new moon on 28 June), 35 BC (new moon on 6 July), 33 BC (new moon on 14 July), and 32 BC (new moon on 3 July). The years 42, 39, 36, 33, and 31 are prime candidates for the intercalary years of Panamos B (μηνὸς Πανάμου δευτέ[ρου - -]).

²⁵⁵ Sextus Pompeius Festus, *De verborum significatu*, s.v. *October Equus: Et Rhodi, qui quotannis quadrigas soli consecratas in mare iaciunt, quod is tali curriculo fertur circumvehi mundum.*

²⁵⁶ Segre and Pugliese Carratelli 1949-1951, 258, no. 153, lines 8-9. See also Segre 1951, 141. Note that Appian (*Mithridatika* 295) relates how Mithridates plunged a chariot with white horses into the sea in the spring of 73 BC on the eve of the Third Mithridatic War to placate Poseidon.

²⁵⁷ Blinkenberg 1938, 17-18 and Zusanek 1996, 55.

the gearing of the Mechanism means that the years on the Games Dial are solar years, and as was noted above, these years almost certainly run from autumnal equinox to autumnal equinox.

Here it is worth returning to the evidence of the frequency of Rhodian amphora handles to see whether their evidence is consistent with both the order and seasons assigned:

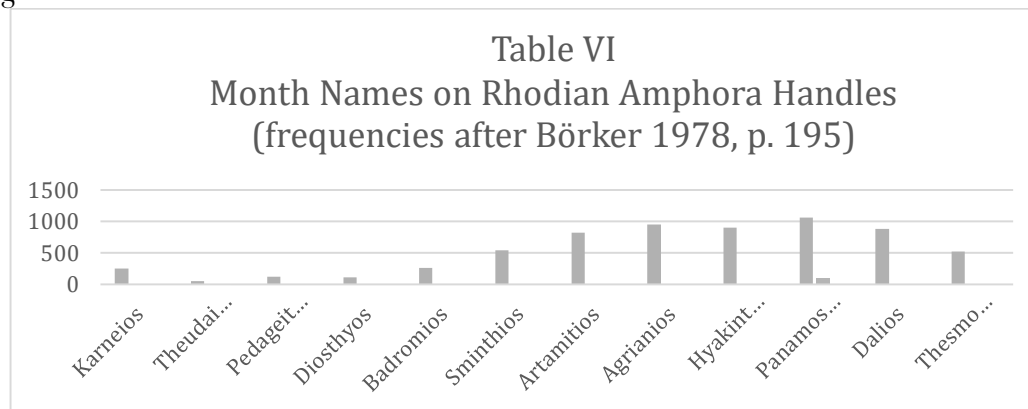


Table VI. Month names on Rhodian amphora handles (frequencies after Börker 1978, 195)

We can see here that from roughly October/November (Karneios) to February/March (Badromios) during the coldest and wettest time of the year, the production level of amphorae is lower, whereas starting in March/April (Sminthios) production begins to rise significantly until it peaks in July/August (Panamos), the hottest and driest time of the year, whence it begins to decline by the end of summer.

We thus have independent compelling seasonal evidence for 7 of Rhodes' 12 months, including several festivals (such as the Karneia, Sminthia, and Halieia whose likely time of year matches the chronology suggested), the likely time of year for a sacrifice to Poseidon Phytalmios, the likely chronology of a Neronian letter that is quite circumscribed, the fixed time of year for the return of swallows whose pattern of migration had been like clockwork for millennia before the advent of globing warming, and the likely placement of Thesmophorios at the autumn equinox. The order and relative placement of these months also matches that of Kos (where we know in one year Panamos A or Panamos B almost certainly fell in July), and it is also broadly consistent with the evidence of the frequency of months on Rhodian amphora handles. When taken individually any one of these points may be dismissed, but when combined, the evidence is so compelling and internally consistent and interlocking, that the order and the seasons of the Rhodian months, and their attending religious festivals, should now be settled beyond any reasonable doubt.

They are also consistent with evidence of the seasons of the months on the Antikythera Mechanism if one equates Rhodian Karneios with the Mechanism's Kraneios. Elsewhere I have argued that the Mechanism was an adaption of a prototype originally designed for the Rhodian calendar so that the Metonic Cycle kicked off with a month that fell close to the autumn equinox, but the designer needed to shift this one month earlier to account for the fact that the Korinthian calendar began one month earlier with

Phoinikaios, and that this accounts for the one-month offset shift on the Games Dial.²⁵⁸

IV. Thoughts on the Summer and Winter Semesters at Kos and Rhodes

One difficult issue of both the Koan and Rhodian calendars is the question concerning the conflicting evidence of the winter and summer semesters, which is important as it impacts arguments about the term of the *monarchos* on Kos, the priest of Helios at Rhodes, and the term of the winter and summer *boula* at both cities. Since the Koan evidence is much stronger, it is best to start there.

A. The Koan Semester System

We already saw (Section III.B) that lines 40-42 of Segre 1993, ED 145 (= *IG XII.4,1* 298) indicate that the gymnasiarch was to make sacrifices during the winter semester in Theudaisios, Kaphisios and Gerastios, and in the summer semester in the months Agrianios, Panamos, and Alseios. Lines 10-12 of *IG XII.4,1* 315 confirm that Theudaisios was in the winter semester, and line 30 of *IG XII.4,1* 320 confirms a second time that Hyakinthios was in the summer semester. It is apparently for this reason that Segre²⁵⁹ expressed the opinion that the semester-system of the Koan calendar was:

χειμερινὰ ἑξάμηνος	θερινὰ ἑξάμηνος
1. Καρνεῖος	7. Ἀρταμίτιος
2. Θευδαΐσιος	8. Ἀγριάνιος
3. Πεταγείτνυος	9. Ὑακίνθιος
4. Καφίσιος	10. Πάναμος
5. Βαδρόμιος	11. Δάλιος
6. Γεράστιος	12. Ἀλσεῖος.

Table VII: The Semester System at Kos (after Segre)

Bosnakis and Hallof agreed with Segre's conclusion about the order of the months, but they proposed that the beginnings of the winter and summer semesters should be shifted one month later so that the winter semester began with Theudaisios and ended with Artamitios, while the summer semester began with Agrianios and ended with Karneios.²⁶⁰ They based this conclusion on two inscriptions that indicate that the old *monarchos* who was in office in Alseios was still in office in Karneios. For instance, the first inscription (Bosnakis and Hallof 2005, 220, no. 20 = *SEG LV* 931 = *IG XII.4,1* 315) concerns the sale of the priesthood of Homonoia. It indicates that the *monarchos* Aristoboulos was in office in Alseios when the first payment was due (line 27 = τὰν μὲν πράταν ἔμηνη Ἀλσεΐωι τῶι ἐπὶ Ἀριστοβούλου), he was still in office when the treasurers were to use 1/10 of this money to buy silver plates and give an accounting of it by 10 Karneios (lines 38-39 = ποιησάσθω τὸν ἀπολογισμὸν ἔσχατον τοῦ Καρνείου μηνὸς | τοῦ ἐπὶ Ἀριστοβούλου τῶι δεκάται), then the second and third payments were due in Gerastios and Alseios during the tenure of the *monarchos* after Aristoboulos (lines 27-30 = τὰν δὲ | δευτέραν ἔμμηνη

²⁵⁸ Iversen 2017, 184 ff. On this idea, also see Jones 2020, section 7.

²⁵⁹ Segre 1944-1945, 170.

²⁶⁰ Bosnakis and Hallof 2005, 233-240.

Γεραστίω τῶι μετὰ μόναρχον Ἀριστόβουλον ὅς | κα γένηται πρᾶτος, τὰν δὲ τρίταν ἔμ μηνὶ Ἀλσειῶι τῶι ἐπὶ τοῦ αὐτοῦ | μονάρχου).

Likewise a second inscription involving the sale of the priesthood of Dionysos Thylophoros indicates that the monarch Charmidas was in office on 1 Alseios (line 1 = ἐπὶ μονάρχου Χαρμίδα, μηνὸς Ἀλσειῶι νεμνην[ιαί]), and he was still in office in Karneios when the first payment was due (lines 9-10 = τὰν μ[έν] | [πρά]ταν ἔμ μηνὶ Καρνεῶι τῶι ἐπὶ Χαρμίδα), but his successor was in office when the second payment was due in Gerastios (lines 10-11 = τὰν δὲ δευ[τέρου] ἔμ μηνὶ Γεραστίω τῶι μετὰ μόναρχον Χαρμίδα[ν]) and also when the third payment was due in the following Alseios (= [τὰν δε]τρίταν ἔμ μηνὶ Ἀλσειῶι ἐπὶ τοῦ αὐτοῦ μονάρχου[ν]). Bosnakis and Hallof then conjectured that it was not plausible for the term of the monarch's office not to be coterminous with the semester system, and since it was clear the term of the *monarchos* continued into Karneios, consequently they moved the start of the winter semester one month later to begin in Theudaisios.²⁶¹

Support for placing the beginning of the monarch's term in Theudaisios can be found on a manumission text from Kalymna first published by Newton (*JHS* 11, 1881, 362-364 = *SIG*³ 1210 = Segre 1944-45, 199, no. 196), which has the following dating formula:

- 1 ἐπὶ στεφανηφόρου Κλευ-
φῶντος τοῦ Φιλωνίδα,
μηνὸς Θευδαισίου αἰ', Μο-
ναρχίσις· Νείκη Μενε-
5 κράτου ἀνεκήρυξε τὴν
ἰδίαν θρεπτὴν Ἡδονή[ν]
ἐλευθέραν, κτλ.

Here, as Newton noted, Hedone was set free on Theudaisios 11 during a festival called the *Monarchia*. Since it is more likely that a festival with this name would be held in the first several days after the new *monarchos* had entered office, rather than in the following month, it seems likely that the term of the *monarchos* indeed began in Theudaisios, as Bosnakis and Hallof supposed. On the other hand, having the winter semester also start in Theudaisios is unsatisfactory for in going six months forward it would place the start of the warm season as late as Agrianios – the month, as we saw in Section III.C.2, at Rhodes that was normally coincident with Athenian Thargelion (May/June). In addition, as John D. Morgan has pointed out to me, there is at least one, and possibly up to three, different inscriptions that appear to contradict this view.

The first is an inscription, or really a series of inscriptions, which is not cited by Bosnakis and Hallof, that show in one year the switch in *monarchos* may have happened sometime before Karneios 20, and thus was not coterminous with Theudaisios. This evidence comes from Kalymna in a series of inscriptions recording manumissions published by Segre (1944-45, 186-188, nos. 167-172). Segre thought, the series began with his number 167 and continued *seriatim* to his number 172.²⁶² According to his readings, they show that the *monarchos* Flavius Claudianus may have been in office by 20 Karneios

²⁶¹ Bosnakis and Hallof 2005, 238.

²⁶² Segre 1944-45, 170-171. Segre noted that no. 167 is the only inscription in the series where Clodianus' *gentilicium*, Flavius, is given, which he took to indicate that this is the first in this series.

(no. 167, line 1 = ἐπὶ μο(νάρχου) Φλαουίου Κλωδιανοῦ, μηνὸς Κ[αρνείου] κ'),²⁶³ he was still in office on Petageitnyos 10,²⁶⁴ still in office on Tiberios 7,²⁶⁵ which month Segre (pp. 170-171) argues supplanted Γεράστιος, still in office on the first day, known as “Sebaste”, in the month of Kaisar,²⁶⁶ which month Segre argues supplanted Ἀρταμίτιος, still in office on Dalios 20,²⁶⁷ and finally still in office on Alseios 3.²⁶⁸ Although this evidence probably is datable to the Flavian period (c. 70-96 AD), as suggested by Clodianus' *gentilicium*,²⁶⁹ or somewhat later, there is no reason why it should be assumed the year of the monarch or semester system had changed. I have been informed, however, that Bosnakis and Hallof are re-editing these texts and now have a reading of the month in no. 167 that significantly differs from Segre's. They also have some *inedita*, so this evidence must be set aside.

The second and more serious obstacle is Segre 1993, ED 180, lines 28-30 (= IG XII.4,1 320), where the *prostatai* of the summer semester are said to be in place by the *noumenia* of Artamitios (τοὶ χειρίζοντες τὰ τοῦ Ἡρακλεῦ[ς] | τοῦ Καλλινίκου χρήματα διαγραφόντω τοῖς προστάταις | ἐξ θυσίαν, τοῖς μὲν τὰν θερινὰν ἄρχουσιν Ἀρταμιτίου νο|μηνία). Bosnakis and Hallof suggest that the term of these had not yet started, they were only given the money for a sacrifice that they could then use a month later in Agrianios when their term did begin. Although in the next paragraph we will see that the summer *archontes* did apparently offer sacrifices a few days before the start of the term, it is not likely the *prostatai* would have waited a full month before their term started.

The third piece of contradictory evidence involves an inscription (Segre 1993, ED 63 = IG XII.4,1 325) that strongly implies the switch of winter officers and summer officers happened between the 24th and 27th of Gerastios, or shortly thereafter:

Face A 1 [- - - - -] μένωι Α[- - - -] ΠΑ..[- - - - -]
 [- - - - -] Δ[.] ΣΙΑΜ ἱερεῖα τὰ νομιζόμεν[α]
 [.] ΑΙ//ΚΛΕ[.] Ε[.] ΟΝ τοὶ μὲν τὰν χειμεριν[άν]
 ἄρχοντες Γεραστίου · κζ' · τοὶ δὲ τὰν θερι-
 νὰν ἄρχον[τ]ες [τ] ἄ[ι] κδ', τῶν δὲ ἄλλων ὁ χρή-
 ζων ἐπεὶ κα δηλήται, ὧν ὁσιόν ἐστιν θύεν
 5 ταῖς θεαῖς· θυόντωι δὲ καὶ τοὶ ἐργολαβεῦν-
 τες τὸ ἱερόν ἢ δαμόσιον ἔργον καθ' ἕκασ-
 τον ἐνια[υτόν] ἄ[π]α[ξ]...

In view of the phrase “the customary victims” in line 2 and the clear references to sacrifices in lines 6 and 7, it seems difficult to interpret this inscription as prescribing anything other than that in this year the winter officials were to make sacrifices on the 24th

²⁶³ Segre says of this supplement “*Κ in ectypo discernere mihi videor, et Κ[αρνείου] restituo, quamquam id brevius est quam ut lacuna impleat; hic enim mensis apud Coos mensem Πεταγεῖτννον praecedit, quo titulus sequens incisus est.*” Bosnakis and Hallof are re-editing this text (see below).

²⁶⁴ Segre 1944-45, 187, no. 168, line 1 (= ἐπὶ μο(νάρχου) Κλωδιανοῦ, μηνὸς Πεταγεῖτννίου ι').

²⁶⁵ Segre 1944-45, 187, no. 169, line 1 (= ἐπὶ μο(νάρχου) Κλωδιανοῦ, μηνὸς Τιβερίου ζ').

²⁶⁶ Segre 1944-45, 187, no. 170, line 1 (= ἐπὶ μο(νάρχου) Κλωδιανοῦ, μηνὸς Καίσαρος Σεβ(αστή)).

²⁶⁷ Segre 1944-45, 188, no. 171, line 1 (= ἐπὶ μο(νάρχου) Κλωδιανοῦ, μηνὸς Δαλίου κ').

²⁶⁸ Segre 1944-45, 188, no. 172, lines 1-2 (= ἐπὶ μο(νάρχου) Κλωδιανοῦ, | μηνὸς Ἀλσειῶ γ').

²⁶⁹ Flavian Clodianus' *columella* is preserved (Segre EF 79). He also appears on IG XII.4,2 1120 = ED 66, where he is a contemporary of a Tiberius Claudius Neikagoras, as well as Baebius Demetrius, a Coan *monarchos* (*Tituli Calymnii* 197) and Asiarch (Segre EF 771).

of Gerastios (Γεραστίου · κζ' = 24th),²⁷⁰ while the summer officials were to make sacrifices on the 27th of this same month. This implies that in this year, the switch between the winter and summer semesters happened at the end of Gerastios or shortly thereafter, and by symmetry this means that the winter semester began six months earlier near the end of Alseios or within Karneios. Bosnakis and Hallof, in the *apparatus criticus* to line 5 of *IG XII.4,1 325* explain this seemingly contradictory evidence by stating that “*It is obvious the word Ἀλσειού has dropped out*” (*Ἀλσειού nomen exidisse patet*). Another explanation that requires no assumption of a mistake would be, as J.-M. Carbon has suggested to me and which seems to me most probable, is that the *archontes* of the summer semester had already been elected, as one would expect, by the end of Gerastios and they were expected to make a sacrifice in anticipation of entering their office only a few days later on 1 Artamitios. This would be consistent with *IG XII.4,1 320*, where, as we saw above, the *prostatai* of the summer semester are said to be in place and were to make a sacrifice on the *noumenia* of Artamitios. This would mean that Segre was right after all, that is to say the winter semester at Kos did begin with 1 Karneios and the summer semester began with 1 Artamitios. It would also mean the office of *monarchos* was not coterminous with the semester system and in fact, we now know the same is true at Rhodes, where the eponymous priest of Helios' term was not coterminous with the semester system (see IV.B and Section V.A).

