Literary and Archæoastronomical Evidence for the Origins of the Hellenic Calendar in the Aegean Bronze Age

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Abstract

There are a number of Mycenæan Linear B tablets, which begin with the name of a month and which contain information about offerings made to divinities. These tablets suggest the exciting possibility that the Hellenic ritual lunisolar calendars of the Archaic Period (and later) are a heritage from the Mycenæan period. We know that the Hellenes had the astronomical knowledge to regulate such a calendar through intercalation, but there is only fragmentary evidence that the Mycenæans had comparable knowledge. We have performed a preliminary archæoastronomical study of Mycenæan orientations in mainland Hellas and these do not indicate any interest in systematic observations of celestial events. An investigation of corresponding orientations in Crete, on the other hand, gives strong evidence of long term astronomical observations on the part of the Minoans, observations that would have made possible the regulation of a lunisolar calendar. Moreover, the investigation indicates that the Minoans did have such a calendar. As we know that the Mycenæan culture was deeply influenced by that of the Minoan, the results of our research provide archæological support for the surviving literary evidence of a Mycenæan lunisolar calendar. We propose, therefore, that the Minoans were the source of the astronomical knowledge necessary for the Mycenæan calendar and that the Mycenæans transmitted this knowledge to the later Hellenes, where it also exerted a major influence on Hellenic Astronomy.

KEY WORDS: Hellenic Calendars, Bronze Age, Aegean Sea, Crete, Mycenæ, Literary Sources, Linear B Tablets, Tholos Tombs, Thalamos Tombs, Sanctuaries, Orientations, Ancient Astronomy.

I. Introduction

Several thousand small clay tablets, written in the so–called Linear B script of the Mycenæans, were found in the Late Bronze Age ruins of several palaces in the area which now comprises Hellas. The great majority come from Pylos in Western Hellas and Knōssos in Crete [VENTRIS & CHADWICK, 1973]. The brilliant decipherment of these tablets by Michael Ventris proved that they had been written in an early form of Hellenic, and their decoding has been characterized as one of the greatest scholastic feats of the 20th century [CHADWICK, 1960]. The significance of this achievement for the understanding of the cultures of ancient Hellas is still being realized. For example, arguments can now be made (based on some of these texts), concerning the origins of the Hellenic lunisolar calendar in a Mycenæan predecessor that was derived from the Minoan calendar. These arguments can now be supported by evidence from the archæological remains of the island of Crete.

Among the Linear B tablets found at Pylos and Knōssos were several introduced by the name of a month, for example on tablet Tn 316 [see Fig. 1], and in several cases the word for month, *mēnos*, follows the name (as we would say nowadays «in the month of X»). These tablets are considered to be parts of a ritual calendar stipulating the offerings to be made to specific deities at specified shrines in the months named [VENTRIS & CHADWICK, 1973: 275, 303-12]. The seasonal character indicated by the very names of several of the Mycenæan months, for example the sailing month on tablet Tn 316 [see Fig. 1], points to a lunisolar calendar [PALAIMA, 1995: 629 & n. 26]. In other cases the month names were those of deities and several of these, as well as the names of the deities themselves, have survived in later calendars of the various Hellenic city–states, for example *Lapato* in Arkadia and *Dios* in Aitōlia, Makedonia and Lesbos [VENTRIS & CHADWICK, 1973: 305, SAMUEL, 1972: 64-65]. The same type of ritual calendar regulated offerings to the gods in the city–states of later Hellas [GEMINOS, 8: 7-9]. Thus, there are striking similarities to the later Hellenic ritual lunisolar calendars in the Mycenæan documents.

II. Regulating Lunisolar Calendars

Lunisolar calendars require adequate astronomical knowledge about the relationship between the cycles of the Sun and the Moon, for the development of a method in order to keep months and seasons synchronized. This is best done by the intercalation of a month at regular intervals so that the same lunar months occur in the same solar seasons. The use of the eight– or the nineteen–year cycle, at the end of which the Sun, the Moon and the Earth have very nearly the same relationship to each other as they had at the beginning of the cycle, facilitates the regulation of such a calendar, the nineteen–year cycle being more accurate than the eight–year cycle [SAMUEL, 1972: 1-12]. The existence of a lunisolar calendar, however, does not prove the use of these cycles, as the calendar can be regulated on the basis of various astronomical relationships. We know that a number of rules of thumb based on such relationships were developed for intercalation at an early date in the Near East [COHEN, 1993: 5-6].

III. A Foreign Influence on the Aegean Calendars?

Similar calendars were found at Alalakh in the Near East, dating to the first half of the second millennium BCE [WISEMAN, 1953: 92-93]. Thus we have texts pointing to comparable Bronze Age ritual lunisolar calendars in the Near East and in Hellas. Although it may be tempting to see the Mycenæan calendar as the product of Near Eastern influence, in our opinion it is more likely that the calendars of both areas grew out of similar cultural circumstances. Here the overriding importance of an agricultural economy, where offerings to the gods in the proper seasons were regarded to be of great importance in securing divine good will and —consequently— continuing fertility. Also, the similarities mentioned above between the Mycenæan and the Hellenic calendars point more to a local tradition rather than to borrowing from the Near East [SAMUEL,

1972: 21-22]. We have, as we intend to show, both literary and archæoastronomical evidence for the indigenous origin and development of a lunisolar calendar in Hellas, evidence which stretches from the Early to the Late Bronze Age. This implies as well the indigenous origin of the astronomical knowledge needed.

The existence of intercalation at an early date in the Near East may be the reason why it has been something of a tradition to assume influence from that area of Hellas in the transmission of the knowledge of the eight– and nineteen–year cycles. However the evidence indicates that the Hellenes were using both cycles no later than the fifth century BCE, which is earlier than we know of their use among the Babylonians [DICKS, 1970: 172-173; SAMUEL, 1972: 35-49; COHEN, 1993: 5-6; NEUGEBAUER, 1957: 80-82]. Egypt does not seem a likely source of influence since their calendar had been separated from astronomical observations at an early date, and by the Middle Bronze Age was based on the mechanical assignment of a set number of days to the week, month and year, very much like our own calendar. Although we still determine the date for Easter in accordance with lunisolar calendric principles, which are based on the relationship between the Sun and the Full Moon following the Spring Equinox.