B. The Rhodian Semester System

As for the division between winter and summer semesters at Rhodes, we are lacking direct evidence (except as noted in Section III.C that Petageitynos and Badromios fell in the winter semester and Dalios in the summer semester), but based on the comparative material from Kos we would expect it to be:

χειμερινὰ ἑξάμηνος	θερινὰ ἑξάμηνος
1. Καρνείος	7. Ἀρταμίτιος
2. Θευδαίσιος	8. Ἀγριάνιος
3. Πεταγείτνυος	9. Ὑακίνθιος
4. Διόσθυος	10. Πάναμος
5. Βαδρόμιος	11. Δάλιος
6. Σμίνθιος	12. Θεσμοφόριος

Table VIII: The Semester System at Rhodes

C. The Two Calendar-Years of Kos and Rhodes

From the above discussion it is clear that both Kos and Rhodes had two calendar-years in operation, an Eponymous Calendar-Year and a Bouleutic Calendar-Year, the latter which followed the semester system. This is not unprecedented, as we know that Athens had two or even three calendar-years in operation, the Prytany Calendar-Year, the Archon's Calendar-Year, and when the latter differed from the lunar calendar, they also had a third calendar, the Lunar Calendar-Year. **Table IX** gives a summary of these two calendar-years at Kos and Rhodes:

²⁷⁰ κζ' = ἑβδόμησι ἀπιόντος (= 24th) and κδ' = τετράδι ἀπιόντος (= 27th). For the backward count of dates from 30 at Kos and Rhodes, see above Section III.A.

	Kos and Kalymna		Rhodes		Julian*
	Eponymous	Bouleutic	Eponymous	Bouleutic	
Χειμερινὰ ἑξάμηνος	XII	(1) Καρνεῖος	III	(1) Καρνεῖος	Oct./Nov.
	I	(2) Θευδαΐσιος	IV	(2) Θευδαΐσιος	Nov./Dec.
	II	(3) Πεταγεῖτνος	V	(3) Πεδαγεῖτνος	Dec./Jan.
	III	(4) Διόσθιος	VI	(4) Καφίσιος	Jan./Feb.
	IV	(5) Βατρόμιος	VII	(5) Βαδρόμιος	Feb./Mar.
	V	(6) Γεράστιος	VIII	(6) Σμίνθιος	Mar./Apr.
θερινὰ ἑξάμηνος	VI	(7) Ἀρταμίτιος	IX	(7) Ἀρταμίτιος	Apr./May
	VII	(8) Ἀγριάνιος	X	(8) Ἀγριάνιος	May/June
	VIII	(9) Ὑακίνθιος	XI	(9) Ὑακίνθιος	June/July
	IX	(10) Πάναμος	XII	(10) Πάναμος	July/Aug.
	X	(11) Δάλιος	I	(11) Δάλιος	Aug./Sept.
	XI	(12) Θεσμοφόριος	II	(12) Ἀλσεῖος	Sept./Oct.

Roman Numerals = Order of the Eponymous Calendar-Year

Arabic Numerals = Order of the Bouleutic Calendar-Year

*Note that sometimes a Greek month started in the last several days of the month preceding the earlier of a pair of Julian months.

Table IX: The Two Calendar-Years of Kos and Rhodes

V. The Intercalary month Πάναμος δεύτερος and the *Dipnanamia* at Rhodes

A. The Position of the Intercalary Month Πάναμος δεύτερος

Of all the months of the Rhodian calendar, or perhaps of all Greek calendars, none has given rise to more peculiar theories than the month of Πάναμος δεύτερος (= B' for convenience's sake) at Rhodes. One aspect of this started when *IG XII.1 4* (= Badoud 2015, 361, no. 18) was discovered, the fragmentary calendar discussed extensively above (Section III.C.1) that lists an entire year of the Rhodian calendar with Πάναμος Α' in the 10th position and the intercalary month Πάναμος Β' in the 13th position. As a result of this placement, Paton championed the unorthodox idea that at Rhodes, the intercalary month Πάναμος Β' was inserted not directly after its homonymous month, as is the case in all other firmly attested intercalations in other Greek and Babylonian calendars, but at the end of the year.²⁷¹ Börker modified this idea and instead argued that originally Πάναμος δεύτερος was inserted directly after Πάναμος, then for a time between Πεδαγεῖτνος and Διόσθιος, and finally after Θεσμοφόριος.²⁷² These anomalous theories should now be conclusively discarded with the publication of Zimmer and Baïrami 2008, 159, no. E2611 (= Badoud 2015, 409, no. 37), which shows that Nikasikrates served as priest of Helios for five months of the summer semester, and Aristagoras served as priest of Helios for two months of the summer semester. Lines 5 and 6 of this same inscription, on the other hand, show that Zenon served as priest for four months of the summer semester, while Hestiodoros served for two months of the summer semester. There are other examples that show one priest

²⁷¹ Paton and Hicks 1891, 328-329.

²⁷² Börker 1978, 213-216.

serving for 4 or 5 months of the summer semester and another priest serving for two,²⁷³ or of two priests serving in the same semester.²⁷⁴ *IG XII.1 53* attests an ἐπτάμηνος of the *boula* presumably in an intercalary year.²⁷⁵ *SIG³ 644b*, which is dated *c.* 172 BC, also shows the priesthood of Damokles started by Dalios, but the switch of Prytaneis happened sometime between Dalios and Badromios (at the start of the winter semester, probably on 1 Karneios).²⁷⁶

As Zimmer and Baïrami point out, the obvious reason why Nikasikrates served for five months instead of four, is because an intercalary month had been inserted during his tenure at some point in the middle of the summer semester, rather than at the end.²⁷⁷ We have seen in the discussion of the winter and summer semesters above (Section IV.A-B), that the summer semester at Rhodes likely began around Artamitios, so, as Badoud points out, the five months of Nikasikrates are almost certainly Artamitios-Agrianios-Hyakinthios-Panamos-Panamos B, and the two months of Aristagoras almost certainly were Dalios-Thesmophorios, which means that Πάναμος Β' was inserted directly after Πάναμος Α', as one would expect.²⁷⁸ It also means, as Badoud notes, the term of the priest of Helios was not coterminous with the Bouleutic Calendar-Year, which was based on the semester system, but that it terminated at the end of the 10th month, Πάναμος Α', in an ordinary year, and if it was an intercalary year, at the end of Πάναμος Β'.²⁷⁹

This is confirmed by Peek 1969, 10, no. 4 (= Badoud 2015, 397, no. 30), which shows that the priest of Helios, [Ἀρχι]βίος (whose priesthood is dated *c.* 120-115 BC), served 5 months of the summer ἑξάμηνος or ἐπτάμηνος and another priest presumably served 2 months (with line divisions given *exempli gratia*):

[ἀ βουλά ἀ βουλεύσσα τὰν θερινὰν ἑξά/ἐπτά-μηνον τὰν]
[ἐπ' ἱερέως Ἀρχι]βίου μῆνας πέντε [καὶ ἐπ' ἱερέως - - - - -]
[μῆνας δύο - -].

That Ἀρχίβιος' year was intercalary is demonstrated by an amphora stamp.²⁸⁰

As for the placement of Πάναμος Β' as the 13th month on *IG XII.1 4*, one possible explanation is that when the inscriber laid out the intercalary year of 383 or 384 days into 4 columns of approximately 96 days each, when he finished with Πάναμος Α'—and here it should be emphasized that at *IG XII.1 4*, col. II, line 47 the minuscule text should read not Π(άναμος) Α'ά' (as in *IG*) or Π(άναμος) α' (per Badoud), but Πα(νάμου) α'²⁸¹—he ignored

²⁷³ Konstantinopoulos 1963, 1, no. 1, lines 15-19 (= Badoud 2015, 410, no. 38) seems to be another example of one priest serving 4 months of the summer semester and the other priest serving 2 months. Badoud 2015, 397, no. 30 seems to be an example of one priest serving 5 months and another priest 2 months.

²⁷⁴ Maiuri 1925, 32, no. 20 = Badoud 2015, 397, no. 31. From the photograph in Badoud, I now read in lines 1-2 ἀ [βου]λά ἀ β[ο]υλεύ[υ]σσα τὰ[ν] θερινὰν / ἑξαμηνόν (Badoud reads [ἀ βου]λά [ἀ βο]υλεύ[υ]σσα τὰ[ν] / ἑξαμηνόν). Note that apart from reading more letters in the photo, there is adequate room to restore θερινὰν at the end of the line.

²⁷⁵ Μοσχίωνα Ἐκάτωνος | τὸν Βράσιον, πρύτανιν | ἀ βουλά ἀ βουλεύουσα | τὰν ἐνεστακυῖαν ἐπτά|μηνον εὐνοίας ἔνεκεν θεοῖς.

²⁷⁶ Hiller von Gaertringen 1931, 745.

²⁷⁷ Zimmer and Baïrami 2008, 161.

²⁷⁸ Badoud 2015, 19-21.

²⁷⁹ Badoud 2015, 17-18.

²⁸⁰ Badoud 2015, 146, no. 13.

²⁸¹ The Α of Πα(νάμου) is smaller and within and underneath the Π like a monogram (similar monograms are used to express all the other preserved names of months), while the intercalary month is abbreviated

his copy and from habit moved right on to Δάλιος and then only realized his mistake later when it was too late, and because at this point the full and hollow months were out of sequence so that he could not easily fix the mistake through erasure and reinscribing, he simply inserted Πάναμος Β' at the end, which every Rhodian would have understood took place directly after Πάναμος Α'.

B. The Dipanamia Festival at Rhodes and Kos and the Intercalary Month

The other odd theory concerning Rhodian Πάναμος Β' concerns the festival of the Διπανάμια, which were obviously associated with the month of Panamos. This festival is attested only on inscriptions at both Rhodes and Kos,²⁸² so the etymology of the word, and thus the nature of the festival, is unknown and has been the subject of much speculation. Bergk long ago proposed the Δι referred to a cult of Zeus Panamos in the same manner that the Δι in the Διπόλεια at Athens referred to a cult of Zeus Polieus,²⁸³ but Dittenberger objected, by noting that while the month Panamos is widely found throughout the Greek world, the epithet Zeus Panamos is nowhere else attested.²⁸⁴ He, therefore, theorized that the Δι of Διπανάμια meant “double” and that these celebrations took place only in the intercalated month Πάναμος Β' –a situation that as far as I know would be unique in the Greek world. He hesitated, however, to state at what intervals these were celebrated (and thus at what interval the intercalations took place) because he felt the drawing of the inscription by Ross (1845, fasc. III, 28, no. 277) that had the principal evidence in his day for the interval of these games was too poor, so he expressed the hope that one day this inscription would be republished with a better text. Eventually it was found and republished by Hiller von Gaertringen (1894, 16-17 = *IG* XII.1 730; *SIG*³ 724; Pugliese Carratelli, 1952-1954, p. 259, no. 5b; Badoud 2015, 316, no. 6 = **Table XI** below), who enthusiastically accepted Dittenberger's explanation that the Dipanamia were a festival celebrated in the intercalated month of Πάναμος Β', even though on this inscription it happened that the Dipanamia were clearly normally pentaeteric and one time it appeared that these were celebrated in back-to-back years.

When Dittenberger republished this inscription in 1900 as number 609 in the second edition of his monumental *Sylloge Inscriptionum Graecarum* (= *SIG*²) and saw the Dipanamia were celebrated in back-to-back years (during the tenure of priests 19 and 20 of this inscription), he suppressed the first celebration under priest 19 in the list because, as he sensibly stated in the *apparatus criticus*, “*Permissus sane intercalandi cyclus, cui neque cum sole neque cum luna convenire poterat. Quod v. 19 idem vocabulum nomini τριετηρίς adiungitur, id utique, si modo ulla ei cum intercalandi ratione necessitudo intercedit, ad errorem referendum est.*”

ΠΒ, with the Β fused with the Π. In addition, there are no examples on stone where the Rhodians ever referred to Πάναμος as either Πάναμος πρώτος or Πάναμος Α', and while there are about 100 amphorae stamped Πανάμου δευτέρου, a search of the CEAlex website <<http://www.amphoralex.org>> last accessed 08/07/2021 indicates there are at least 14 examples stamped Πάναμος Β'. This is important because if the letter-cutter had inscribed Π(ανάμου) Α' α' –that is to say if he meant Πανάμου (πρώτου) α'– it would indicate that the idea of an intercalary year was on his mind, and it would make it much less likely that he would have made the mistake of moving directly from Πάναμος to Δάλιος.

²⁸² The only other place where the (Di) Panamia are attested are on Kos (*IG* XII.4,1 337, line 28) and in Boiotia at Darmezin 1999, 88, no. 123, lines 22-23 and 104, no. 139, lines 11-12.

²⁸³ Bergk 1845, 67-68.

²⁸⁴ Dittenberger 1887, IX-X.

Nam in nullo cyclo duo ternorum denorum mensium anni se excipere possunt". And then when this inscription was published a second time by Dittenberger as number 724 in his posthumous third edition of 1917, which had Hiller as one of the editors, this same note appeared, but Hiller put the back-to-back Dipanamia celebrations back into the text under priests 19 and 20 and inserted the following cavalier note in the commentary: [*At quis novit omnes intercalandi modos qui Graecis placuerunt?*]. Later Hiller further argued that the embolismic months for this festival were intercalated according to an ὀκταετηρίς similar to that described by Geminus (see above, Section I), only based on this inscription he posited the intercalations were in years 1, 2 and 6.²⁸⁵ Undeterred by this clearly absurd system of intercalation every four years and occasionally back-to-back, he justified this view with the weak argument that this was before the Julian calendar reforms, so everything was left up to the chronographic and astronomical specialists who did not follow the normal rules for intercalary months. This may prompt us to ask, to quote from Hiller himself, "*Did Hipparchos, Poseidonios and lesser stars live among the Rhodians in vain?*"²⁸⁶. Surely, the likely answer to this question is "no".

In any case, later another inscription came to light (Pugliese Carratelli, 1952-1954, 256, no. 5) that once again showed mostly pentaeteric Dipanamia along with two other back-to-back celebrations, and based upon this newer evidence Badoud²⁸⁷, as noted above, has resuscitated Hiller's idea that the intercalations were based upon the ὀκταετηρίς, only he argues that one set of Dipanamia were every four years (1:4), and the other set every eight years (1:8), with the intercalations in years 1, 4 and 5. He also argues this was for political reasons (i.e. equality's sake) due to the "règle Triennale" of Rhodes that stipulated that the homonymous priest of Helios rotated among the three major cities of Ialysos, Kameiros and Lindos. According to his argument, no intercalation interval was divisible by 3 so that in a period of 24 years (three ὀκταετηρίδες), each of the three major cities would each have an eponymous official with three intercalary years of 13 months, two of these intercalary years at the Dipanamia on the 1:4 cycle, and one on the 1:8 cycle. Even if one accepts the premises the Dipanamia were only celebrated in the intercalary month of Panamos (a unique festival in the Greek world), and that they were celebrated on 1:4 cycle and 1:8 cycle (which would produce a unique intercalation cycle), and that the intercalations were arranged so that in three ὀκταετηρίδες each of the three major cities would each have three eponymous officials with an intercalary year of 13 months, even so were one to arrange the intercalations in years 3-5-8 (per Geminus), or 1-3-6, that is at other more acceptable evenly-spaced-out interval (per Geminus), each city would still have supplied three eponymous officials for the intercalary months after three ὀκταετηρίδες. Or if one really wanted each of the three cities to have 1 intercalary year per ὀκταετηρίς and did not care if there were more than two years between one intercalation, one could even intercalate in years 2, 4 and 6, which would be a big improvement over years 1, 4, and 5 (but this would not be ideal as it would still require a three-year interval between year 6 of one ὀκταετηρίς and year 2 of the next). Furthermore, if one were to do the same with the Metonic Cycle of 19 years and intercalated in years 1, 3, 6, 9, 11, 14 and 17 (per the Antikythera Mechanism), after three such cycles, each city would have supplied seven

²⁸⁵ Hiller 1929, 354.

²⁸⁶ Hiller 1929, 354.

²⁸⁷ Badoud 2015, 138-140.

eponymous officials with an intercalary year. In other words, had the Rhodians really been motivated to choose their intercalation scheme by *équité* –a proposition for which there is absolutely no evidence– they could have just as easily achieved this using a more rational system of intercalation with the long-since discarded ὀκταετηρίς or the even more rational ἔννεακαιδεκαετηρίς, which was discovered before Rhodes even underwent its synoikism. The result is that the foundation of intercalations upon which Badoud has built his arrangement of the priests of Helios coupled with the evidence on amphora stamps is also on extremely shaky ground.²⁸⁸

Fortunately, there is other evidence that does not require these unique and unlikely theories. For instance, Schwyzer argued that the month name Πάν̄αμος is derived from πανῆμαρ (πᾶν + ἡμαρ, ἡματος) and means “*den ganzen Tag*”, because it is in this month the sun first shines “*all the day long*”.²⁸⁹ Trümpy²⁹⁰ further argued this etymology is justified by Greek phonetic rules, as the final -μος is a shortening from -μ(ατ)ος like other compounds that have neuters in the second element of the type -μα, -ματος, for example ἀν-ώνυμος from ἀν-ῶνομ(ατ)ος. She then argued, however, that rather than “*den ganzen Tag*”, as Schwyzer suggested, the root means a month “*alle Tage habend*” or a month “*ganze Tage habend*” = “*lange Tage habend*” and further speculates that this month and phonetic change was very old (from the 2nd millennium BC) and that originally this was an intercalary month that had nothing to do with the festival calendar but was merely inserted whenever it was needed to balance out the lunar and solar years. Eventually, with the passage of time, it emerged as a regular month that fell in the summer, although one still prone to be an intercalary month. Surely, Schwyzer’s “*all the day long*” is to be preferred, not the least because Trümpy’s interpretation requires a unique type of intercalary month, as well as a unique derivation for a month name that refers to itself (“a month having long days”) rather than referring to some god, hero, place, event, or other aspect of a festival within the month. In addition, as John D. Morgan has pointed out to me, an all-day festival, from sunrise to sunset, has a well-attested counterpart, the all-night festival, or Παννυχίς, from sunset to sunrise.

If Schwyzer is correct, there are two explanations that could explain the month name and its associated festivals. The first is that the name refers to a festival that was “all day long” and that ideally occurred in a summer month near the summer solstice, either the month of the summer solstice or the one right after it (the days are longest about 20 days on either side of the solstice). In this case, then, the Δι of Διπανάμια would just be a “*double all-day-long festival*”, that is one that lasted two days in a row, and like any normal festival it would fall in both Πάναμος Α’ and Πάναμος Β’. This theory would also explain why the Dipanamia and the Halieia seem to be closely associated, as they both, so I argue, occurred in the same month of Panamos.

The second possibility is that Παν̄αμ(α)ρ was actually an epithet of Zeus, and so the Δι of Διπανάμια referred to Zeus, as Bergk long ago suggested, in which case the festival would once again fall in both Πάναμος Α’ and Πάναμος Β’. The second theory may perhaps be supported by the cult of Ζεὺς Πανάμαρος, also spelled Πανημέριος (“Zeus of the Live-Long

²⁸⁸ Badoud 2015, 140-152.

²⁸⁹ Schwyzer 1953, 437; 518.

²⁹⁰ Trümpy 1997, 26-29.

Day”), that is widely attested in Caria starting in the 1st century BC, especially at the site of its homonymous city of Panamara, which was not far from Rhodes and Kos (indeed, Panamara was a part of the Rhodian Peraia for a time after 188 BC). This would then answer Dittenberger’s original objection that cult of Zeus Panam(ar)os is nowhere else attested.

The history of the cult of Zeus at Panamara is, however, complicated and controversial. There is no direct literary evidence about the city or cult apart from a glancing reference in Tacitus (3.62) that Stratonikeia, which was in charge of Panamara after 166 BC, was championing a cult of Zeus. Unfortunately, the site with its hilltop sanctuary has never properly been excavated and is suffering some damage.²⁹¹ Consequently, we are completely reliant upon the epigraphical evidence, the earliest of which shows that by the end of the third century BC there was a *koionon* of the Panamareis that administered the sanctuary,²⁹² but at this time the dedications were to Zeus Karios, not to Zeus Panamaros. Later, starting in the first century BC, the inscriptions indicate the cult was in honor of Zeus Panamaros/Panemerios.

There are three views on this evidence. The first is that that cult name was a much older Karian epithet that theophorically gave rise to the site name at some point in the deep past²⁹³ and the epithet Karios was a later effort at Hellenization or political consolidation. Something akin to this view is proposed by Laumonier, who suggests the theophoric name Παναμύας²⁹⁴ –attested at Halikarnassos²⁹⁵ and one time at both Mylasa²⁹⁶ and Amyzon in Karia,²⁹⁷ but also at Kos,²⁹⁸ Samos,²⁹⁹ Priene,³⁰⁰ and Termessos³⁰¹ – is Karian and he explicitly suggests the cult of Zeus Panamaros was Karian but had some connection with the month of Panamos and the Dipanamia on Rhodes.³⁰² This idea, however, does not explain the presence of Πάναμος in the Dorian calendars of the Peloponnesos, Northwest Greece and Sicily, or in the Boiotian, Thessalian and Macedonian calendars, which surely indicate this month existed in many Greek calendars already in the archaic period and probably much earlier. Moreover, it is illogical to argue that Πανάμαρος, the epithet of Zeus which is first attested in the Roman period, was actually a much older epithet than Κάριος, which is repeatedly attested in the Hellenistic period.

The second view is that the site name later gave rise to the epithet Panamaros in the first century BC as well as the Panamareia festival, hence no connection to the month

²⁹¹ See Williamson 2009.

²⁹² *IStratonikeia*, no. 3, which dates to 201 BC.

²⁹³ Kretschmer 1896, 305; Schäfer 1912, 417-418; Oppermann 1924, 84-86.

²⁹⁴ The forms Παναμύαυ and Παναμύας are attested at Aspendos in Pamphylia (*SEG* XII 490 and *SEG* XLI 1309). Παναμύας is also attested one time at Pancion d’el-Kanaïs in Egypt (Bernand 1972, no. 41).

²⁹⁵ Meiggs and Lewis 1969, 69, no. 32, line 12 and *SEG* IV 191, line 3 (= Παναμύας Κασβώλλιος); *SIG*³ 46, line 11;

²⁹⁶ *IMylasa*, no. 12, line 10.

²⁹⁷ *SEG* XXXV 1080, line 4 (Παναμύας Υσσώλου) and lines 5-6 (Παος Παναμύω)

²⁹⁸ At Kos, a Παναμύας Μαιδάτα (*IG* XII.4,1 75, face B, line 147 and *IG* XII.4,2 456, line 27), a Παναμύας Θευδότου (*IG* XII.4,1 304, line 47) and his son Θευδοτος Παναμύα (*IG* XII.4,2 454, face B, lines 145-146 and *IG* XII.4,2 456, lines 30-31) are attested.

²⁹⁹ *IG* XII.6,2 658.

³⁰⁰ *IPriene* 51, no. 47, line 30.

³⁰¹ *TAM* III,1 8, lines 1-2.

³⁰² Laumonier 1958, 221-222, n. 3.

Panamos or the Dipanamia festival, which seems much more likely in light of the usual Greek practice of applying to a god an epithet formed from the name of a city or some other geographical feature (*e.g.*, Ζεὺς Νεμεῖος, Ἥρα Ἀργεῖα, Ποσειδῶν Γεραῖστιος, Ἀπόλλων Δῆλιος, Ἄρτεμις Βραυρωνία, Ἀθηνᾶ Κυνηθία on Delos, Ἀθανᾶ Λινδία on Rhodes).³⁰³

More recently I.-J. Adiego has proffered a third explanation by placing Panamaros among the locally derived toponyms which, he argues, derives from Lykian *mere/maraza* (“law”/“judge”).³⁰⁴

Of all these choices, it seems mostly likely the month name is of Greek origin and simply means “all day long”, which accounts for its widespread use in many Greek calendars without any reference to a specific deity. It also explains the Δι- of Διπανάμια.

VI. The Years of the Rhodian Festivals

From various inscriptions, especially from *IG XII.1 730* (= Pugliese Carratelli, 1952-1954, 259, no. 5b = Badoud 2015, 316, no. 6 = **Table XI** below), a list of the priests of Apollo Erethimios at Ialysos, and Pugliese Carratelli 1952-1954, 256, no. 5 (= Badoud 2015, 311, no. 2 = **Table XI** below), a list of *p[rophetai]* at Rhodos town, we are informed of a series of yearly officials and the games celebrated during their tenure during the first century BC. Recently Badoud has revisited these, but as noted above (Section II.A) his years for at least some of the games are off because he misunderstood the evidence for the year of the Halieia, which is the key to determining the years of the other games. I believe he also errs in placing the Halieia in the month of Dalios instead of Panamos, which, because there was a switch to the new priest of Helios and many other officials after Panamos, also affects some of his arguments about the terms of other offices.

For instance, as Badoud recognizes, *Lindos II 419*, which dates to AD 22/3, strongly implies that the terms of the priest of Helios, Pleistarchos, and that of Athena Lindia, Aristeidias (ἐπ’ ἱερέως τᾶς Ἀθάνας Ἀριστείδα, τοῦ δὲ Ἄλιου Πλε[ι]στάρχου, Πα(νάμου) ις’) along with the *epistates* and *mastroi* at Lindos were the same, thus running from Dalios (the 11th month of the Bouleutic Calendar-Year) to Panamos (the 10th month of the Bouleutic Calendar-Year).³⁰⁵ This is particularly evident at lines 18 and 19 of this inscription, where it states the next priest of Athena Lindia, Kallistratos, and of the next priest of Halios, Rhodopeithes, along with the terms of the *epistatai* and *mastroi* at Lindos were the same: [ὄμ]οίως δὲ καὶ τοὶ ἐπιστάτοι τοὶ ἄρχοντες | [τ]ὸν ἐπ’ ἱερέως Καλλ[ιστρ]άτου καὶ Ῥοδοπέιθευ ἐνιαυ[τόν]. The use of the phrase ἐπ’ ἱερέως Καλλ[ιστρ]άτου καὶ Ῥοδοπέιθευ (“in the priesthood [singular] of Kallistratos and Rhodopeithes”) in the attributive position before the noun ἐνιαυ[τόν] is particularly striking and indicates that the terms of these two priests, as well as that of the Lindian *epistatoi*, were in a sense considered a single, coterminous priesthood. That Kallistratos and Rhodopeithes, along with the Lindian *epistatoi*, had coterminous terms is confirmed by lines 2-4 of *IG XII.1 762*, which should undoubtedly be dated late in the year AD 22 or probably more likely to the early winter of AD 23,³⁰⁶ and be restored: περὶ χορα(γῶ)ν [ἐπ’ ἱερέως τᾶς] | [μὲν Ἀθάνας Καλλι]στράτου, τοῦ δὲ Ἄλιου Ῥοδο|πε[ί]θευ,

³⁰³ Hanslik-Andrée 1949, 450-451; Debord 2001, 31-35.

³⁰⁴ Adiego 2007, 335, n. 2.8.

³⁰⁵ Badoud 2015, 21; 127.

³⁰⁶ In AD 22/3 there were new moons on December 12 and January 10. The 11th of Diosthyos should therefore have fallen around 23 December AD 22, or 21 January, AD 23.

⟨Δ⟩ιοσ[θύ]ου ένδεκάτῃ. The same picture emerges with almost all the other priesthoods, which on numerous inscriptions are listed as being coterminous with the priest of Helios. For instance, *Lindos* II 134 (dating *c.* 215 BC) lists the priest of Helios at the top followed by the priests of Athena Lindia and Zeus Polieus, Poseidon Hippios, Apollo Pythios, Aphrodite, the Muses, Dionysos, Asklepios, Herakles, the Dioskouroi, the Samothracian Gods, and Sarapis. Or Segre 1949-1951, 242, no. 111 (dating *c.* 189 BC) has the dating formula [ἐπ' ἱερέ]ως τοῦ Ἄλιου Ζενοφάνευσ | [τοῦ Ἰέρω]νος καὶ δαμιουργοῦ Μελα|[νώ]που, Ἄρταμι]τίου δεκάται, or *IG XII.3* 1270 (dating *c.* 155 BC,³⁰⁷ from Syme), which reads ἐπ' ἱερέως Σωσικλεῦς καὶ δαμιουργοῦ Κτησία, Πα|νά|μου [δ]ιχομηνία, or *SEG XXV* 853, lines 5-7 (from Telos, dating *c.* 145 BC³⁰⁸) with the dating formula καὶ [π]υθασταὶ πυθάξαντες ἐν[αυσίαν] ἐπ' ἱερέως Τιμοδίκου, | δαμιουργοῦντος Ἀριστοφίλ[ου]. These inscriptions seem to suggest that terms of the priest of Helios and the *damiourgos* at Kameiros, along with all the major priesthoods, were also coterminous (and they extended together at least until the διχομηνία of Πάναμος).

From a few other inscriptions it is also clear that the term of the office of the same *damiourgos* at Kameiros extended through both the Dipanamia and the Halieia.³⁰⁹ Since, as was mentioned above in Section II.A, Badoud places the Dipanamia in Panamos B (at the end of one priest of Helios' term) and the Halieia in Dalios at the beginning of the next priest of Helios' term, from this he is forced to argue that the terms of the local officers like the *damiourgos* at Kameiros or the *epistates* and *mastroi* at Lindos, while generally based on the same eponymous year of the priest of Helios, started a "few days later" (and necessarily after the Halieia were finished) than of the term of the priest of Helios because "without doubt they were obliged to present themselves at Rhodes before entering their office".³¹⁰ Of course from the Scholiasts to Pindar, whose testimony about the Halieia has been able to be confirmed in many ways, we are told the Halieia finished on the 24th of the month (assuming the Scholiast got the 24th day from the lunisolar calendar of Rhodes and imprecisely equated it with the 24th day of Gorpaios in the fixed calendar of Alexandria – a common type of equation between a lunisolar calendar and a fixed calendar such as the Gregorian calendar many still make today, though it is known to be inexact), and so Badoud's "a few days later" would actually have to be almost an entire month. If, on the other hand, the Dipanamia and the Halieia were both in the month of Panamos, there would be no need for these extra few days and the terms of the priest of Helios and the local officials such as the *damiourgos* at Kameiros could still run concurrently. We have some corroboration that the term of the *damiourgos* began on 1 Dalios at Segre and Pugliese Carratelli 1949-1951, 258, no. 152 (= Badoud 2015, 446, no. 67), which indicates that on 1 Dalios the *damiourgos* was to sacrifice a cow to Helios, and by the 20th of Panamos, the *hieropoioi*, whose term of office was likely the same as that of the *damiourgos*, were to sacrifice 3 goats. The most obvious way to interpret this inscription is posit that it temporally follows the eponymous year, with the term of the *damiourgos* beginning on 1 Dalios and continuing to the end of Panamos. If correct, this means that Badoud's arrangement of the Dipanamia

³⁰⁷ For the date, see Badoud 2015, 178, A 56.

³⁰⁸ For the date, see Badoud 2015, 178, A 57. The text in *SEG XXV* 853 has a typographical error (ἐπ' ἱερέως Τιμοδόκου instead of Τιμοδίκου). For corrections to lines 2-4, see also Peek 1969, 19, no. 29.

³⁰⁹ Segre and Pugliese Carratelli 1949-1951, 160, nos. 4b and 4c; 164, no. 4l.

³¹⁰ Badoud 2015, 21; 127.

on the 1:4 cycle and Halieia as falling in the same summer but across the years of two different *damiourgoi* (and other priestly officials) cannot be maintained.

Table X, therefore, which is based on the evidence of (A) *IG XII.1 730* (list of priests of Apollo Erethimios = **Table XI**), (B) Pugliese Carratelli 1952-1954, 256, no. 5 (list of p[rophetai] = **Table XII**), (C) Pugliese-Carratelli, 1952-1954, 252, no. 3 (list of officials), (D) Pugliese-Carratelli, 1952-1954, 259, no. 5a (list of officials), (E) Segre and Pugliese Carratelli 1949-1951, 159-164, nos. 4b/4c (list of *damiourgoi*), (F) Segre and Pugliese Carratelli 1949-1951, 164, no. 4l (a *damiourgos*), and (G) *Lindos II 490* = Badoud 2015, 441, no. 64, provides a corrected version of the years of the Rhodian festivals. Note that these inscriptions are chosen because it is clear they reference the pentaeteric Great Halieia. I should also note here, that it is clear that later there is a change in some of these festivals (see more on this below). Rather than using the Bouleutic Calendar-Year from Karneios to Thesmophorios, I have chosen to use the Eponymous Calendar-Year of the priest of Helios as the baseline Rhodian year, which, as we saw above, ran from 1 Dalios (\approx August) to the end of Panamos A (\approx July), or, in the case of an intercalary year, from Dalios to the end of Panamos B. I also assume that the terms of the priests of Apollo Erethimios of *IG XII.1 730* (= Inscription A) and the p[rophetai] of Pugliese Carratelli 1952-1954, 256, no. 5 (= Inscription B), like the *damiourgos* at Kameiros (= Inscriptions E and F), the priest of Athena Lindia, and the *mastroi* and *epistatai* at Lindos, and apparently the other major priesthoods, had the same term of office. Since the month of Panamos was roughly equivalent to the first month of the Athenian calendar, Hekatombaion, which fell at the end of Olympiad years (the Olympia probably took place in the month normally coincident with the second Athenian month, Metageitnion³¹¹), it will also be convenient to use Olympiad years. The result is as follows:

³¹¹ On the season of the Olympia, see Miller 1975.