Our knowledge from cuneiform texts as to the existence of a lunisolar calendar in the Near East is supplemented with information from the same sources about the custom of astronomical observations necessary for the construction and maintenance of a calendar. There were scribes charged with observing and recording the motions of the celestial bodies from as early as the 3rd millennium [COHEN, 1993: 4]. However we have only recently been able to suggest just how such knowledge may have been acquired by the Mycenæans, aside from the unsupported assumption of influence from the Near East. From our archæoastronomical studies we have found indications that the method used by the Mycenæans to regulate their ritual calendar originated initially from the Minoans and was conveyed by the Mycenæans to the Hellenes. We can show that the Minoans had considerable astronomical knowledge, which by its very nature must have been the result of many years of systematic observations of the motions of celestial bodies.

IV. The Hellenic Lunisolar Calendar

The clearest written statement on the antiquity and importance of seasonal offerings in Hellas comes from the astronomer Geminos (1st century BCE): «When the years are reckoned exactly according to the Sun, and the months and days according to the Moon, then the Hellenes think that they sacrifice according to the custom of their fathers; that is, the same sacrifices to the gods are made at the same times of the year» [GEMINOS, 8: 15]. The Hellenes were in fact bound by law to observe this custom [GEMINOS, 8: 7-9]. Although Geminos is a late source, his work shows good knowledge of the history of Astronomy in Hellas and contains many references to earlier astronomers whose writings were still available. According to Geminos, the knowledge needed to regulate a lunisolar calendar was ancient in Hellas, and the Linear B calendar tablets offer support for this view. As we point out above, the instructions for ritual offerings found in the Mycenæan documents (introduced with the name of a month) indicate the use of a lunisolar calendar.

V. On the Archæoastronomical Method

Our evidence for Minoan astronomical observations has been obtained through the application of archæoastronomical methods to Minoan archæological remains. This —in practice— means study of the orientations of their monuments, the basic method of Archæoastronomy [HOSKIN, 2001:7-20; BLOMBERG & HENRIKSSON, 2001: 609-10]. As far as we know, this is the only way of recovering the astronomical achievements of an ancient culture, of which no legible documents have survived, and it is due to the fact that people in many places and periods have been strongly motivated to establish physical relationships between themselves and the cosmos by orienting their settlements and buildings to prominent celestial events.

Crucial to the accuracy of the results obtained is reliance on adequate measuring equipment and computer programs. For measuring orientations we used the digital theodolite SOKKIA SET 4C. For the computations of astronomical data we use the computer program developed by Henriksson, and for statistical evaluations we rely upon the Department of Mathematical Statistics at Uppsala University. The parameters for calculating the visibility of bright stars are from Bemporad [BEMPORAD, 1904], Sidentopf [SIDENTOPF, 1941], Ljunghall [LJUNGHALL, 1949], and Schmidt [SCHMIDT, 1865]. It is important to use Schmidt's visibility calibrations for Athens from c. 1850 CE, as his observations were made before modern air pollution.

VI. Minoan Orientations

In our study of 323 graves with passage approaches in Crete we relied on published plans, except in the case of the 224 graves at Armenoi. The orientations of these were estimated by the astronomers who measured them to be accurate to ± 1° [PAPATHANASSIOU *et al.*, 1992: S45). We measured the orientations of the remaining 99 graves on the published plans [BOSANQUET, 1901-02; EVANS, 1905; EVANS, 1914; FORSDYKE, 1926-27; HOOD & DE JONG, 1952; HOOD, HUXLEY & SANDARS, 1958-59; HUTCHINSON, 1956; IMMERWAHR, 1971; PINI, 1968; POPHAM, 1974; POPHAM, 1980]. No information was available as to the accuracy of the these, but we think it is reasonable to assume that they are accurate to within ± 5°. Only passage graves were chosen, since the orientations of long walls can be more accurately measured than those of cist or pit graves. The graves show an amazing adherence to eastward orientation within the limits of sunrise: 86% lie within these limits, which is only 18% of the circle, and 40% lie within ± 10° of due East, which is less than 6% of the circle [see Fig. 2]. From these data it is not possible to tell whether the orientations were determined by religious or other factors, but it is clear that there was a strong interest in having the graves oriented to the East within the limits of sunrise, and particularly to sunrise at the Equinoxes.

Our study of the orientations of fifteen major Minoan monuments other than graves —the four major palaces, the six peak sanctuaries with adequate surviving walls, and five of the large villas— gives even more striking results [see Fig. 3]. Ten of these fifteen monuments have orientations to major celestial events: sunrise at the Summer Solstice in two cases; sunrise at the Equinoxes in four cases; sunset at the Equinoxes in one case; sunset at the Summer Solstice in three cases; sunrise at the Winter Solstice in one case; moonrise at the Southern Major Standstill in one case; the heliacal rising of Arcturus in two cases; and the heliacal setting of the same star in three cases. A total of seventeen orientations to major celestial events at these ten sites, and eleven of the seventeen orientations were marked by a foresight. Seven of these were natural foresights and four were human–made. The asterisks in Fig. 3 signify the presence of a foresight. Four of the monuments have orientations to more than one major celestial event: two, each in the case of the peak sanctuaries on Pyrgos and Traostalos; three, in the case of the villa at Vathypetro; and four, in the case of the peak sanctuary on Petsophas. Sunrise at the Solstices and Equinoxes are all common objects of Minoan orientations. Sunset at these times seems not to have been as important; and those three orientations towards sunset at the Summer Solstice are therefore especially interesting and will be discussed below. The orientation at Petsophas to sunset at the Equinoxes is also unique and is due, we think, to the special function of that site for observing the celestial bodies: for the sake of keeping the calendar, for navigation, and perhaps also for religious reasons .

The orientations of the palace at Knōssos and the peak sanctuary on Juktas were established in the Early Bronze Age, and therefore our results indicate long–term systematic observations of the celestial bodies beginning probably no later than the second half of the third millennium BCE. The deviations from due East in the case of orientations to the Equinoxes is due to the mountainous character of Crete, which shifts sunrise southwards (except when it occurs at the sea level as in the case of Pyrgos). We are in the process of studying other monuments but our results from those buildings are still preliminary. We can say, however, that we have found nothing, which contradicts the results mentioned above.