Priest of Helios ≈ Olympiad Year	Table X: Years of Festivals Based On: A = <i>IG XII.1</i> 730 = Pugliese Carratelli, 1952-1954, 259, no. 5b ³¹² (= Table XI) B = Pugliese Carratelli, 1952-1954, 256, no. 5 ³¹³ (= Table XII) C = Pugliese-Carratelli, 1952-1954, 252, no. 3 ³¹⁴ D = Pugliese-Carratelli, 1952-1954, 259, no. 5a ³¹⁵ E = Segre and Pugliese Carratelli 1949-1951, 159-164, nos. 4b ³¹⁶ /4c F = Segre and Pugliese Carratelli 1949-1951, 164 & 229, no. 4l G = <i>Lindos II</i> 490 = Badoud 2015, 441, no. 64 / = Festival known to be in second Julian year of an Olympiad year						
	Trieteris ³¹⁷ (Bakcheia?)	Romaia	Dipanamia	Halieia	Pentaeteris ³¹⁸	Panagyris ³¹⁹ (Erethimia?)	Hippokathesia
Ol.X.1							
Ol.X.2	A,B	A,B	A,B,E? (1:8)		A		
Ol.X.3			A,B,E (1:4)	A,E			
Ol.X.4	A,B				B	A	
Ol.Y.1							
Ol.Y.2	A,B,C	A,B,C			A		
Ol.Y.3			A,B,C,D,F,G (1:4)	A,F,G		B,F? ³²⁰ (1:8)	
Ol.Y.4	A,B,C				B,C,D	A	

Table X: Years of Rhodian Festivals Roughly in Relation to Olympiad Years

As noted above, the key to unlocking the years of the games is found on the Antikythera Mechanism, which places the Halieia in the same year as the Nemea (as do the Scholiasts to Pindar) prior to the Olympia, thus in the summers, for example, of 101, 97, 93 BC. I have argued above that the Halieia were celebrated in the month of Panamos and the Dipanamia also fell in Panamos, hence, if correct, the Halieia would have fallen in the same month as the Dipanamia on the 1:4 cycle (I would say the order of celebration was probably the Dipanamia followed by the Halieia),³²¹ the Dipanamia on the 1:8 cycle

³¹² = Badoud 2015, 316, no. 6.

³¹³ = Badoud 2015, 311, no. 2.

³¹⁴ = Badoud 2015, 313, no. 3.

³¹⁵ = Badoud 2015, 314, no. 4.

³¹⁶ = Badoud 2015, 419, no. 44.

³¹⁷ As Hiller von Gaertringen points out (1929, 353), *IG XII.1* 155, face II, lines 49-51 (= Gabrielsen 1994, 157, Appendix 2) seems to equate the Trieteris with the Bakcheia (ἐν ταῖς τῶν Βακχείων ὑποδοχῆι κατὰ τριετηρίδα, ἀνέθηκε | τριετηρίσι καὶ τῶι κοινῶι).

³¹⁸ The identification of the Pentaeteris has been various. Hiller von Gaertringen (1929, 353-354) identified them with the Ἀλεχάνδρεια καὶ Διονύσια attested on other Rhodian inscriptions. Segre (1949, 82), on the other hand, proposed to identify them with the Πύθια, which are otherwise unattested at Rhodes. Finally, Pugliese Carratelli (1952-1954, 251-252) identified them with the Ἀλιεῖα, which view Badoud (2015, 123) endorses. The inscriptional evidence, however, strongly argues against this last identification. See below.

³¹⁹ The Panagyris is widely believed to refer to the Erethimia. See Hiller von Gaertringen at *SIG*³ 724, ad n. 2; Maiuri 1925, 28; Blinkenberg at *Lindos II*, p. 28; Pugliese Carratelli 1952-1954, 261; Badoud 2015, 111. On the Great Erethimia, see Kontorini 1975.

³²⁰ At Segre and Pugliese Carratelli 1949-1951, 164, 229, no. 4l, I would restore: [ὁ δεῖνα τοῦ δεῖνα *demos*] | ἐφ' οὗ Ἀλιεῖα καὶ Διπα] | νάμια κα[ὶ Ἰπποκαθέσια] | ἐγένετ[ο, -----].

³²¹ The order of these two cannot be determined from inscriptions, since sometimes the Dipanamia are listed before the Halieia and sometimes after it. However, given the Halieia is at the end of the month (if the Scholiasts to Pindar are accurate about the festival ending on the 24th of the month), it is more likely the Dipanamia came first. In addition, it would not be a problem to celebrate two large festivals in fairly close

would have fallen one year earlier in the summers of (for example) 102, 98, 94 BC, and both the Dipanamia and the Halieia would have been at the very end of the priest of Helios' term and thus in the second of the two Julian years, which I indicate with the slash mark, /. The Hippokathesia were celebrated in Agrianos, apparently in the same year as every other Halieia,³²² hence they would have been celebrated every eight years in the spring of (for example) 97, 89, 81 BC, just a few months prior to the Dipanamia on the 1:4 cycle, and of course the Great Halieia.

We do not know the time of year of the Trieteris (= Bakcheia?), Panagyris (= Erethimia?), Pentaeteris, or Romaia, or whether all of these even had a fixed time of year, hence with the available evidence we cannot say whether they would have been celebrated in the late summer or in the fall in the first half of the priest of Helios' term, or in the spring or early summer at the end of the priest of Helios' term. Note that the Panagyris (= Erethimia?) when they resume "after the war" in priest 22 of Inscription A (for more on this war, see below and **Table XI**, Year 22), have shifted one year later.

One thing that is important to note here, is that Badoud³²³ follows Pugliese Carratelli³²⁴ in equating the Pentaeteris that appear on B, C and D with the Halieia that appear on A, E, F and G. However, the Trieteris, Romaia, and the Dipanamia (both on the 1:4 and 1:8 cycle) all appear in the same relative years on A, B, and C,³²⁵ whereas the Halieia on inscriptions A, E, F, and G appear in the same year as the Dipanamia on the 1:4 cycle, but the Pentaeteris on inscriptions B, C, and D falls one year after the Dipanamia on the 1:4 cycle, which strongly suggests that the Pentaeteris on inscriptions B, C, and D cannot refer to the Halieia. Again, the way Badoud explains this is by placing the Dipanamia on the 1:4 cycle in Panamos B of the priestly years 91/0, 87/6, 83/2 (thus in the summers of 90, 86 and 82), by placing the Halieia in Dalios in the priestly years 90/89, 86/5, 82/1 (thus also in the summers of 90, 86, 82), and by placing every other Trieteris in the same years of the Halieia, thus also 90/89, 86/5, 82/1. The entire argument, however, falls apart, as least in regards to these seven inscriptions, because he has unquestionably placed the Halieia one summer too early.

Besides the evidence of Inscription A (= *IG XII.1 730* = Pugliese Carratelli, 1952-1954, 259, no. 5b = Badoud 2015, 316, no. 6 = **Table XI**), which consistently seems to indicate that the Dipanamia preceded the Halieia, there is also Inscription G (= *Lindos II 490* = Badoud 2015, 441, no. 64). Blinkenberg read the key lines of this inscription, 11-12, as ἐφ' οἷῳ Διπανάμια, ἵπ[π]οκ[α]θήσια | ἱερὸς ἀγῶν Ἁλία. Since we know the Hippokathesia

succession in the same month. As always seems to be the case with the Halieia, there is a parallel with the Nemea at Argos, where the Heraia were celebrated shortly before the Nemea, although it is not clear whether both festivals were celebrated in Argive Panamos. Perlman (2000, 132) argued the Nemea came first followed by the Heraia, but for the close succession of the Heraia and then the Nemea in 209 BC, see the movements of Philip V at Livy 27.30-31.

³²² Segre and Pugliese Carratelli 1949-1951, 258, no. 153, lines 8-9.

³²³ Badoud 2015, 122-123.

³²⁴ Pugliese Carratelli 1952-1954, 250-252.

³²⁵ The only anomalies are the celebration of the Halieia under priest 17 of inscription A, which could be an engraving error, as Hiller thought, or a one-time celebration, perhaps to make up for the one skipped in year 4, and the appearance of the Dipanamia under *prophetas* 16 of B, which, as Badoud (2015, 124) argues, was very likely only there because the inscriber ran out of room to put it under *prophetas* 17 (a year due a Dipanamia celebration on the 1:8 cycle) due to the roughening of the inscription there for a tenon.

preceded the Dipanamia, if this reading were correct, it would suggest these games were listed in reverse chronological order, thus indicating the Halieia came after the Dipanamia. Note, however, that Badoud now reads lines 11-12 ἐφ' ο[ὗ] Διπανάμια, ἐ[ἰσελαστικός] | ἱερός ἀγών Ἄλεια, which is quite a convincing reading especially based on Blinkenberg's photo (the final A of ΔΙΠΑΝΑΜΙΑ seems to be followed directly by Ε) and because a similar expression (ἀγωνοθέτου τῶν ἱερῶν καὶ εἰσελαστικῶν τῶν μεγάλων | Ἀλείων ἀγώνων) is found on Maiuri 1925, 48, no. 38, lines 6-7 and probably should be restored in lines 10-11. This new reading, in turn, once again suggests the Dipanamia preceded the Halieia.

As noted above, there is problematic evidence that indicates that there must have been a later change that is consistent with some of Badoud's placements of some of these festivals, specifically lines 5-7 of *SEG XXXIII* 644, which indicate that Diopieithes son of Aristonidas apparently served as priest of the Samothracian Gods during the Halieia and the Trieteris, and he also served as priest of Aphrodite when the Romaia and Trieteris were celebrated (Ἄλεια καὶ Τριητηρίδα καὶ | ἱερατεύσας vac. Ἀφρ[ο]δίτας | Ῥωμαῖα vac. καὶ Τριητηρίς). The confluence of the Trieteris and the Romaia poses no problem with the earlier evidence, but the appearance of the Halieia in the same year as the Trieteris does. The other evidence comes from Pugliese Carratelli 1952-1954, 253, no. 4, a list of the priests of Asklepios dated by the editor tentatively to AD 4/5,³²⁶ but which Badoud (2015, 132-133 and 315, no. 5) dates 30-21 BC. In years 1 and 4 of the preserved list the Halieia, Trieteris, and Kaisareia (which on this inscription is said to be celebrated for the first time and possibly replaced the Romaia) were all celebrated, and these three are celebrated in the same year a second time on this same inscription in an indeterminable sequence (which indicates this was not a one-off occurrence), whereas the Dipanamia were celebrated in the terms of priests 3 and 6. Meanwhile the Trieteris was skipped in priests 3 and 5. Again the confluence the Trieteris and the Kaisareia/Romaia is consistent with the earlier evidence, as is the Dipanamia on the 1:8 cycle appearing only 3 years after a Dipanamia on the 1:4 cycle, but the appearance of the Halieia in this same year as both the Trieteris and now also the Kaisareia/Romaia is problematic.

There is no way to square this later contradictory evidence in any reasonable way with the earlier evidence other than positing disruptions (certainly there must have been disruptions since two Trieteris in a row were skipped), and/or organization of years for some of the games, and/or a change in the year of the offices by the end of the first century BC and beginning of the first century AD, and/or we could posit that some of these later references are actually to the Lesser Halieia. We already saw above that the Panagyris (= Erethimia?) of Inscription A (= **Table XI** below) changed its years relative to the other celebrations "after the war", so it would not be surprising to see something similar happen to some of the other festivals later, particularly in the period after Cassius' pillaging of Rhodes in the summer of 42 BC.³²⁷

The placement of these games naturally leads to some redating of some of these inscriptions. Most notably *IG XII.1* 730 (= Pugliese Carratelli, 1952-1954, 259, no. 5b = Badoud 2015, 316, no. 6). I provide a new date in **Table XI** below.

³²⁶ Pugliese Carratelli (1952-1954, 255) argues that the Kaisareia were instituted in memory of Gaius Caesar, the nephew and adopted son of Augustus, who died in Lykia in AD 4.

³²⁷ We know Brutus and Cassius battled at Philippi on 3 October 42 BC not long after Cassius looted Rhodes.

The reference to “*Panagyris after the war*” in Year 22 is one of the more significant pieces of evidence to date this stele. Paton had suggested it referred to the peace in 189 BC after the war with Antiochus III³²⁸, but Holleaux, based on prosopographical arguments, demonstrated Paton’s thesis could not stand and he suggested the Rhodians’ engagement with Mithridates in the First Mithridatic War in the summer and/or fall of 88 BC³²⁹, which Hiller von Gaertringen then used to start the list off in 109/8 BC³³⁰ (which would actually work as far as the years of the games are concerned). A bit later Van Gelder argued “the war” referred to the end of the First Mithridatic War in 85 BC and accordingly he began the list in 106/5 BC (which would not work).³³¹ Later Hiller von Gaertringen changed his mind³³² and along with Blinkenberg³³³ believed this war to be Cassius’ pillaging of Rhodes in 42 BC. Furthermore, Blinkenberg placed the Panagyris of Year 22 in the year of Φίλιπ[πο]ν Φιλίππου καθ’ ὑ[ο]θησίαν δὲ Ἀ[σ]τυκράτεως,³³⁴ during whose year of service in 42/1 we are told on another inscription ἀ εἰρήνα καὶ εὐετηρία ἐγένετο,³³⁵ and so he began the list 63/2 BC (which does not work), which date Badoud has refined, based on his own chronology, to begin in 62/1 BC (which also does not work).³³⁶ Several other Rhodian officials, however, styled their years as those of peace and prosperity,³³⁷ so the reference to peace in the year of Philip deserves no extra weight. More importantly, Philippoi was a fairly short affair, but this inscription seems to suggest that several festivals were missed during a long period of war, including two Trietereis in a row starting in Year 1, a Romaia and Dipanamia (1:8) in Year 3, a Dipanamia (1:4) and Halieia in Year 4, three Trietereis in a row starting in Year 7, and a whopping seven Panagyreis in a row starting in Year 7. Would it not be most logical to conclude that the war referenced started around the time all these festivals began being omitted in Year 1 rather than to posit that it happened just before they restarted in Year 22? Consequently, if we were to make the war the Rhodian engagements with Cassius in 42 BC, would it not make more sense to put that event near Year 7 when the Erethimia began to be skipped? That would, however, certainly put this list too late based on the prosopography.

What we are looking for, then, is a prolonged period of instability especially between Years 1 and 22. The only good candidates in this period are the three Mithridatic Wars and the War on the Pirates, which the Rhodians could have justly viewed as one long engagement. In particular, the omission of the Romaia (and possibly Dipanamia) in Year 3 and especially the omission of the Halieia in Year 4 are very striking and require an explanation. Since the First Mithridatic War did really not get underway until after the

³²⁸ Paton 1890, 284.

³²⁹ Holleaux 1893, 171-175; 180.

³³⁰ Hiller von Gaertringen 1894, 23-24.

³³¹ Van Gelder 1900, 164, n. 3; 304.

³³² Hiller von Gaertringen 1929, 354.

³³³ Blinkenberg 1938, 10-11.

³³⁴ *Lindos* II 1, fr. J, col. I, lines 6-7.

³³⁵ *Lindos* II 347, lines 1-4; Blinkenberg 1938, pp. 10-11.

³³⁶ Badoud 2015, 132.

³³⁷ Cf. Segre and Pugliese Carratelli 1949-1951, 161, no. 4e (Κλεισίτιμος Αἰνησιτίμου | ἐφ’ ᾧ ἐγένετο εὐθηνία | καὶ εὐκαρπία ἅπασα); *SEG* XXXIX 748, lines 3-7: (Μ(ἄρκος) Αὐρ(ήλιος) | Σεραπίων β’ Ἄμ(ιος) καθ’ ὑ(οθησίαν) δὲ Μάρ(κου) | Αὐρ(ήλιου) Διονυσιοκλεῦς Πολί(τας) ἐφ’ οὗ | ἐ(ὐ)πορ(ία) καὶ εὐφορία πάντων | καρπῶν ἐγένετο); Jacopi 1932, 184, no. 10, lines 3-7: (Ἀριστόμαχον Ἀριστο|μάχου τοῦ Ἀριστομά|χου Βυβάσσιον | ἐφ’ οὗ ἅ πᾶσα εἰρήνα | καὶ εὐωνία ἐγένετο).

fall of 89 BC, there is no good reason to posit that any games would have been skipped until the spring of 88. Thus the Trieteris began to be skipped in Year 1 (89/8), let us say in the spring of 88 BC, because of the blockade of Rhodes at the outset of the First Mithridatic War. Apparently, there were enough resources to run the Panagyris this year, which were likely the more minor Erethimia celebrations at Ialysos (or these were run in the late summer or fall of 89 before the blockade began in the spring of 88). The Romaia and Dipanamia could have been skipped in Year 3 (87/6) because of the slaughter of Romans in 88 BC and the continuing operations of the First Mithridatic War. Likewise, the Dipanamia and Halieia of Year 4 (86/5) were both skipped in the summer of 85 BC because resources were depleted after three-and-a-half years of continuous warfare with the peace was not yet secure that summer. The Trieteris and Panagyris of Year 7 (83/2) were skipped because the Second Mithridatic War was heating up, but enough resources were there to run a Romaia that year. This would have been the celebration referred to by *IG XII.1 46*,³³⁸ apparently a grander celebration to show Rhodes' solidarity with the Romans after the slaughter of 88 BC and their allied campaigns against Mithridates.

³³⁸ As Badoud (2015, 131-132) points out, the Romaia mentioned in *IG XII.1 46* must date between 88 BC (a *terminus post quem* based on the adoption of 3 people) and 76 BC (a *terminus ante quem* based on the adoption of a priest of Athena). Thus it could be those of 87/6, or 83/2, or 79/8. Badoud dates it to 80 BC, but I believe his date for the Romaia are off by 2 years. Based on my chronology of *IG XII.1 730*, the Romaia of 87/6 and 79/8 are both omitted, leaving only the Romaia of 83/2.

Year	Approximate Olympiad Year	Old Date: Hiller	Old Date: Van Gelder	Old Date: Blinkenberg	Old Date: Badoud	New Date: Iversen	Priest of Apollo Erethimios	Festival					
								Trieteris	Panagyris (= Erethimia?)	Romaia	Dippanamia	Haliaeia	
1	172.4	109/8	106/5	63/2	62/1	89/8	Μηρόφιλος Ἐπιπράττεις Βρυγινδάριος	O	X				
2	173.1	108/7	105/4	62/1	61/0	88/7	Πεισικράτης Δαμεινέτου Ἰστανίος						
3	173.2	107/6	104/3	61/0	60/59	87/6	Ἀγρίλοχος Κλεισθένους Ἰστανίος	O	X	O	O		
4	173.3	106/5	103/2	60/59	59/8	86/5	Ἀστυκρατίδας Καλλιστράτου Ὑπερέγχεύς				O		O
5	173.4	105/4	102/1	59/8	58/7	85/4	Πραξιφών Ἀριστομβρότου Βρυγινδάριος	X	X				
6	174.1	104/3	101/0	58/7	57/6	84/3	Δεξιναύτας Ἀγήμονος Ἰστανίος						
7	174.2	103/2	100/99	57/6	56/5	83/2	Τεισαγόρας Τεισαγόρα Νεοπολίτας	O	O	X			
8	174.3	102/1	99/8	56/5	55/4	82/1	Ἀλεξιμαχος Ευφάνους Ἀστυπαλατεύς				X		X
9	174.4	101/0	98/7	55/4	54/3	81/0	Δαμόπολις Δαμοπόλιος Πονταρεύς	O	O				
10	175.1	100/99	97/6	54/3	53/2	80/79	Ἀρχίας Ἀρχία Ἰστανίος						
11	175.2	99/8	96/5	53/2	52/1	79/8	Εὐφράνωρ Ἀγήμονος Πονταρεύς	O	O	O	O		
12	175.3	98/7	95/4	52/1	51/0	78/7	Ἀγρίπολις Φιληράτου Ἰστανίος					X	X
13	175.4	97/6	94/3	51/0	50/49	77/6	Σύμμαχος Σύμμάχου Ἰστανίος	X	O				
14	176.1	96/5	93/2	50/49	49/8	76/5	Ἀριστομβροτίδας Δάμιωνος Πολίτας						
15	176.2	95/4	92/1	49/8	48/7	75/4	Εὐαγόρας Διονυσίου Νεοπολίτας	X	O	X			
16	176.3	94/3	91/0	48/7	47/6	74/3	Ἀρχίας Ἀριστανδρίδα Ἰστανίος					X	X
17	176.4	93/2	90/89	47/6	46/5	73/2	Ἀριστείδας Ζευομβρότου Πονταρεύς	X	O				X
18	177.1	92/1	89/8	46/5	45/4	72/1	{Α} Ἀνταγόρας Ἀγεστράτου Βρυγινδάριος						

Year	Approximate Olympiad Year	Old Date: Hiller	Old Date: Van Gelder	Old Date: Blinkenberg	Old Date: Badoud	New Date: Iversen	Priest of Apollo Erethimios	Festival				
								Trieteris	Panagyris (= Erethimia?)	Romaia	Dipanamia	Halieia
19	177.2	91/0	88/7	45/4	44/3	71/0	Άγέστρατος Δαμοκράτεus Ἰστανίος	X	O	X	X	
20	177.3	90/89	87/6	44/3	43/2	70/69	Νικαικράτης Ξενοδάμου Ἰστανίος			X	X	X
21	177.4	89/8	86/5	43/2	42/1	69/8	Τιμοκλείδας Τιμαγόρα Σιβυθίος	O	O			
22	178.1	88/7	85/4	42/1	41/0	68/7	Δαμόστρατος Σπουσίλα Ποντωρεύς		X (πανάγυρις μετά τὸν πόλεμον)			
23	178.2	87/6	84/3	41/0	40/39	67/6	Άλεξιμβροτίδας Διοπίθεus Σιβυθίος	X		X		
24	178.3	86/5	83/2	40/39	39/8	66/5	Ζετῆς Ξενομένεus Ποντωρεύς		X		X	X
25	178.4	85/4	82/1	39/8	38/7	65/4	Ἡρόδοτος Λυσάνδρου Βρυγινδάριος	X				
26	179.1	84/3	81/0	38/7	37/6	64/3	Φιλότιμος Φιλοτίμου Ποντωρεύς		O			
27	179.2	83/2	80/79	37/6	36/5	63/2	Γόργων Βρυγινδάριος			O	O	
28	179.3	79/8	79/8	36/5	35/4	62/1	Κλευσθέης Ἀγησιλόχου Ἰστανίος		X		X	X

Table XI – Redating of Officials' Years and Festivals on *IG XII.1 730* (= Pugliese Carratelli, 1952-1954, 259, no. 5b = Badoud 2015, 316, no. 6)
 Temple of Apollo Erethimios, Ialysos. X = Festival Celebrated; O = Festival Omitted

Previous scholars have overlooked the various wars against the pirates, but we know that the vacuum left by Roman preoccupation in the Mithridatic Wars led to increased piracy in the eastern Mediterranean that was so serious that it crippled Mediterranean commerce and led to the looting of many temples.³³⁹ The other omissions could, therefore, be explained by continuing operations against the pirates and the Third Mithridatic War. Thus the omissions in Year 11 (79/8), such as the Romaia and Dipanamia, were at a time when we are told that P. Servillius was sent to suppress marauding pirates in the eastern Mediterranean (and undoubtedly the Rhodians were some of the loudest voices calling for help in this matter).³⁴⁰ The omissions in Year 21 could be explained by the continuing problem with pirates. For instance, Phlegon of Tralles reports that in 69/8 the pirate Athenodoros made the Delians captives and destroyed some of the statues of their gods, so C. Triarius, the legatus of L. Lucullus, constructed a wall around Delos.³⁴¹ So serious was it, that Pompey was eventually granted unprecedented powers to stop it. This was a very large undertaking,³⁴² and besides the Romans the only other state we are told that was involved was Rhodes.³⁴³ Since this campaign took less than 3 months to complete and it was finished by the early summer of 67 BC,³⁴⁴ there could have been time to celebrate the Panagyris (= Erethimia?) of Year 22 (68/7 BC). Furthermore, we know that Rhodes had long waged war against piracy and would have had great reason to celebrate such a triumph.³⁴⁵ Those omitted in Years 26 (64/3) and Year 27 (63/2) would fall at the end of Third Mithridatic War when there was yet again some instability.

The placing of *IG XII.1 730* in the years 89/8 - 62/1 BC naturally impacts where to place Pugliese Carratelli, 1952-1954, 256, no. 5 (= Badoud 2015, 311, no. 2), which must go close in time either directly before or after *IG XII.1 730*, because there are no omissions of festivals on Pugliese Carratelli, 1952-1954, 256, no. 5 (hence no overlapping of years between these two inscriptions), plus men from both inscriptions appear on *IG XII.1 46* (which I date to 83/2 BC above). I would place Pugliese Carratelli, 1952-1954, 256, no. 5 (= Badoud 2015, 311, no. 2) as in **Table XII:**

³³⁹ For the fear, destruction and economic havoc wrought by the brashness of pirates as a consequence of the Mithridatic Wars, see Plut., *Pompey* 24-29.

³⁴⁰ Appian, *Mithridatika* 93b; Florus 1.41.6.4.

³⁴¹ Phlegon of Tralles, *FrGrH* 257, F12.13.

³⁴² See Plut. *Pompey* 26-29, and especially at 26.2 where Plutarch reports Pompey had at his disposal 500 manned ships, 120,000 infantrymen, and 5,000 cavalrymen.

³⁴³ Florus 1.41.6.8 (*Quippe cum classibus et suis et socialibus Rhodiorum abundaret, pluribus legatis praefectis utraque Ponti et Oceani ora complexus est*). See also Strabo 11.1.6, who reports that Pompey stopped at Rhodes on his expedition against the pirates, undoubtedly to pick up his Rhodian allies.

³⁴⁴ See Plut., *Pompey* 28.2.

³⁴⁵ For discussion and references, see Berthold 1984, 98-99.

Year	Old Date: Blinkenberg	Old Date: Badoud	New Date: Iversen	Priest, Athena Lindia	π[ροφάται ἐν τῶι ᾄστει]	Festival					
						Trieteris	Pentaeteris	Romaia	Hippokathesia	Dippanamia	
1	81/80	92/1	59/8		Κλευκρί[ατης - - - - -] Ἰο[τάνιος]	X		X			X
2	80/79	91/0	58/7		Καλλιφά[νης - - - - -]						X
3	79/8	90/89	57/6		Πραταγό[ρας - - - - -]	X	X				
4	78/7	89/8	56/5	83/2	Εὐπόλε[μος Εὐπολέμου] τοῦ [Τιμοκράτους] καθ' ἕθε[ισταν δὲ Τιμοκράτους] [Κλάσιος]						
5	77/6	88/7	55/4		Διονύσι[ος - - - - -] Φ[ιλαγῆος]	X		X			
6	76/5	87/6	54/3		Τιμαχίδ[ις Ἀγησιμίου] Λιν[δοπολίτας]				X		X
7	75/4	86/5	53/2		Πολύα[ρα] [τος - - - - -] Π[ιεδιεύς]	X	X				
8	74/3	85/4	52/1		Ἱεροφάν[ης - - - - -] Β[- - - -]						
9	73/2	84/3	51/0		Ἐ[κάτων Φανί<λ>α Λ[- - - -]	X		X			X
10	72/1	83/2	50/49		Ἀριστοκ[λῆς Ἐριμοκρώντος Εὐθηνίτα]						X
11	71/0	82/1	49/8		Ζενοστρ[ατος Σ]ωθένης Κα[- - - - -]	X	X				

Year	Old Date: Blinkenberg	Old Date: Badoud	New Date: Iversen	Priest, Athena Lindia	π[ροφάται ἐν τῶι ᾄστει]	Festival					
						Trieteris	Pentaeteris	Romaia	Hippokathesia	Dippanamia	
12	70/69	81/0	48/7		Μοσχίω[ν Ε]κατόμνω Λα[δαρμιο]ς						
13	69/8	80/79	47/6		Αινέας [Μεν]ελεὺς Π[- - - - -]	X		X			
14	68/7	79/8	46/5	72/1	Διονύσι[ος Δ]ιονυσίου τοῦ Εὐπολέμου				X		X

15	67/6	78/7	45/4	64/3	Καρ[παθιοπο]λίτας καθ' ὑθεσι[αν δε Εὐ]ἄνορος Πάγιος	X	X			
16	66/5	77/6	44/3		Ζηνόδο[τος Δ]ιοφάντου το[ῦ Ζηνοδ]ότου Λιν[δοπο]λίτας καὶ ἐπιλ[αχῶν ἱερ]ιεὺς Ἀλίου Τιμαγό[ρας Τ]ιμαγόρα Σ[ιβύθιο]ς					X ³⁴⁶
17	65/4	76/5	43/2		Ἄγριοκ[λής] Γόργου Λ[-----]ς	X		X		

Table XII: Redating of Officials' Years and Festivals on Pugliese Carratelli, 1952-1954, 256, no. 5 (= Badoud 2015, 311, no. 2)

³⁴⁶ For the explanation of the seeming misplacement of the Dipanamia in this year, see footnote 325.

In addition to there being no overlapping of festivals, the choice of placement of this inscription before or after of *IG XII.1 730* turns on arguments about the normal *cursus honorum* at Rhodes. In particular, it depends on whether one places the office of *prophetas* as typically being before the priesthood of Athena Lindia, or after this office. Badoud argues that the normal rule was to serve as a *prophetas* before being the priest of Athena Lindia.³⁴⁷ However, as Blinkenberg recognized,³⁴⁸ and as Habicht has shown,³⁴⁹ the normal *cursus honorum* for a Lindian politician was first to be a *hierothyta*, then a *mastros*, then a priest of Athena Lindia 10 to 20 years after being a *hierothyta* (probably followed the next year by being priest of Zeus Polieus and certainly followed two years later by being priest of Artemis Kekoia), and then the priest of Helios as much as 20-25 years after being priest of Athena. On this inscription, however, Zenodotos is listed as being a prophet *and* as having been (or as I shall argue below, as being), the priest of Helios. I believe, therefore, we can confidently posit that Zenodotos served as a *prophetas* long after he was priest of Athena Lindia. According to Blinkenberg's chronology, however, Zenodotos would have served as a prophet and priest of Helios in the city before being Priest of Athena Lindia, Zeus Polieus, and Artemis Kekoia in 64/3 BC.³⁵⁰ Blinkenberg was led to this conclusion because Zenodotos' adoption was not mentioned on Pugliese Carratelli, 1952-1954, 256, no. 5 (**Table XII**, year 15),³⁵¹ but it was mentioned on the list of the Priests of Athena Lindia³⁵² and on another series of inscriptions honoring him.³⁵³ They thus concluded his year of office as prophet must date before 64/3.

We thus have two seemingly contradictory pieces of evidence with Zenodotos, namely that Zenodotos' adoption is mentioned by 64/3 BC at the time he was Priest of Athena (which normally was served about 20 years prior to being priest of Helios), while on Pugliese Carratelli, 1952-1954, 256, no. 5 (**Table XII**, year 15) he is mentioned as being prophet in the city and priest of Helios without his adoption being mentioned. To resolve this conundrum, I would argue that while one would normally expect the adoptive patronym to be included, in this last inscription his adoption was just left off.

There are other examples where we know a man was already adopted, but his adoptive status was not mentioned later on official inscriptions. For instance, Κλευμήδης Κλευμήδους καθ' ὑθεσίαν δὲ Δείωνος was priest of Athena Lindia in 57/6, but his adoptive status is not recorded later at *Lindos II 350*, line 21, which dates to 38/7 BC and lists other men's adoptive status, nor is his adoptive status mentioned on *Lindos II 378*, col. I, line 9, which dates to 27/6 BC and again lists other men's adoptive status. Thus in this case, the same man's adoptive status is not listed two times later. In addition to Kleumedes, *Lindos II 350* lists 16 other former priests of Athena Lindia including Πύθων Πύθωνος καθ' ὑθεσίαν δὲ Νικοτίμου, who was priest of Athena Lindia in 38/7,³⁵⁴ and Πολύχαρμος Εὐκράτεις καθ' ὑθεσίαν δὲ Ὀνασάνδρου, who was priest of Athena Lindia in 34/3, but as with Kleumedes, both men's adoptive status is omitted in 27/6 when other men's is included. Thus, of the 17 named former priests of Athena Lindia listed on this inscription, of which we know 8 were adopted by the time they were priest of

³⁴⁷ Badoud 2015, 129.

³⁴⁸ *Lindos II 281b*, 592.

³⁴⁹ Habicht 2003, 567-569.

³⁵⁰ Blinkenberg 1938, 27-28.

³⁵¹ Blinkenberg 1938, 27. Also noted by Hiller von Gaertringen 1929, 352. Also see Blinkenberg's discussion at *Lindos II 281b*, 590-592.

³⁵² *Lindos II 1*, fr. G, col. III, lines 16-18.

³⁵³ *Lindos II 311-312* (these belong to the same monument); *Lindos II 315*; and *IG XII.1 833*. Other inscriptions that mention him include *Lindos II 281b*; *Lindos II 308-309*; and *Lindos II 314*.

³⁵⁴ *Lindos II 1*, fr. J, col. I, lines 12-13.