VII. The Minoan Calendar

The preference for orientation towards the Summer Solstice, the Equinoxes and the heliacal rising and setting of Arcturus, indicates that the main purpose of the Minoans with their observations was calendric. This is underscored from the special arrangements made at three sites, to show when it was time to intercalate a month in the case of a lunisolar calendar. At Petsophas, the peak sanctuary on the east coast near the important Minoan town now known as Palaikastro, and a site with multiple orientations to major celestial events [see Fig. 4], the heliacal rising of Arcturus occurred one lunar month before the Autumn Equinox. The wall AB was oriented to this event and the appearance of Arcturus at that time permitted the application of a simple rule of thumb for determining when to intercalate a month: if the new crescent Moon appears in the eleven–day interval following the rising of Arcturus, it is time to intercalate a month. The New Moon was chosen as its first visibility is the most easily determined phase of the Moon [SAMUEL, 1972: 14]. It was traditional in later Hellas to use the first crescent Moon following one of the Solstices or Equinoxes as the beginning of the year [SAMUEL, 1972: 14-17]. Different city–states used different celestial events. Thus, at Petsophas we have evidence that the Minoan year begun with the first appearance of the New Moon following the Autumn Equinox.

At Juktas, the peak sanctuary near Knōssos on the north coast of central Crete, there was a similar arrangement [see Fig. 5]. Here the Sun rises on the morning of the Equinoxes in a saddle formed by two peaks opposite the sanctuary, and eleven days later it rises where two mountains intersect. There is no corresponding well–marked position to the North, where the Sun rises eleven days before the Autumn Equinox [see Fig. 6]. The eleventh day after the Autumn Equinox has the special value of predicting the phase of the Moon at the following Autumn Equinox, since the phase of the Moon will be the same on both days [BLOMBERG & HENRIKSSON, 2002: 82-83]. Knowing the phase of the Moon in advance of the new year may well have been ritually important as there are indications that the Moon had a prominent place in Minoan religion [BLOMBERG & HENRIKSSON, 1996: 34-35].

In the case of the palace at Knōssos the west wing is oriented to sunrise at the Equinoxes and the result is such that a conspicuous shallow bowl forming one of the stones of the floor in the most sacred area of the building is illuminated by the first rays of the Sun on the Equinoxes and, when filled with water, casts a reflection on the rear wall of the room [see Fig. 7]. Eleven days after the Autumn Equinox the Sun strikes the stone for the last time, until it does again eleven days before the Spring Equinox. Here the same rule of thumb applies in connection with the Autumn Equinox: if the New Moon appears in the interval following the Equinox, when the first rays of sunrise strike the bowl, and eleven days following the Autumn Equinox, when the shallow bowl is illuminated for the last time until the Spring Equinox, then it is time to intercalate a month. There were no architectural features which interfered with the proposed arrangement and there are several which support our interpretation of the deliberate construction of a calendar device in this very important Minoan building. One feature is that the shadow cast by the Sun on the morning of the Equinoxes just grazes a double axe inscribed in the southern wall [BLOMBERG & HENRIKSSON, 2002: 83-85]. Another is that the floor level of the sacred area remained the same over the centuries as the level of the Central Court rose. The position of the stone above the original floor level is crucial for the functioning of the device.

Only the palace at Mallia was not oriented to a major celestial event, but it presents an alignment of calendric significance, as we have shown elsewhere [HENRIKSSON & BLOMBERG, forthcoming].

Thus, evidence from the orientations of three of the most important Minoan sites indicates that the Minoan year began in connection with the Fall Equinox. This was not the most usual time for the beginning of the year in Hellas.

The Solstices were more usually followed by the Spring Equinox [TRÜMPY, 1997: 1]. It may therefore be significant that the new year in Knōssos in the Hellenistic period began in connection with the Autumn Equinox [GUARDUCCI, 1945: 79].

In our opinion, there is strong evidence for concluding that the Minoans had a lunisolar calendar of the same type as the later Hellenes, which was a calendar that began at the first appearance of the new crescent Moon following an Equinox or Solstice, the Autumn Equinox in the case of the Minoans. In order to be able to orientate complex structures to several major celestial events (as at Petsophas and Pyrgos), the Minoans must have conducted systematic observations at these sites for a very long time. Since the peak sanctuary on Juktas was in use in the Early Bronze Age and the west wing of the palace at Knōssos retained the orientation of the Early Bronze Age structure on the site when it was built in the Middle Minoan Period [CATLING, 1973-74: 34; SHAW, 1977: 48], we can assume that the Minoans had begun their systematic observations of the celestial bodies long before the beginning of the 2nd Millennium BCE. The Mycenæans, as we know, assumed power in Crete at some point in the Late Bronze Age. The precise time for this and the nature of their supremacy is very much debated but it is generally agreed that they had gained control in Crete by the Late Minoan II Period [DRIESSEN & MACDONALD, 1997]. They adapted the Minoan Linear A script for writing their own language and their pottery styles are closely related to those of the Minoans. Therefore, it would not be surprising at all if they had also adopted the Minoan calendar.

VIII. Mycenæan Orientations

If we consider, instead, the possibility that the calendar of the Mycenæans was based on their own astronomical observations rather than having been borrowed from the Minoans, is there any support for this? We studied the orientations of 370 passage graves in Mycenæan Hellas [see Fig. 8]. The 54 at Prosymna were measured with a theodolite and can therefore be assumed to be accurate to less than ± 1° [BLEGEN, 1937]. The others were measured by us on the published plans and (as in the case of the Minoan graves above), we estimate the accuracy of the measurements to be within ± 5° [BLEGEN, 1973; BULLE, 1906-09; DĒMAKOPOULOU, 1990; FRÖDIN & PERSSON, 1938; HEARTLEY & SKEAT, 1930-31; HOPE SIMPSON, 1958-59; IAKŌVIDĒS, 1980; KONTORLĒ–PAPADOPOULOU, 1987; MARAVELIA, 2002; PAPADOPOULOS, 1976; PAPAZOGLOU–MANIOUDAKĒ, 1994; PERSSON, 1931; PERSSON, 1942; PROTONOTARIOU–DEILAKĒ, 1990; WACE, 1932; WELLS, 1990]. It is apparent that the distribution of the Mycenæan orientations is completely different from the Minoan. There is no concentration to any major celestial event. There is indeed a significant concentration to the southwest quadrant (56%), but not towards sunset at the Winter Solstice.

We also measured the orientations of the Mycenæan palaces and cult rooms from the recently published plans in a special study of these places, where the orientations are in most cases stated [WHITTAKER, 1997]. These structures show no pattern in their orientations [see Fig. 9], in contrast to what we found in the case of Minoan buildings. No consistent interest can be discerned for major celestial events.

In our own investigations of Minoan monuments, however, we found three small shrines in Crete which deviated in their orientations from those of the other buildings in our study: the oblique building in the North Court of the palace at Mallia, the similar small shrine just southeast of the villa at Hagia Triada (building H), and the tripartite shine just east of the columnar hall of the villa at Vathypetro. These three buildings were religious in character and all have the same orientation: to sunset at the Summer Solstice [Figs. 3 & 10]. The first two were built following the island–wide destructions at the end of the period Late Mionan IB [PELON, 1997; LA ROSA, 1985], the period considered by many to have been followed by Mycenæan control in Crete. The tripartite shrine could not be dated archæologically but shards from Late Minoan III were found in the area of the Villa [DRIESSEN & SAKELLARAKĒS, 1997; SHAW, 1978; HENRIKSSON & BLOMBERG, forthcoming]. These three small shrines are the only buildings which we have found in Crete with this particular orientation. We think it probable that they are Mycenæan, constructed in Crete under the influence of the Minoan custom for orienting important monuments to major celestial events. They may provide concrete evidence of Mycenæan acquaintance with the Minoan techniques for keeping their lunisolar calendar, and also with Minoan astronomical knowledge in general.

Aside of these three remarkable small shrines we find no other evidence of Mycenæan systematic observations of the celestial bodies in the orientations of their graves and other monuments, as we do in the case of the Minoans. Yet we do find the use of a lunisolar calendar in Mycenæan documents. Moreover this calendar is of the same type as that used by the later Hellenes. The Mycenæans were acquainted with Minoan culture to the extent that they could adapt the Linear A syllabic script of the Minoans to their own language, although the two languages seem not to have been closely related. In general the Mycenæans give the impression of having been great admirers of Minoan culture and willing to be influenced by it. We propose that the source of their calendar was that of the Minoans, and that this calendar continued to be used in the later Hellenic communities, many of which grew up in or near the ruins of the former Mycenæan centers. This is by no means an unrealistic assumption as our own calendar is derived from the Julian calendar, which goes back before our own era.

The results from our archæoastronomical investigations of the archæological ruins of the Minoans (and also of the Mycenæans in Crete), support the evidence from the Mycenæan documents that their calendar was lunisolar and that it was derived from the Minoans, rather than having been developed from their own observations or from a foreign influence.

IX. The Minoan Influence on Hellenic Astronomy

Our archæoastronomical investigations of Minoan monuments indicate an accumulation of considerable

astronomical knowledge. We proposed that this knowledge —as in the case of the calendar— was acquired by the Mycenæans and was conveyed through them to the Hellenes. The intrinsic reasonableness of this is supported by the concrete evidence of the Mycenæan orientations to a major celestial event of three important buildings in Crete, as well as of passages in early Hellenic literature which attest to early celestial observations, i.e.: the study of the heavens on the part of the ephors at Sparta [BLOMBERG & HENRIKSSON 1996: 39].

Other signs for the transmission of astronomical knowledge lie in the navigational handbooks which have survived. The most complete of these was written by Aratos in the 3rd century BCE. This work has its place in a literary tradition that was several centuries old by Aratos' time, and which continued long into the Roman period. The dependence of this work on Bronze Age observations has been shown by a number of modern authors using several different methods of proof [HENRIKSSON & BLOMBERG, 1999; HENRIKSSON & BLOMBERG, 2000; BLOMBERG, P., present volume]. Giving strong support to this hypothesis are the archæological finds of parts of figurines from the peak sanctuaries on Petsophas and Traostalos. These are almost exclusively of the type used by Aratos to describe the constellations as they rise and set during the night [BLOMBERG, 2002; BLOMBERG, 2000]. Our study indicates that the positions given by Aratos were those of the relevant stars at c. 2000 BCE and that there was continuing adjustment due to the shift in stellar positions as a result of the precession of the celestial sphere. As in the case of the lunisolar calendar, the Mycenæans and the later Hellenes had good need of navigational skills and would most probably have used the knowledge acquired by the Minoans.

X. Bibliography

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TABLE 1. Grave Orientations in Crete.