Athena Lindia, the adoptive status of 3 are omitted after they were priest of Athena Lindia, or 37.5%.³⁵⁵ In addition, there is at least one contrary example of which I know: Πασ[ιφῶ]ν Ἐπιλύκου was priest of Athena Lindia in 124/3 BC with no mention of his adoptive status on the official record (*Lindos* I 1, fr. F, col. I, line 4), but in that same year or shortly after he appears as Πασιφῶν Ἐπιλύκου καθ' ὑοθεσίαν δὲ Δαμοκλεῦς.³⁵⁶ These examples demonstrate conclusively that once a man was adopted, his adoptive status need not always be mentioned.

Thus, in this particular case, which was special, it is more likely that Zenodotos' identification as the one who was the replacement priest of Helios was felt, within the constraints of a reasonable number of lines, to be more important to state than his adoptive status (or it was Zenodotos' choice). Whether Zenodotos first served as a prophet or priest of Helios is an open question, but the wording καὶ ἐπιλαχῶν ἱερεὺς Ἄλιου is unique. In particular, the conjunction καὶ is not used with any other prophet's name on this list, which suggests it should be taken literally: that is in this year Zenodotos was both a prophet *and* he replaced (by lot) the normally elected priest of Helios, who apparently died in office or had become incapacitated.³⁵⁷ Indeed, on several of Zenodotos' other honorary inscriptions, the formula is always καὶ προφατεύσας ἐν τῷ ἄστει καὶ ἐπιλαχῶν ἱερεὺς Ἄλιου.³⁵⁸ If this and my chronology are correct, Zenodotos' year of office as replacement priest of Helios was also in 45/4, and thus exactly 19 years (20 years by inclusive counting, which is suggestive) after he was priest of Athena Lindia in 64/3, which is well within the normal parameters of the *cursus honorum*.

In any case, if Zenodotos' year as prophet (year 15) fell after his year as priest of Athena Lindia in 64/3, this means that year 15 should date to 63/2 at the earliest, which in turn means that Year 1 of this inscription can date to 77/6 at the earliest. Furthermore, on another honorary inscription that was published later (which Blinkenberg never saw),³⁵⁹ all of the accomplishments of Eupolemos (prophet in year 4) are listed, who was priest of Athena Lindia in 83/2 BC, including that he served as a both a *prytanis* and as a *prophetas*, as well as being a general during the Mithridatic War. This honorary inscription is apparently dated to the year of Κλεῦθεμις Κλευξένου,³⁶⁰ who was priest of Athena Lindia in 53/2 BC.³⁶¹ If it is correct that Eupolemos would have served as prophet in the city of Rhodos after having been a priest of Athena Lindia, Year 4 of this inscription can be placed after 83/2 but before 53/2. If correct, based on the evidence concerning Eupolemos and Zenodotos, we can say that Year 1 should date between 77/6 and 57/6 BC. If the dating of *IG* XII.1 730 (= **Table XI**) is correct, we can further narrow the beginning of the inscription found in **Table XII** between 62/1 and

³⁵⁵ *Lindos* II 378, col. I, lines 4-26. The identification of these men and the absolute chronology are certain, since this is a list of former priests of Athena Lindia and Zeus Polieus who were honoring the priest of 27/6 BC, Πάνθειος Δαμόσωνος καθ' ὑοθεσίαν δὲ Καλλιξείνου.

³⁵⁶ *Lindos* II 244a-f. It is possible he was adopted shortly after being priest of Athena Lindia. For the family stemma, see *Lindos* II, 47-48, no. 19.

³⁵⁷ This assumes that ἐπιλαχῶν here means *suffectus*, which I think is warranted. The choice of verb implies that this election was done by lot (possibly among the current roster of *prophetas*), rather than by show of hands (note that the formula χειροτονηθεὶς τε δαμιουργός at Segre and Pugliese Carratelli 1949-1951, 238, no. 110, line 40 suggests that at Kameiros the selection of the *damiourgos* was made by show of hands).

³⁵⁸ *Lindos* II 311-312 (these belong to the same monument); *Lindos* II 315 and *IG* XII.1 833, which should clearly be restored as relating to Zenodotos.

³⁵⁹ Kontorini 1989, 164, no. 73 (= *SEG* XXXIX 759), line 7: πρυτανεύσαντα ἢ καὶ ἢ προφατεύσαντα.

³⁶⁰ Kontorini made no comment on the appearance of Kleuthemis' name (*SEG* does note he was Priest of Athena Lindia in 53/2, but still dates the inscription to some point after 78 BC). The appearance of Kleuthemis' name, however, seems to be a dating formula and it also makes more sense that such an award was issued by a current priest of Athena to a former priest after a long and illustrious career.

³⁶¹ *Lindos* II 1, fr. H, col. III, line 12.

57/6 BC, that is as coming after the end of that in **Table XI**. Furthermore, now that we know years in which the games fell, the only possibility left is the span of years that runs from 59/8 to 43/2, which also happens to be the period of relative peace after the War on the Pirates and Third Mithridatic War but before Cassius' looting of the city in apparently the middle or late summer of 42 BC – an ideal stretch of time for all the festivals of the inscription in **Table XII** to have been celebrated, as they seem to have been.

Bibliography

- Adiego, I.-J. 2007. *The Carian Language*. Leiden and Boston, Brill.
- Allen, M., W. Ambrisco, M. Anastasiou, D. Bate, Y. Bitsakis, A. Crawley, M.G. Edmunds, D. Gelb, R. Hadland, P. Hockley, A. Jones, T. Malzbender, H. Mangou, X. Moussas, A. Ramsey, J.H. Seiradakis, J.M. Steele, A. Tselikas, and M. Zafeiropoulou (eds) 2016. “*Special Issue: The Inscriptions of the Antikythera Mechanism*”, *Almagest: International Journal for the History of Scientific Ideas* 7.1. Turnhout: Brepolis.
- Amandry, P. 1980. “Sur les concours argiens”, *Bulletin de correspondance hellénique, Supplément*. 6, 211-253.
- Amandry, P. 1983. “Le Bouclier d’Argos (Note complémentaire)”, *Bulletin de correspondance hellénique* 107, 627-634.
- Anastasiou, M., Y. Bitsakis, A. Jones, X. Moussas, A. Tselikas, and M. Zafeiropoulou. 2016a. “The Inscriptions of the Antikythera Mechanism 4: The Back Dial and Back Plate Inscriptions”, in Allen *et al.* 2016, 138-215.
- Anastasiou, M., Y. Bitsakis, A. Jones, X. Moussas, A. Tselikas, and M. Zafeiropoulou. 2016b. “The Inscriptions of the Antikythera Mechanism 6: The Front Cover Inscription”, in Allen *et al.* 2016, 250-297.
- Arenz, A. 2006. *Herakleides Kritikos »Über die Städte in Hellas«. Eine Periegesis Griechenlands am Vorabend des Chremonideischen Krieges*. Munich: Herbert Utz Verlag.
- Arnaoutoglou, I. 1994. “APXEPAHICTHΣ and its Meaning in Inscriptions”, *Zeitschrift für Papyrologie und Epigraphik* 104, 107-110.
- Arnott, W. G. 2007. *Birds in the Ancient World from A to Z*. London, New York: Routledge.
- Badoud, N. 2015. *Le temps de Rhodes: Une chronologie des inscriptions de la cité fondée sur l'étude de ses institutions*. Munich: C.H. Beck.
- Barth, M. and J. Stauber. 1993. “Inschriften Mysia & Troas: Nördlich Troas”, The Packard Humanities Institute Online Searchable Greek Inscriptions: <<https://epigraphy.packhum.org/text/287565?&bookid=715&location=746>>.
- Bennett, C. 2011. *Alexandria and the Moon: An Investigation Into the Lunar Macedonian Calendar of Ptolemaic Egypt* (Studia Hellenistica 52). Leuven & Walpole, MA: Peeters.
- Bergk, Th. 1845. *Beiträge zur griechischen Monatskunde*. Gießen: B.C. Ferber.
- Bernard, A. 1972. *Le Paneion d’el-Kanaïs: les inscriptions grecques*. Leiden: Brill.
- Bernardini, P.A. 1977. “Le Halieia di Rodi e lo scolio a Pind, 0.7, 146ab (p. 229 Dr.)”, *Stadion* 3, 1-3.
- Berthold, R. 1984. *Rhodes in the Hellenistic Age*. Ithaca, NY: Cornell University Press.
- Bevan, G., A. Jones and D. Lehoux. 2019. “The Miletus Parapegma and the Keskintos Astronomical Inscription: New Evidence from Reflectance Transformation Imaging”, *Zeitschrift für Papyrologie und Epigraphik* 212, 137-146.
- Bickerman, E.J. 1980. *Chronology of the Ancient World*. Ithaca: Cornell University Press.
- Bischoff, E. 1894. “Beiträge zur Wiederherstellung altgriechischer Kalender”, *Leipziger Studien zur classischen Philologie* 16, 141-158.
- Bischoff, E. 1919. “Kalender”, in W. Kroll (ed) *Paulys Real-Encyclopädie der classischen Altertumswissenschaft* 20, 1568-1602. Stuttgart: J.B. Metzlersche Verlagsbuchhandlung.
- Bitsakis, Y. and A. Jones. 2016a. “The Inscriptions of the Antikythera Mechanism 3: The Front Dial and Parapegma Inscriptions”, in Allen *et al.* 2016, 68-137.

- Bitsakis, Y. and A. Jones. 2016b. "The Inscriptions of the Antikythera Mechanism 5: The Back Cover Inscription", in Allen *et al.* 2016, 217-249.
- Blinkenberg, Chr. 1938. *Lindiaka VIII. Deux documents chronologiques rhodiennes* (Det Kongelige Danske videnskabernes selskabs virksomhed. Archaeologisk-kunsthistoriske Meddelelser II, 4). Copenhagen: Ejnar Munksgaard.
- Boeckh, A. 1821. *Pindari opera quae supersunt*, vol. 2, part 2. Leipzig: Ioann. August. Gottlob Weigel.
- Boeckh, A. 1855. *Zur Geschichte der Mondcyclen der Hellenen*. Leipzig: B. G. Teubner.
- Boëthius, A. 1922. *Der argivische Kalender* (Filosofi Språkvetenskap och Historiska Vetenskaper 1). Uppsala: A.-B. Akademiska Bokhandeln.
- Börker, Ch. 1978. "Der rhodische Kalender", *Zeitschrift für Papyrologie und Epigraphik* 31, 193-218.
- Bosnakis, D. and K. Hallof. 2005. "Alte und neue Inschriften aus Kos II", *Chiron* 35, 219-271.
- Bresson, A. 1999. "Rhodes and Lycia in Hellenistic Times", in V. Gabrielsen, T. Engberg-Pedersen, L. Hannestad and J. Zahle (eds) *Hellenistic Rhodes: Politics, Culture, and Society* (Studies in Hellenistic Society 9), 98-131. Aarhus: Aarhus University Press.
- Cantor, M. 1880. *Vorlesungen über Geschichte der Mathematik*, vol. 1, *Von den ältesten Zeiten bis zum Jahre 1200 n. Chr.* Leipzig: B.G. Teubner.
- Carman, Chr. and M. Di Cocco. 2016. "The Moon Phase Anomaly in the Antikythera Mechanism", *Institute for the Study of the Ancient World Papers* 11: <<http://doi.org/2333.1/3ffbgd1v>>.
- Carman, Chr. and J. Evans. 2014. "On the Epoch of the Antikythera Mechanism and Its Eclipse Predictor", *Archive for History of Exact Sciences* 68.6, 693-774.
- Carman, Chr., A. Thorndike and J. Evans. 2012. "The Pin-and-Slot Device of the Antikythera Mechanism, with a New Application to the Superior Planets", *Journal of the History of Astronomy* 43.1, 93-116.
- Christesen, P. 2007. *Olympic Victor Lists and Ancient Greek History*. Cambridge & New York: Cambridge University Press.
- Clay, C. 1982. "Die Münzprägung des Kaisers Nero in Rom und Lugdunum", *Numismatische Zeitschrift* 96, 7-52.
- Collignon, M. 1883. "Inscription de Rhodes", *Bulletin de correspondance hellénique* 7, 96-99.
- Crawford, M.H. (ed). 1996. *Roman Statutes*, 2 vols. (Bulletin of the Institute of Classical Studies Supplement 64). London: Institute of Classical Studies.
- Darmezin, L. 1999. *Les affranchissements par consécration en Béotie et dans le monde grec hellénique* (Études anciennes 22). Nancy: Association pour la diffusion de la recherche sur l'antiquité.
- Debord, P. 2001. "Sur quelques Zeus Cariens: Religion et politique", *Studi Ellenistici* 13, 19-37.
- Dever, W.G. 1993. "Preliminary Excavation Reports: Sardis, Paphos, Caesarea Maritima, Shiqmim, 'Ain Ghazal", *The Annual of the American Schools of Oriental Research* 51, 1-43.
- Diehls, H. and A. Rehm. 1904. "Parapegmenfragmente aus Milet", *Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin* 1904.3, 92-111.
- Dittenberger, W. 1887. De sacris Rhodiorum commentatio. Vol. II., III. De cultu Iovis et Minervae, in *Index scholarum in Universitate litteraria Fridericiana Halensi cum Vitebergensi consociata per aestatem anni MDCCCLXXXVII a die XV aprilis usque ad diem XV augustii publice privatimque habendum* 1887, III-XVI.
- Dragoni, G. 1979. *Eratostene e l'apogeo della scienza greca* (Studi di storia antica 4). Bologna: CLUEB.
- Edmunds, M. and Ph. Morgan. 2000. "The Antikythera Mechanism: Still a Mystery of Greek Astronomy?", *Astronomy and Geophysics* 41.6, 10-17.
- Erim, K., R. Duru, T. Efe, J. Borchhardt, A. Erkanal, W. Radt, C.H. Greenewalt, V. Sevin and Ch. Le Roy 1989. "Recent Archaeological Research in Turkey", *Anatolian Studies* 39, 175-185.
- Evans, J. and J. L. Berggren 2006. *Geminus's Introduction to the Phenomena. A Translation and Study of a Hellenistic Survey of Astronomy*. Princeton: Princeton University Press.
- Evans, J. and Chr. Carman. 2014. "Mechanical Astronomy: A Route to the Ancient Discovery of Epicycles and Eccentrics", in N. Sidoli and G. Van Brummelen (eds) *From Alexandria, Through Baghdad: Surveys and Studies in the Ancient Greek and Medieval Islamic Mathematical Sciences in Honor of J.L. Berggren*, 145-174. Berlin: Springer.

- Evans, J. and Chr. Carman. 2019. "Babylonian Solar Theory on the Antikythera Mechanism", *Archive for History of Exact Sciences* 73.6, 619-659.
- Evans, J., Chr. Carman and A.S. Thorndike. 2010. "Solar Anomaly and Planetary Displays in the Antikythera Mechanism", *Journal for the History of Astronomy* 41.1, 1-39.
- Farnell, L.R. 1909. *The Cults of the Greek States*, 5 vols. Oxford: Clarendon Press.
- Farnell, L.R. 1932. *The Works of Pindar*, vol. 2, *Critical Commentary*. London: Macmillan & Company.
- Fotheringham, J.K. (ed). 1923. *Eusebii Pamphili Chronici canones. Latine vertit, adauxit, ad sua tempora produxit S. Eusebius Hieronymus*. London: Humphrey Milford.
- Freeth, T. 2002. "The Antikythera Mechanism 2: Is it Posidonius' Orrery?", *Mediterranean Archaeology and Archaeometry* 2.2, 45-58.
- Freeth, T. 2014. Eclipse Prediction on the Ancient Greek Astronomical Calculating Machine Known as the Antikythera Mechanism. *PLOS ONE* 9.7: <<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103275>>.
- Freeth, T. and A. Jones. 2012. The Cosmos in the Antikythera Mechanism. *Institute for the Study of the Ancient World Papers* 4: <<http://dlib.nyu.edu/awdl/isaw/isaw-papers/4/>>.
- Freeth, T., A. Jones, J.M. Steele and Y. Bitsakis. 2008. "Calendars with Olympiad Display and Eclipse Prediction on the Antikythera Mechanism", *Nature* 454 (31 July), 614-617 and Supplementary Information, pp. 1-42.
- Freeth, T., D. Higgon, A. Dacanalis, L. MacDonald, M. Georgakapoulou and M. Wojcik. 2021. "A Model of the Cosmos in the Ancient Greek Antikythera Mechanism". *Scientific Reports* 11, 5821. <https://doi.org/10.1038/s41598-021-84310-w>
- Frel, J. 1975. "Games on the Rhodian Shore", *Archaeologia Analekta ex Athenarum* 8, 77-78.
- Gabrielsen, V. 1994. "The Rhodian Associations Honoring Dionysodoros from Alexandria", *Classica et mediaevalia* 45, 137-160.
- Gabrielsen, V. 2000. "The Synoikized Polis of Rhodes", in P. Flensted-Jensen, T.H. Nielsen and L. Rubinstein (eds) *Polis and Politics: Studies in Ancient Greek History Presented to Mogens Herman Hansen on his Sixtieth Birthday, August 20, 2000*, 177-205. Copenhagen: Tusculanum Press.
- Gabrielsen, V. 2017. "A New Inscription Attesting to Associations from the Necropolis of Rhodes, with an Appendix by Nicos Christodoulides", *Tyche: Beiträge zur Alten Geschichte Papyrologie und Epigraphik* 32, 15-40.
- Gallivan, P.A. 1974. "Some Comments on the Fasti for the Reign of Nero", *Classical Quarterly* 24, 290-311.
- Gauthier, Ph. 1995. "Du nouveau sur les courses aux flambeaux d'après deux inscriptions de Kos", *Revue des Études Grecques* 108, 576-585.
- Geus, K. 2002. *Eratosthenes von Kyrene: Studien zur hellenistischen Kultur- und Wissenschaftsgeschichte* (Münchener Beiträge zur Papyrusforschung und antiken Rechtsgeschichte 92). Munich: C.H. Beck.
- Giffler, M. 1939. "The Calendar of Cos", *American Journal of Archaeology* 43, 445-446.
- Grainger, J.D. 2010. *The Syrian Wars* (Mnemosyne, bibliotheca classica Batava Supplementum 320). Leiden & Boston: Brill.
- Habicht, Chr. 2003. "Rhodian Amphora Stamps and Rhodian Eponyms", *Revue des Études Anciennes* 105, 541-578.
- Hammond, M. 1938. "The Tribunician Day During the Early Empire", *MAAR* 15, 23-61.
- Hanslik-Andrée, J. 1949. Panamaros. *Paulys Real-Encyclopädie der classischen Altertumswissenschaft*, Band 36,2, *Palatinus bis Paranatellonta*, 450-455. Waldsee, Württemberg: Alfred Druckenmüller Verlag.
- Head, B.V. 1892. *Catalogue of the Greek Coins of Ionia* (R.S. Poole, ed, *Catalogue of the Greek Coins in the British Museum*) London: The Trustees of the British Museum.
- Heberdey, R. and A. Wilhelm. 1896. *Reisen in Kilikien* (Denkschriften der Kaiserlichen Akademie der Wissenschaften in Wien, philologisch-historische Classe 6). Vienna: Carl Gerold's Sohn.
- Herzog, R. 1928. *Heilige Gesetze von Kos* (Abhandlungen der Preussischen Akademie der Wissenschaften 6). Berlin: Verlag der Akademie der Wissenschaften.
- Hiller von Gaertringen, F. 1894. "Die Anagraphe der Priester des Apollon Erethimios", *Hermes* 29, 16-