№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)
1	Armenoi, Zone A, 1	82	57	Armenoi, Zone A, 96	83	113	Armenoi, Zone B, 12	112
2	Armenoi, Zone A, 2	98	58	Armenoi, Zone A, 98	82	114	Armenoi, Zone B, 13	104
3	Armenoi, Zone A, 3	56	59	Armenoi, Zone A, 160	72	115	Armenoi, Zone B, 14	98
4	Armenoi, Zone A, 4	103	60	Armenoi, Zone A, 161	72	116	Armenoi, Zone B, 15	122
5	Armenoi, Zone A, 25	65	61	Armenoi, Zone A, 162	78	117	Armenoi, Zone B, 16	88
6	Armenoi, Zone A, 26	76	62	Armenoi, Zone A, 163	75	118	Armenoi, Zone B, 17	97
7	Armenoi, Zone A, 27	81	63	Armenoi, Zone A, 167	92	119	Armenoi, Zone B, 18	99
8	Armenoi, Zone A, 28	93	64	Armenoi, Zone A, 168	70	120	Armenoi, Zone B, 19	98
9	Armenoi, Zone A, 29	83	65	Armenoi, Zone A, 171	81	121	Armenoi, Zone B, 20	96
10	Armenoi, Zone A, 30	76	66	Armenoi, Zone A, 172	72	122	Armenoi, Zone B, 21	96
11	Armenoi, Zone A, 31	78	67	Armenoi, Zone A, v173	76	123	Armenoi, Zone B, 22	96
12	Armenoi, Zone A, 32	74	68	Armenoi, Zone A, 174	77	124	Armenoi, Zone B, 24	92
13	Armenoi, Zone A, 33	72	69	Armenoi, Zone A, 175	60	125	Armenoi, Zone B, 49	100
14	Armenoi, Zone A, 34	98	70	Armenoi, Zone A, 176	78	126	Armenoi, Zone B, 51	105
15	Armenoi, Zone A, 35	94	71	Armenoi, Zone A, 177	68	127	Armenoi, Zone B, 52	102
16	Armenoi, Zone A, 36	74	72	Armenoi, Zone A, 179	69	128	Armenoi, Zone B, 53	110
17	Armenoi, Zone A, 37	68	73	Armenoi, Zone A, 180	70	129	Armenoi, Zone B, 55	122
18	Armenoi, Zone A, 38	54	74	Armenoi, Zone A, 181	70	130	Armenoi, Zone B, 57	106
19	Armenoi, Zone A, 39	52	75	Armenoi, Zone A, 182	68	131	Armenoi, Zone B, 63	113
20	Armenoi, Zone A, 40	78	76	Armenoi, Zone A, 183	83	132	Armenoi, Zone B, 64	122
21	Armenoi, Zone A, 41	84	77	Armenoi, Zone A, 185	78	133	Armenoi, Zone B, 81	92
22	Armenoi, Zone A, 42	62	78	Armenoi, Zone A, 186	95	134	Armenoi, Zone B, 82	95
23	Armenoi, Zone A, 43	56	79	Armenoi, Zone A, 187	93	135	Armenoi, Zone B, 83	92
24	Armenoi, Zone A, 44	64	80	Armenoi, Zone A, 189	109	136	Armenoi, Zone B, 131	99
25	Armenoi, Zone A, 45	64	81	Armenoi, Zone A, 190	58	137	Armenoi, Zone B, 132	118
26	Armenoi, Zone A, 46	64	82	Armenoi, Zone A, 191	58	138	Armenoi, Zone B, 139	98
27	Armenoi, Zone A, 47	72	83	Armenoi, Zone A, 192	84	139	Armenoi, Zone B, 140	92
28	Armenoi, Zone A, 48	75	84	Armenoi, Zone A, 196	84	140	Armenoi, Zone B, 141	108
29	Armenoi, Zone A, 65	81	85	Armenoi, Zone A, 198	68	141	Armenoi, Zone B, 142	102
30	Armenoi, Zone A, 66	68	86	Armenoi, Zone A, 199	66	142	Armenoi, Zone B, 143	114
31	Armenoi, Zone A, 67	88	87	Armenoi, Zone A, 200	106	143	Armenoi, Zone B, 157	122
32	Armenoi, Zone A, 68	90	88	Armenoi, Zone A, 201	102	144	Armenoi, Zone B, 158	116
33	Armenoi, Zone A, 69	90	89	Armenoi, Zone A, 202	92	145	Armenoi, Zone B, 159	112
34	Armenoi, Zone A, 70	92	90	Armenoi, Zone A, 203	93	146	Armenoi, Zone B, 164	112
35	Armenoi, Zone A, 71	82	91	Armenoi, Zone A, 204	85	147	Armenoi, Zone B, 165	102
36	Armenoi, Zone A, 72	86	92	Armenoi, Zone A, 205	88	148	Armenoi, Zone B, 169	96
37	Armenoi, Zone A, 73	100	93	Armenoi, Zone A, 206	65	149	Armenoi, Zone B, 170	89
38	Armenoi, Zone A, 74	92	94	Armenoi, Zone A, 207	89	150	Armenoi, Zone B, 193	106
39	Armenoi, Zone A, 75	101	95	Armenoi, Zone A, 208	82	151	Armenoi, Zone B, 194	119
40	Armenoi, Zone A, 76	72	96	Armenoi, Zone A, 209	84	152	Armenoi, Zone B, 197	117
41	Armenoi, Zone A, 77	72	97	Armenoi, Zone A, 210	89	153	Armenoi, Zone B, ?	102
42	Armenoi, Zone A, 78	76	98	Armenoi, Zone A, 211	112	154	Armenoi, Zone B, ?	124
43	Armenoi, Zone A, 79	74	99	Armenoi, Zone A, 212	120	155	Armenoi, Zone B, ?	107
44	Armenoi, Zone A, 80	58	100	Armenoi, Zone A, 213	128	156	Armenoi, Zone C, 23	108
45	Armenoi, Zone A, 84	89	101	Armenoi, Zone A, LIII	86	157	Armenoi, Zone C, 50	98
46	Armenoi, Zone A, 85	96	102	Armenoi, Zone A, LIV	92	158	Armenoi, Zone B, 54	107
47	Armenoi, Zone A, 86	112	103	Armenoi, Zone A, ?	95	159	Armenoi, Zone C, 56	118
48	Armenoi, Zone A, 87	88	104	Armenoi, Zone A, ?	94	160	Armenoi, Zone C, 58	120
49	Armenoi, Zone A, 88	100	105	Armenoi, Zone A, ?	81	161	Armenoi, Zone C, 59	128
50	Armenoi, Zone A, 89	92	106	Armenoi, Zone A, ?	92	162	Armenoi, Zone C, 60	101
51	Armenoi, Zone A, 90	83	107	Armenoi, Zone B, 6	101	163	Armenoi, Zone C, 61	112
52	Armenoi, Zone A, 91	94	108	Armenoi, Zone B, 7	99	164	Armenoi, Zone C, 62	118
53	Armenoi, Zone A, 92	126	109	Armenoi, Zone B, 8	133	165	Armenoi, Zone C, 100	118
54	Armenoi, Zone A, 93	123	110	Armenoi, Zone B, 9	119	166	Armenoi, Zone C, 101	124
55	Armenoi, Zone A, 94	110	111	Armenoi, Zone B, 10	115	167	Armenoi, Zone C, 102	108
56	Armenoi, Zone A, 95	75	112	Armenoi, Zone B, 11	109	168	Armenoi, Zone C, 103	112

TABLE 1. Grave Orientations in Crete (continued).

№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)
169	Armenoi, Zone C, 104	113	221	Armenoi, Zone C, 220	118	273	Mavro Spēlio 7	242
170	Armenoi, Zone C, 105	93	222	Armenoi, Zone C, LI	106	274	Mavro Spēlio 9	208
171	Armenoi, Zone C, 106	110	223	Armenoi, Zone C, LII	110	275	Mavro Spēlio 12	248
172	Armenoi, Zone C, 107	82	224	Armenoi, Zone C, ?	?94	276	Mavro Spēlio 13	232
173	Armenoi, Zone C, 108	96	225	Zafer Papoura 8	110	277	Mavro Spēlio 14	271
174	Armenoi, Zone C, 109	117	226	Zafer Papoura 9	99	278	Mavro Spēlio 15	236
175	Armenoi, Zone C, 110	112	227	Zafer Papoura 10	72	279	MAVRO SPELIO 16	231
176	Armenoi, Zone C, 111	116	228	Zafer Papoura 11	97	280	Mavro Spēlio 18	262
177	Armenoi, Zone C, 112	112	229	Zafer Papoura 12	106	281	Mavro Spēlio 19	248
178	Armenoi, Zone C, 113	115	230	Zafer Papoura 13	96	282	Mavro Spēlio 21	224
179	Armenoi, Zone C, 114	118	231	Zafer Papoura 14	120	283	Mavro Spēlio 22	243
180	Armenoi, Zone C, 115	114	232	Zafer Papoura 15	102	284	Gypsades 1	91
181	Armenoi, Zone C, 116	109	233	Zafer Papoura 16	96	285	Gypsades 3	68
182	Armenoi, Zone C, 117	113	234	Zafer Papoura 17	95	286	Gypsades 4	87
183	Armenoi, Zone C, 118	126	235	Zafer Papoura 18	95	287	Gypsades 5	92
184	Armenoi, Zone C, 119	101	236	Zafer Papoura 19	96	288	GYPSADES 6	49
185	Armenoi, Zone C, 120	120	237	Zafer Papoura 20	95	289	Gypsades 7	29
186	Armenoi, Zone C, 121	114	238	Zafer Papoura 21	96	290	Gypsades 8	359
187	Armenoi, Zone C, 122	104	239	Zafer Papoura 22	95	291	Gypsades 9	91
188	Armenoi, Zone C, 123	112	240	Zafer Papoura 29	94	292	Gypsades 10	53
189	Armenoi, Zone C, 124	113	241	Zafer Papoura 32	98	293	Gypsades 15	25
190	Armenoi, Zone C, 125	122	242	Zafer Papoura 35	113	294	Lower Gypsades	257
191	Armenoi, Zone C, 126	99	243	Zafer Papoura 39	93	295	Knōssos, Hospital Site 1	125
192	Armenoi, Zone C, 127	114	244	Zafer Papoura 40	95	296	Knōssos, Hospital Site 3	114
193	Armenoi, Zone C, 128	101	245	Zafer Papoura 49	100	297	Knōssos, Hospital Site 5	89
194	Armenoi, Zone C, 129	122	246	Zafer Papoura 50	97	298	Knōssos, Sellopoulo 3	243
195	Armenoi, Zone C, 130	100	247	Zafer Papoura 52	100	299	Knōssos, Sellopoulo 4	243
196	Armenoi, Zone C, 133	114	248	Zafer Papoura 53	99	300	Knōssos, Hag. Iōannēs	249
197	Armenoi, Zone C, 134	100	249	Zafer Papoura 54	99	301	Knōssos, Kephala	239
198	Armenoi, Zone C, 135	92	250	Zafer Papoura 56	96	302	Knōssos, W of Temple Tomb	331
199	Armenoi, Zone C, 136	92	251	Zafer Papoura 69	115	303	Knōssos, Isopata ?	67
200	Armenoi, Zone C, 137	124	252	Zafer Papoura 80	95	304	Knōssos, Isopata 1	10
201	Armenoi, Zone C, 138	122	253	Zafer Papoura 81	96	305	Knōssos, Isopata 1A	101
202	Armenoi, Zone C, 144	130	254	Zafer Papoura 82	92	306	KNŌSSOS, ISOPATA 2	357
203	Armenoi, Zone C, 145	128	255	Zafer Papoura 84	105	307	Knōssos, Isopata 3	6
204	Armenoi, Zone C, 146	102	256	Zafer Papoura 85	95	308	Knōssos, Isopata 4	1
205	Armenoi, Zone C, 147	118	257	Zafer Papoura 86	94	309	Knōssos, Isopata 5	104
206	Armenoi, Zone C, 148	98	258	Zafer Papoura 89	95	310	Knōssos, Isopata 6	91
207	Armenoi, Zone C, 149	92	259	Zafer Papoura 90	94	311	Phaistos 4	92
208	Armenoi, Zone C, 150	103	260	Zafer Papoura 93	98	312	Phaistos 5	106
209	Armenoi, Zone C, 151	102	261	Zafer Papoura 94	97	313	Phaistos 6	106
210	Armenoi, Zone C, 152	97	262	Zafer Papoura 95	92	314	Phaistos 7	90
211	Armenoi, Zone C, 153	97	263	Zafer Papoura 96	98	315	Phaistos 8	96
212	Armenoi, Zone C, 154	83	264	Zafer Papoura 97	118	316	Phaistos 9	95
213	Armenoi, Zone C, 155	115	265	Zafer Papoura 98	94	317	Phaistos 10	92
214	Armenoi, Zone C, 156	113	266	Zafer Papoura 99	96	318	Phaistos 11	92
215	Armenoi, Zone C, 214	106	267	Zafer Papoura 100	139	319	Phaistos 12	100
216	Armenoi, Zone C, 215	118	268	Knōssos, Temple Tomb	84	320	Phaistos 13	107
217	Armenoi, Zone C, 216	126	269	Mavro Spēlio 1	241	321	Phaistos ?	96
218	Armenoi, Zone C, 217	129	270	Mavro Spēlio 3	239	322	Mallia, Chrysolakkos	82
219	Armenoi, Zone C, 218	132	271	Mavro Spēlio 4	244	322	Palaikastro	190
220	Armenoi, Zone C, 219	135	272	Mavro Spēlio 6	238	323	Archanes Tholos A	78

TABLE 2. Grave Orientations in Mainland Hellas.