- 24.
- Hiller von Gaertringen, F. 1895. "Inschriften aus Rhodos", *Mittheilungen des Kaiserlich Deutschen Archaeologischen Instituts, Athenische Abtheilung* 20, 377-396.
- Hiller von Gaertringen, F. 1926. "Review of A. Maiuri", *Nuova silloge epigrafica di Rodi e Cos*, Florence 1925. *Gnomon* 2, 193-198.
- Hiller von Gaertringen, F. 1929. "Rhodische Priesterlisten und Feste", *Archiv für Religionswissenschaft* 27, 349-354.
- Hiller von Gaertringen, F. 1931. "Rhodos", in W. Kroll (ed) *Paulys Real-Encyclopädie der classischen Altertumswissenschaft*, Supplementband V, *Agamemnon – Statilius*, 731-840. Stuttgart: J.B. Metzlersche Verlagsbuchhandlung.
- Hiller von Gaertringen, F. and S. Saridakis. 1900. "Inschriften aus Rhodos", *Mittheilungen des Kaiserlich Deutschen Archaeologischen Instituts, Athenische Abtheilung* 25, 107-110.
- Hoepfner, W. 2003. *Der Kolob von Rhodos und die Bauten des Helios: Neue Forschungen zu einem der sieben Weltwunder*. Mainz am Rhein: Philipp von Zabern.
- Højte, J. M. 2005. *Roman Imperial Statue Bases from Augustus to Commodus*. Aarhus: Aarhus University Press.
- Holleaux, M. 1893. "Sur la chronologie des inscriptions rhodiennes", *Revue de Philologie de littérature et d'histoire anciennes* 17, 171-185.
- Huin, N. and T. Sparks. 1998. "Arrival and Progression of the Swallow *Hirundo Rustica* through Britain", *Bird Study* 45, 361-370.
- Iversen, P.A. 2017. "The Calendar on the Antikythera Mechanism and the Corinthian Family of Calendars", *Hesperia: The Journal of the American School of Classical Studies at Athens* 86, 129-203.
- Iversen, P.A. 2020. "The Antikythera Mechanism, Rhodes and Epeiros", in Ch. Carman and A. Jones (eds) *Instruments – Observations – Theories: Studies in the History of Astronomy in Honor of James Evans*, 17-38. New York: Institute for the Study of the Ancient World (<https://archive.nyu.edu/handle/2451/61288>).
- Iversen, P.A. and A. Jones. 2019. "The Back Plate Inscription and Eclipse Scheme of the Antikythera Mechanism Revisited", *Archive for History of Exact Sciences* 73.5, 469-511 with erratum, 513-516.
- Jackson, S. 1999. "Callimachean Istrus and the *Halieia* on Rhodes", *Eikasmos: Quaderni Bolognesi di Filologia Classica* 10, 119-124.
- Jacopi, G. 1932. "Nuove epigrafi dalle Sporadi Meridionali", *Clara Rhodos* 2, 165-256.
- Jacopi, G. 1932-1933. "La stipe votive", *Clara Rhodos* 6-7, 269-375.
- Jessen, O. 1912. "Helios", in W. Kroll (ed) *Paulys Real-Encyclopädie der classischen Altertumswissenschaft* 15, 58-93. Stuttgart: J.B. Metzlersche Verlagsbuchhandlung.
- Johnston, A. 1977. "Rhodes, Sunny Side Up", *Zeitschrift für Papyrologie und Epigraphik* 26, 157-158.
- Jones, A. 1999. "Geminus and the Isia", *Harvard Studies in Classical Philology* 99, 255-267.
- Jones, A. 2000. "Calendrica I: New Callippic Dates", *Zeitschrift für Papyrologie und Epigraphik* 129, 141-158.
- Jones, A. 2017. *A Portable Cosmos: Revealing the Antikythera Mechanism, Scientific Wonder of the Ancient World*. New York: Oxford University Press.
- Jones, A. 2020. The Epoch Dates of the Antikythera Mechanism (With an Appendix on its Authenticity). *Institute for the Study of the Ancient World Papers* 17: <<http://dlib.nyu.edu/awdl/isaw/isaw-papers/17/>>.
- Kaltsas, N., E. Vlachogianni, and P. Bouyia (eds) 2012. *The Antikythera Shipwreck: The Ship, the Treasures, the Mechanism. Exhibition Catalogue, National Archaeological Museum, April 2012-April 2013*. Athens: Kapon.
- Kantzia, Ch. 1989. "Οδός Π. Μελά (ακάλυπτος χώρος μεταξύ των οικοπέδων Ν. Μυλωνά και Κυπριώτη - Νουρή)", *Αρχαιολογικόν Δελτίον* 44, Χρονικά, 480-482.
- Karo, G. 1965. "Antikythera", in J. du Plat Taylor (ed) *Marine Archaeology: Developments During Sixty Years in the Mediterranean*, 35-39. London: Hutchinson.
- Klaffenbach, G. 1914. *Symbolae ad historiam collegiorum artificum Bacchiorum*. Berlin: Mayer & Müller.

- Kleiner, F. 1978. "Hoard Evidence and the Late Cistophori of Pergamum", *American Numismatic Society Field Notes* 23, 77-105.
- Köhler, U. 1884. "Exegetisch-kritische Anmerkungen zu den Fragmenten des Antigonos von Karystos", *Rheinisches Museum für Philologie* 39, 293-300.
- Kolonas, L. 2012. "The 1976 Investigations", in N. Kaltsas *et al.* (eds) 2012, 32-34.
- Konstantinopoulos, Gr. 1963. "Ἐπιγραφαὶ ἐκ Ρόδου", *Ἀρχαιολογικὸν Δέλτιον* 18, *Μελέται*, 1-36.
- Konstantinopoulos, Gr. 1966. "Ἀρχαιολογικαὶ ἀνασκαφαὶ ἐντὸς τῆς πόλεως τῆς Ρόδου", *Ἀρχαιολογικὸν Δέλτιον* 21, *Χρονικά*, 438-456.
- Kontorini, V.N. 1975. "La concours des Grands Éréthimia à Rhodes", *Bulletin de correspondance hellénique* 99, 97-117.
- Kontorini, V.N. 1989. *Inscriptions inédites relatives à l'histoire et aux cultes de Rhodes au IIe et au Ier s. av. J.-C.* (Archeologia Transatlantica 6; Publications d'histoire de l'art et d'archéologie de l'Université catholique de Louvain 42; Inscriptions inédites de Rhodes 2). Louvain-la-Neuve: Institut supérieur d'archéologie et d'histoire de l'art.
- Kretschmer, P. 1896. *Einleitung in die Geschichte der griechischen Sprache*. Göttingen: Vandenhoe und Ruprecht.
- Lambert, S.D. 2002. "Parerga II: The Date of the Nemean Games", *Zeitschrift für Papyrologie und Epigraphik* 139, 72-74.
- Larson, J. 2007. "A Land Full of Gods. Nature Deities in Greek Religion", in D. Ogden (ed) *A Companion to Greek Religion*, 56-70. Malden, MA and Oxford: Blackwell.
- Laumonier, A. 1958. *Les cultes indigènes en Carie* (Bibliothèque des Écoles Françaises d'Athènes et de Rome 188). Paris: Éditions de Boccard.
- Lehoux, D. 2007. *Astronomy, Weather, and Calendars in the Ancient World: Parapegmata and Related Texts in Classical and Near Eastern Societies*. Cambridge, UK & New York: Cambridge University Press.
- Maiuri, A. 1925. *Nuova silloge epigrafica di Rodi e Cos*. Florence: Felice Le Monnier.
- Malkin, I. 2011. *A Small Greek World: Networks in the Ancient Mediterranean*. Oxford and New York: Oxford University Press.
- Martelli, M. 1988. "La stipe votive dell'Athenaion di Jalysos: Un primo bilancio", in S. Dietz and I. Papachristodoulou (eds) *Archaeology in the Dodecanese*, 104-120. Copenhagen: National Museum of Denmark, Department of Near Eastern and Classical Antiquities.
- Marthari, M. 2000. *To Αρχαιολογικό Μουσείο της Ίου*. Athens: Hypourgeio Politismou.
- Mattingly, H.B. 1971. "Some Problems in Second Century Attic Prosopography", *Historia: Zeitschrift für Alte Geschichte* 20, 26-46.
- Meiggs, R. and D.M. Lewis. 1969. *A Selection of Greek Historical Inscriptions to the End of the Fifth Century B.C.* Oxford: Clarendon Press.
- Meritt, B.D. 1928. *The Athenian Calendar in the Fifth Century*. Cambridge, MA: Harvard University Press.
- Meritt, B.D. 1961. *The Athenian Year* (Sather Classical Lectures 32). Berkeley: University of California Press.
- Meritt, B.D. 1964. "Athenian Calendar Problems", *Transactions and Proceedings of the American Philological Association* 95, 200-260.
- Meritt, B.D. 1977. "Athenian Archons 347/6 – 48/7 B.C.", *Historia: Zeitschrift für Alte Geschichte* 26, 161-191.
- Meritt, B.D. 1981. "Mid-Third-Century Athenian Archons", *Hesperia: The Journal of the American School of Classical Studies at Athens* 50, 78-99.
- Mikalson, J.D. 1974. *The Sacred and Civil Calendar of the Athenian Year*. Princeton: Princeton University Press.
- Miller, S. 1975. "The Date of the Olympic Festivals", *Mitteilungen des Deutschen Archäologischen Instituts, Athenische Abteilung* 90, 215-231.
- Mommsen, A. 1889. "Jahresbericht über die griechischen Sakralaltertümer. 5. Artikel: Rhodos", *Jahresbericht über die Fortschritte der classischen Altertumswissenschaft* 60.3, 409-437.
- Moretti, L. 1953. *Iscrizioni agonistiche Greche* (Studi pubblicati dall'Istituto Italiano per la Storia Antica 12). Rome: Angelo Signorelli.

- Moretti, L. 1991. "Dagli *Heraia* all'*Aspis* di Argo", *Miscellanea Greca e Romana* 16, 179-189.
- Morgan, J.D. 1996. "The Calendar and the Chronology of Athens", *American Journal of Archaeology* 100, 395.
- Morgan, J.D. 1998. "Polyeuktos, the *Soteria*, and the Chronology of Athens and Delphi", *American Journal of Archaeology* 102, 389.
- Morgan, Ph. 2002. The Antikythera Mechanism. Unpublished M.Sc. Thesis, University of Cardiff.
- Nietzel, S. 1977. *Apions [Glossai Homerikai]* (Sammlung griechischer und lateinischer Grammatiker 3). Berlin & New York: de Gruyter.
- Neugebauer, O. 1975. *A History of Ancient Mathematical Astronomy*, 3 vols. (Studies in the History of Mathematics and Physical Sciences 1). Berlin, Heidelberg, New York: Springer.
- Nilsson, M.P. 1906. *Griechische Feste von religiöser Bedeutung mit Ausschluss der Attischen*. Leipzig: B.G. Teubner.
- Nilsson, M.P. 1909. *Timbres amphoriques de Lindos: Publiés avec une étude sur les timbres amphoriques rhodiens* (Exploration archéologique de Rhodes, Fondation Carlsberg, V). Copenhagen: Imprimerie Bianco Luno.
- Oikonomidou, M. 2001. "ΝΟΜΙΣΜΑΤΙΚΟΣ «ΘΗΣΑΥΡΟΣ» ΑΝΤΙΚΥΘΗΡΩΝ", in A. Alexandri and I. Leventi (eds) *Καλλιστευμα: Μελέτες προς τιμήν της Όλγας Τζάχου-Αλεξανδρή*, 541-544. Athens: Hypourgeio Politismou.
- Oppermann, H. 1924. *Zeus Panamarnos* (Religionsgeschichtliche Versuche und Vorarbeiten, Bd. 19, Heft 3). Gießen: A. Töpelmann.
- Osborne, M.J. 1989. "The Chronology of Athens in the Mid Third Century B.C.", *Zeitschrift für Papyrologie und Epigraphik* 78, 209-242.
- Osborne, M.J. 2009. "The Archons of Athens 300/299 – 228/7", *Zeitschrift für Papyrologie und Epigraphik* 171, 83-99.
- Palmer, L.R. 1963. *Mycenaean Greek Texts*. Oxford: Clarendon Press.
- Paton, W.R. 1890. "Inscriptions de Rhodes", *Bulletin de correspondance hellénique* 14, 275-291
- Paton, W.R. and E.L. Hicks. 1891. *The Inscriptions of Cos*. Oxford: Clarendon Press.
- Peek, W. 1969. *Inschriften von den dorischen Inseln* (Abhandlungen der Sächsischen Akademie der Wissenschaften zu Leipzig, Philologisch-historische Klasse 62, Heft 1). Berlin: Akademie Verlag.
- Perlman, P. 1989. "The Calendrical Position of the Nemean Games", *Athenaeum* 67, 57-90.
- Perlman, P. 2000. *City and Sanctuary in Ancient Greece: The Theorodokia in the Peloponnese* (Hypomnemata 121). Göttingen: Vandenhoeck and Ruprecht.
- Petzl, G. and E. Schwertheim. 2006. *Hadrian und die dionysischen Künstler. Drei in Alexandria Troas neugefundene Briefe des Kaisers an die Künstler-Vereinigung* (Asia Minor Studien 58). Bonn: Dr. Rudolf Habelt GMBH.
- Pfeiffer, S. 2004. *Das Dekret von Kanopos (238 v. Chr.): Kommentar und historische Auswertung eines dreisprachigen Synodaldekretes der ägyptischen Priester zu Ehren Ptolemaios' III. Und seiner Familie* (Archiv für Papyrusforschung und verwandte Gebiete 18). Munich: K.G. Saur.
- Price, D. de Sollà. 1974. "Gears from the Greeks. The Antikythera Mechanism: A Calendar Computer from ca. 80 B.C.", *Transactions of the American Philosophical Society* 64, 1-70.
- Pugliese Carratelli, G. 1939-1940. "Per la storia delle associazioni in Rodi antica", *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente* 17-18 (n.s. 1-2), 117-200.
- Pugliese Carratelli, G. 1940. "Note su epigrafi di età imperiale I. Onori a Tiberio e ad Antonio Pio", in R. Andreotti and F. Araldi (eds) *Studi di antichità classiche offerti da colleghi e discepoli a Emanuele Ciaceri al termine del suo insegnamento universitario*, 254-260. Genova: Società anonima Dante Alighieri.
- Pugliese Carratelli, G. 1951. "La formazazione dello stato rodio", *Studi Classici e Orientali* 1, 77-88.
- Pugliese Carratelli, G. 1952-1954. "Supplemento epigrafico rodio", *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente* 30-32 (n.s. 14-16), 247-316.
- Pugliese Carratelli, G. 1955-1956. "Nuovo supplemento epigrafico rodio", *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente* 33-34 (n.s. 17-18), 157-181.