№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)
1	Mycenæ Clytaimnēstra Grave	168	56	Dendra 14	231	111	Prosymna XXXV	194
2	Mycenæ Grave circle A	259	57	Dendra 15	262	112	Prosymna XXXVI	196
3	Mycenæ C–T Grave	115	58	Dendra 16	256	113	Prosymna XXXVII	103
4	Mycenæ Atreus Grave	101	59	Dendra Tholos	256	114	Prosymna XXXVIII	96
5	Mycenæ 1	285	60	Pylos Grave III	233	115	Prosymna XXXIX	86
6	Mycenæ 2	195	61	Pylos Tholos IV	227	116	Prosymna XL	65
7	Mycenæ 3	200	62	Pylos E–4	178	117	Prosymna XLI	266
8	Mycenæ 4	259	63	Pylos E–6	170	118	Prosymna XLII	246
9	Mycenæ 5	276	64	Pylos E–8	182	119	Prosymna XLIII	126
10	Mycenæ 6	338	65	Pylos E–9	178	120	Prosymna XLIV	237
11	Mycenæ 7	307	66	Pylos E–10	181	121	Prosymna XLV	262
12	Mycenæ 8	77	67	Pylos K–1	193	122	Prosymna XLVI	276
13	Mycenæ 9	174	68	Pylos K–2	269	123	Prosymna XLVII	220
14	Mycenæ Fig Tree Tomb	104	69	Asinē 1 North–East	13	124	Prosymna XLVIII	263
15	Mycenæ ?	114	70	Asinē 1 East	54	125	Prosymna XLIX	266
16	Mycenæ 102	102	71	Asinē 2	35	126	Prosymna L	204
17	Mycenæ 502	116	72	Asinē 3	47	127	Prosymna LI	196
18	Mycenæ 504	97	73	Asinē 5	61	128	Prosymna LII	188
19	Mycenæ 505	90	74	Asinē 6	40	129	Prosymna WI	228
20	Mycenæ 513, Kalkani	341	75	Asinē 7	53	130	Prosymna WII	267
21	Mycenæ 514, Kalkani	16	76	Asinē II: 1	9	131	Kokla I	113
22	Mycenæ 515, Kalkani	5	77	Prosymna I	240	132	Kokla VIII	98
23	Mycenæ 516, Kalkani	1	78	Prosymna II	124	133	Kokla IX	110
24	Mycenæ 517, Kalkani	358	79	Prosymna III	129	134	Kokla VII	137
25	Mycenæ 518, Kalkani	10	80	Prosymna IV	136	135	Kokla VI	129
26	Mycenæ 519, Kalkani	7	81	Prosymna V	288	136	Kokla V	117
27	Mycenæ 520, Kalkani	282	82	Prosymna VI	304	137	Kokla IV	103
28	Mycenæ 521, Kalkani	248	83	Prosymna VII	326	138	Kokla II	112
29	Mycenæ 522, Kalkani	217	84	Prosymna VIII	304	139	Aigion A	12
30	Mycenæ 523, Kalkani	199	85	Prosymna IX	284	140	Aigion 1	22
31	Mycenæ 524, Kalkani	217	86	Prosymna X	213	141	Aigion 2	31
32	Mycenæ 525, Kalkani	17	87	Prosymna XI	247	142	Aigion 3	22
33	Mycenæ 526, Kalkani	13	88	Prosymna XII	260	143	Aigion 4	13
34	Mycenæ 527, Kalkani	2	89	Prosymna XIII	128	144	Aigion 5	32
35	Mycenæ 528, Kalkani	7	90	Prosymna XIV	316	145	Aigion 5a	347
36	Mycenæ 529, Kalkani	14	91	Prosymna XV	315	146	Aigion 5b	23
37	Mycenæ 530, Kalkani	2	92	Prosymna XVI	231	147	Aigion 6	30
38	Mycenæ 531, Kalkani	224	93	Prosymna XVII	253	148	Aigion 7	19
39	Mycenæ 532, Kalkani	15	94	Prosymna XVIII	279	149	Aigion 8	22
40	Mycenæ 533, Kalkani	4	95	Prosymna XIX	286	150	Athens, Agora 1	20
41	Mycenæ ?, Kalkani	217	96	Prosymna XX	282	151	Athens, Agora 3	25
42	Mycenæ ?, Kalkani	221	97	Prosymna XXI	285	152	Athens, Agora 4	16
43	Dendra 1	258	98	Prosymna XXII	270	153	Athens, Agora 5	118
44	Dendra 2	263	99	Prosymna XXIII	229	154	Athens, Agora 7	283
45	Dendra 3	260	100	Prosymna XXIV	242	155	Athens, Agora	88
46	Dendra 4	259	101	Prosymna XXV	231	156	Athens, Agora	7
47	Dendra 5	240	102	Prosymna XXVI	225	157	Athens, Agora 13	14
48	Dendra 6	249	103	Prosymna XXVII	239	158	Athens, Agora 14	1
49	Dendra 7	248	104	Prosymna XXVIII	214	159	Athens, Agora 15	28
50	Dendra 8	251	105	Prosymna XXIX	155	160	Athens, Agora 18	59
51	Dendra 9	226	106	Prosymna XXX	240	161	Athens, Agora 20	1
52	Dendra 10	247	107	Prosymna XXXI	225	162	Athens, Agora 21	35
53	Dendra 11	238	108	Prosymna XXXII	223	163	Athens, Agora 23	304
54	Dendra 12 *Cuirass Tomb*	255	109	Prosymna XXXIII	219	164	Athens, Agora 24	10
55	Dendra 13	240	110	Prosymna XXXIV	222	165	Athens, Agora 40	246

TABLE 2. Grave Orientations in Mainland Hellas (continued).