- Rados, K. 1910. *Ναυτικά καὶ Ἀρχαιολογικά Σελίδες. Περὶ τῶν Θησαυρῶν τῶν Ἀντικυθήρων*. Athens: Panelleniou Kratous.
- Rediadis, P. 1910. “Τὸ ἐξ Ἀντικυθήρων Ἀστρολάβον”, *Ἀρχαιολογικὴ Ἐφημερίς* 1910, 158-172.
- Rehm, A. 1905. Svoronos, Athener Nationalmuseum. Unpublished paper in a folder entitled “Studien zu Astrolabe von Antikythera” and archived as “Rehmiana III/9” at the Bayerische Staatsbibliothek, Munich, 1-7.
- Rehm, A. 1906. *Astronomische Instrumente der Alten*. Unpublished paper archived as “Rehmiana III/7” at the Bayerische Staatsbibliothek, Munich, 1-31.
- Rehm, A. 1907. Review of P. Rediadis, *Der Astrolabos von Antikythera*, translated by W. Barth, Athens 1903. *Philologische Wochenschrift* 27, 467-470.
- Reger, G. 1994. “The Political History of the Kyklades 260-200 B.C.”, *Historia: Zeitschrift für Alte Geschichte* 43, 32-69.
- Reinach, S. 1904. “Inscriptions des îles (Ios, Délos, Rhodes, Chypre)”, *Revue des Études Grecques* 17, 196-214.
- Remijsen, S. 2011. “The So-called ‘Crown Games’: Terminology and Context of the Ancient Categories of *Agones*”, *Zeitschrift für Papyrologie und Epigraphik* 177, 97-109.
- Rigsby, K. 1996. *Asylia: Territorial Inviolability in the Hellenistic World* (Hellenistic Culture and Society 22). Berkeley, Los Angeles & London: University of California Press.
- Robinson, D.M. 1958. “A New Logos Inscription”, *Hesperia: The Journal of the American School of Classical Studies at Athens* 27, 74-78.
- Ross, L. 1845. *Inscriptiones graecae ineditae*. Fasciculus III: *Insunt lapides insularum Meli, Therae, Casi, Carpathi, Rhodi, Symes, Chalces, Calymnae, Astypalaeae, Amorgi*, II. Berlin: Typis Academicis.
- Ryan, F.X. 2010. “The Dates Indicated by the Two Deadlines in the Decree on the Stala of Athana Lindia”, in G. Reger, F.X. Ryan and T.F. Winters (eds) *Studies in Greek Epigraphy and History in Honor of Stephen V. Tracy* (Ausonius Éditions 26), 327-354. Paris & Bordeaux: Éditions de Boccard.
- Samuel, A. 1972. *Greek and Roman Chronology: Calendars and Years in Classical Antiquity* (Handbuch der Altertumswissenschaft I.7). Munich: C.H. Beck.
- Schäfer, J. 1912. *De Iove apud Cares Culto*. Dissertation, Martin-Luther University of Halle-Wittenberg.
- Schwyzler, E. 1953. *Griechische Grammatik auf der Grundlage von Karl Brugmanns griechischer Grammatik, Band I, Allgemeiner Teil. Lautlehre Wortbildung. Flexion*. Munich: C.H. Beck.
- Segre, M. 1944-1945. “Tituli Calymnii”, *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente* 22-23 (n.s. 6-7), 1-250.
- Segre, M. 1949. “L’oracolo di Apollo Pythaeus a Rodi”, *La Parola del Passato; Revista di Studi Antichi* 4, 72-82.
- Segre, M. 1951. “Rituali rodii di sacrifici”, *La Parola del Passato; Revista di Studi Antichi* 6, 139-153.
- Segre, M. 1993. *Iscrizioni di Cos* (Monografie della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente 6). Rome: L’Erma di Bretschneider.
- Segre, M. and G. Pugliese Carratelli. 1949-1951. “Tituli Camirenses”, *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente* 27-29 (n.s. 11-13), 141-318.
- Staïs, V., Chr. Tsountas, K. Kourouniotis and P. Kavvadias. 1902. “Τὰ εὑρήματα τοῦ ναυγίου τῶν Ἀντικυθήρων”, *Ἀρχαιολογικὴ Ἐφημερίς* 1902, 146-172.
- Stobbe, H.F. 1873. “Die Tribunenjahre der römischen Kaiser”, *Philologus* 32, 1-91.
- Svoronos, I.N. 1903. *Ὁ θησαυρὸς τῶν Ἀντικυθήρων*. Athens: Beck & Barth.
- Throckmorton, P. 1970. *Shipwrecks and Archaeology: The Unharvested Sea*. Boston & Toronto: Little, Brown and Company.
- Toomer, G. J. 1988. “Hipparchus and Babylonian Astronomy”, in E. Leichty, M. de J. Ellis and P. Gerardi, (eds) *A Scientific Humanist: Studies in Memory of Abraham Sachs* (Occasional Publications of the Samuel Noah Kramer Fund 9), 353-365. Philadelphia: The University of Pennsylvania Museum.

- Trümper, C. 1989. "Nochmals zu den Mykenischen Fr-Taefelchen. Die Zeitangaben innerhalb der Pylyischen Oelrationenserie", *Studi Micenei ed Egeo-Anatolici* 27, 191-234.
- Trümper, C. 1997. *Untersuchungen zu den altgriechischen Monatsnamen und Monatsfolgen* (Bibliothek der klassischen Altertumswissenschaften, ser. 2, vol. 98). Heidelberg: Universitätsverlag C. Winter.
- Tselekas, N. 2012. "The Coins", in N. Kaltsas *et al.* (eds) 2012, 216-226.
- Van der Waerden, 1960. "Greek Astronomical Calendars and Their Relation to the Athenian Civil Calendar", *JHS* 80, 168-180.
- Van der Waerden, 1984. "Greek Astronomical Calendars II.. Callippos and His Calendar", *Archive for History of Exact Sciences* 29, 115-124.
- Van Gelder, H. 1900. *Geschichte der alten Rhodier*. Haag: Martinus Nijhof.
- Vollgraff, W. 1916. "Novae inscriptiones Argivae", *Mnemosyne* 44, 219-238.
- Weinberg, G.D., V.R. Grace, G.R. Edwards, H.S. Robinson, P. Throckmorton and E. Ralph. 1965. "The Antikythera Shipwreck Reconsidered", *Transactions of the American Philosophical Society* 55, 3-48.
- Wilamowitz-Moellendorf, U. von. 1922. *Pindaros*. Berlin: Weidmann.
- Wilamowitz-Moellendorf, U. von. 1931-1932. *Der Glaube der Hellenen*, 2 vols. Berlin: Weidmann.
- Williamson, Ch. 2009. "Panamara. The (Mis)fortunes of a Karian Sanctuary", *Groniek* 42 (183), 211-218.
- Wright, M.T. 2002a. "A Planetarium Display for the Antikythera Mechanism", *Horological Journal* 144.5, 169-173.
- Wright, M.T. 2002b. "Antikythera Error", *Horological Journal* 144.6, 193.
- Wright, M.T. 2005. "The Antikythera Mechanism: A New Gearing Scheme", *Bulletin of the Scientific Instrument Society* 85 (June Issue), 2-7.
- Wright, M.T. 2006. "The Antikythera Mechanism and the Early History of the Moon-Phase Display", *Antiquarian Horology* 30, 319-329.
- Wright, M.T. 2012. "The Front Dial of the Antikythera Mechanism", in T. Koetsier and M. Ceccarelli (eds) *Explorations in the History of Machines and Mechanisms: Proceedings of HMM 2012*, 279-292. Dordrecht, Netherlands and New York: Springer.
- Wright, M.T. 2013. "The Antikythera Mechanism: Compound Gear-Trains for Planetary Indications", *Almagest: International Journal for the History of Scientific Ideas* 4.2, 4-31.
- Yalouris, N. 1990. "The Shipwreck of Antikythera: New Evidence of its date after Supplementary Investigation", in J-P. Descoedres (ed) *Eumousia: Ceramic and Iconographic Studies in Honour of Alexander Cambitoglou* (Mediterranean Archaeology Supplement 1), 135-136. Sydney: Meditarch.
- Zafeiropoulou, M. 2012. "Old and New Fragments of the Antikythera Mechanism and Inscriptions", in Kaltsas, N., E. Vlachogianni, and P. Bouyia (eds) 2012, 241-248.
- Zervoudaki, I.E. 1975. "Ἡλιος και Αλιεία", *Αρχαιολογικὸν Δέλιον* 30, *Μελέται*, 1-20.
- Zervoudaki, I.E. 1983. "ΜΑΥΣΣΩΛΛΟΣ ΚΑΙ ΑΛΙΕΙΑ", *Αρχαιολογικὸν Δέλιον* 38, *Μελέται*, 249-257.
- Zimmer, G. and K. Baïrami. 2008. "Ροδιακά Εργαστήρια Χαλκονλαστικής: Ρόδος ΙΓ", (Δημοσιεύματα του Αρχαιολογικού Δελτίου 98). Athens: Hypourgeio Politismo.
- Zink, G. 1969. "The Migrations of European Swallows *Hirudo Rustica* to Africa from Data Obtained Through Ringing in Europe", *Journal of African Ornithology* 40.1, 211-222.
- Zusaneck, H. 1996. *Rhodos und Helios. Mythos, Topos und Kultentwicklung*. 2nd Edition. Frankfurt am Main: Peter Lang.

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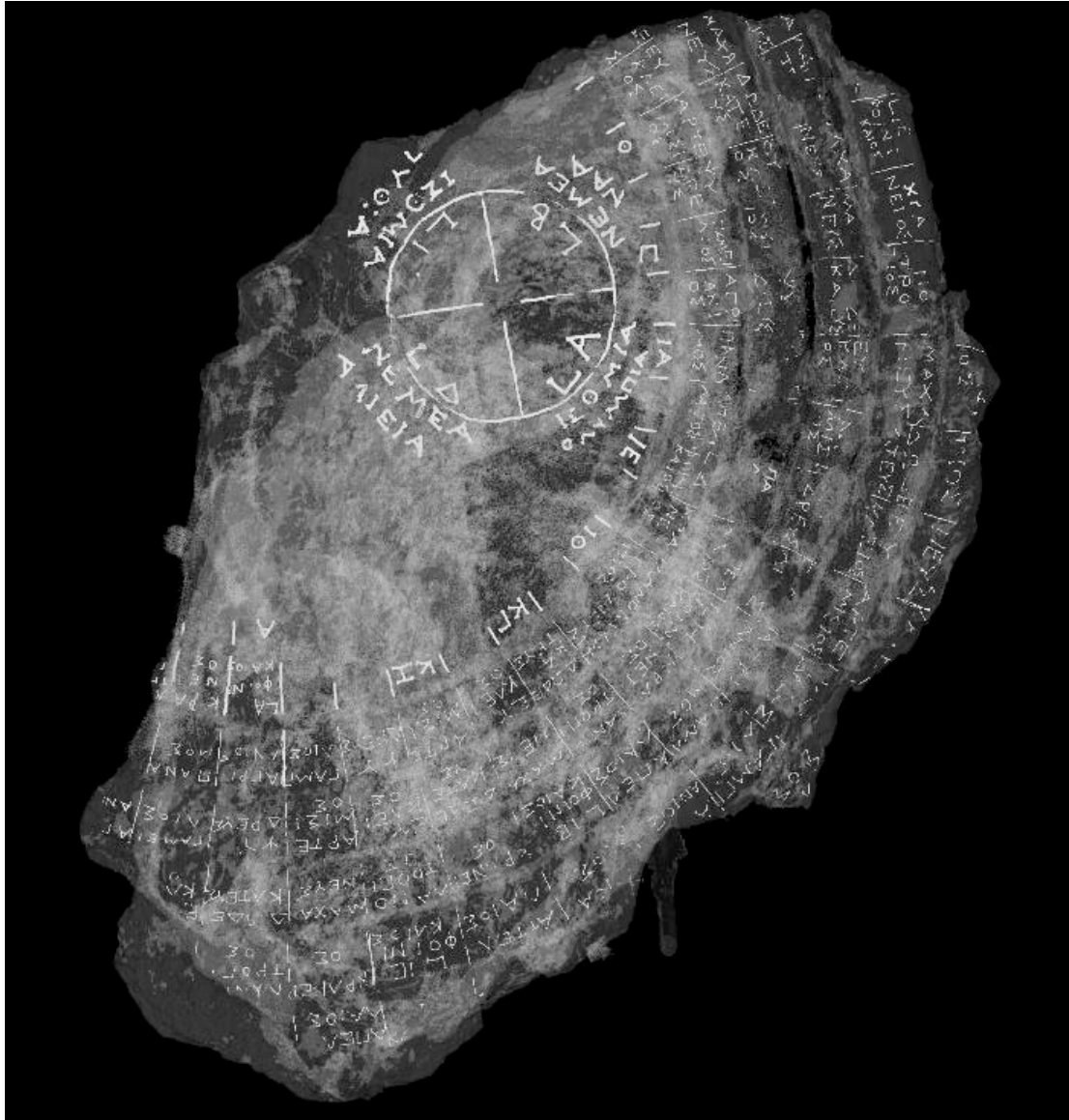


Figure. 1: The Metonic Spiral & Games Dial. Drawing by Paul Iversen

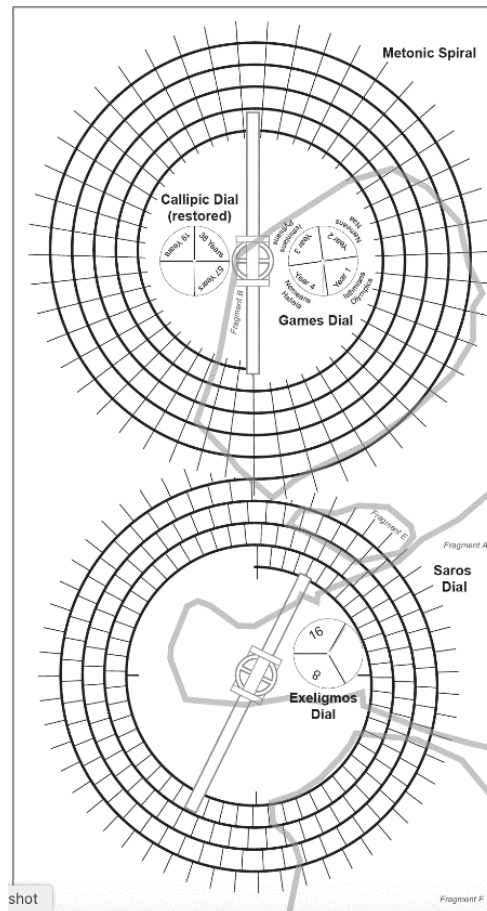


Figure 2: Proposed position of the pointers on the Metonic Spiral, the Games Dial, the Callippic Dial (restored), the Saros Dial, and the Exeligmos Dial at the start-up date of August 24, 205 BC with extant fragments marked with gray lines. The years on the Games Dial likely run from autumnal equinox to autumnal equinox.

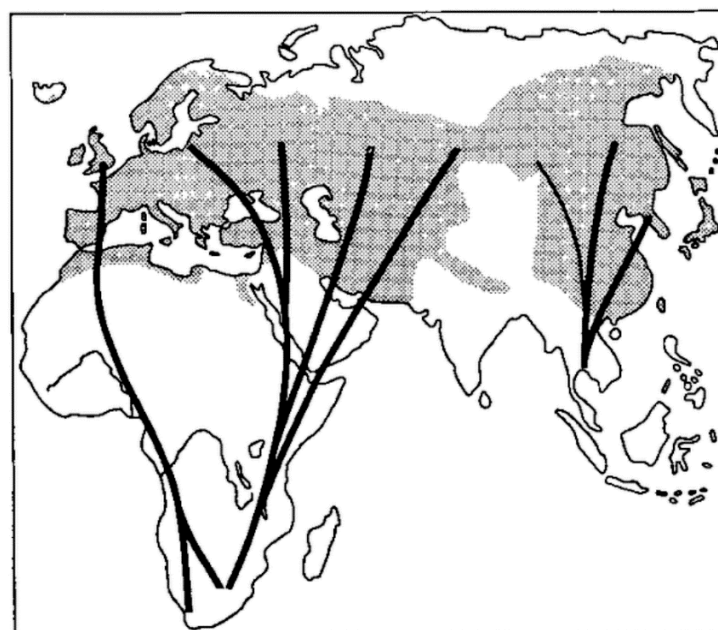


Figure 3: Generalized Swallow Migration Routes (From Zink 1969: 211)