№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)
166	Perati 1	274	219	Perati 96	155	272	Perati 151	191
167	Perati 2	252	220	Perati 97	158	273	Perati 152	205
168	Perati 3	250	221	Perati 99	82	274	Perati 153	203
169	Perati 4	265	222	Perati 100	134	275	Perati 154	199
170	Perati 5	237	223	Perati 102	238	276	Perati 155	216
171	Perati 10	238	224	Perati 103	246	277	Perati 156	194
172	Perati 12	193	225	Perati 104	244	278	Perati 157	192
173	Perati 13	198	226	Perati 105	217	279	Perati Σ 1	221
174	Perati 14	248	227	Perati 106	226	280	Perati Σ 2	257
175	Perati 15	244	228	Perati 107	208	281	Perati Σ 3	239
176	Perati 16	241	229	Perati 108	211	282	Perati Σ 4	263
177	Perati 17	263	230	Perati 109	185	283	Perati Σ 5	239
178	Perati 18	182	231	Perati 110	212	284	Perati Σ 6	118
179	Perati 19	247	232	Perati 111	193	285	Perati Σ 7	141
180	Perati 20	250	233	Perati 112	191	286	Perati Σ 8	213
181	Perati 21	241	234	Perati 113	170	287	Perati Σ 9	190
182	Perati 23	227	235	Perati 114	215	288	Perati Σ 10	164
183	Perati 25	230	236	Perati 115	280	289	Perati Σ 11	210
184	Perati 26	198	237	Perati 116	277	290	Perati Σ 12	209
185	Perati 27	197	238	Perati 117	297	291	Perati Σ 13	154
186	Perati 31	204	239	Perati 118	257	292	Perati Σ 14	195
187	Perati 33	212	240	Perati 119	271	293	Perati Σ 15	166
188	Perati 36	219	241	Perati 120	284	294	Perati Σ 15	169
189	Perati 39	217	242	Perati 121	264	295	Perati Σ 16	190
190	Perati 42	280	243	Perati 122	234	296	Perati Σ 18	191
191	Perati 43	359	244	Perati 123	236	297	Perati Σ 22	184
192	Perati 46	226	245	Perati 124	236	298	Perati Σ 23	190
193	Perati 47	217	246	Perati 125	229	299	Perati Σ 24	206
194	Perati 48	276	247	Perati 126	217	300	Perati Σ 25	198
195	Perati 49	273	248	Perati 127	226	301	Perati Σ 26	209
196	Perati 50	274	249	Perati 128	221	302	Perati Σ 27	163
197	Perati 51	227	250	Perati 129	246	303	Perati Σ 28	181
198	Perati 52	200	251	Perati 130	239	304	Perati Σ 29	147
199	Perati 53	195	252	Perati 131a	226	305	Perati Σ 30	174
200	Perati 55	224	253	Perati 131b	218	306	Perati Σ 31	129
201	Perati 57	308	254	Perati 132	227	307	Perati Σ 32	114
202	Perati 64	130	255	Perati 133	223	308	Perati Σ 33	199
203	Perati 65	128	256	Perati 134	203	309	Perati Σ 34	180
204	Perati 66	195	257	Perati 135	212	310	Perati Σ 35	115
205	Perati 67	185	258	Perati 136	209	311	Perati Σ 36	132
206	Perati 68	164	259	Perati 137	210	312	Perati Σ 37	122
207	Perati 74	104	260	Perati 139	220	313	Perati Σ 38	193
208	Perati 75	93	261	Perati 140	207	314	Perati Σ 39	198
209	Perati 76	97	262	Perati 141	191	315	Perati Σ 40	186
210	Perati 77	125	263	Perati 142	205	316	Perati Σ 41	193
211	Perati 78	209	264	Perati 143	221	317	Perati Σ 43	251
212	Perati 87	273	265	Perati 144	208	318	Perati Σ 44	137
213	Perati 88	283	266	Perati 145	198	319	Perati Σ 46	200
214	Perati 89	275	267	Perati 146	203	320	Perati Σ 47	223
215	Perati 90	146	268	Perati 147	240	321	Perati Σ 48	189
216	Perati 91	127	269	Perati 148	198	322	Perati Σ 49	187
217	Perati 92	134	270	Perati 149	220	323	Perati Σ 50	258
218	Perati 93	188	271	Perati 150	196	324	Perati Σ 51	269

TABLE 2. Grave Orientations in Mainland Hellas (continued).

№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)	№	Site and Grave Designation	A(°)
325	Perati Σ 52	237	341	Triphylia, Tholos 1	207	357	Volimidhia A8	181
326	Perati Σ 53	236	342	Triphylia, Tholos 2	179	358	Keph. Kontogenadas A	215
327	Perati Σ 55	212	343	Triphylia, Kopanaki Tholos	203	359	Kallithea 0	262
328	Perati Σ 55	238	344	Triphylia, Malthi, Tholos 1	291	360	Epidauros–Limēra A	1
329	Perati Σ 56	235	345	Triphylia, Malthi, Tholos 2	282	361	Keph. Metaxata Ad	29
330	Perati Σ 57	238	346	Triphylia, Vassiliko	121	362	Keph. Metaxata Ad	21
331	Perati Σ 59	238	347	Triphylia, Kakovatos A	164	363	Nemesis	133
332	Perati Σ 60	271	348	Triphylia, Kakovatos B	211	364	Thorikos B	185
333	Various, Attika, Vrana 10C	200	349	Triphylia, Kakovatos C	215	365	Phōcis, Medeōn A1	266
334	Sparta, Arkines A	128	350	Krēnē (Achaïa) 3	290	366	Phōcis, Medeon T239	227
335	Sparta, Arkines B	35	351	Marmarianē 1	208	367	Dimini B	296
336	Nichōria 3	241	352	Marmarianē 2	190	368	Thessalia, Pteleon A	145
337	Nichōria 4	206	353	Marmarianē 3	214	369	Thessalia, Pteleon C	142
338	Messēnia, Routsi, Tholos 1	331	354	Marmarianē 4	161	370	Thessalia, Pteleon E	255
339	Messēnia, Routsi, Tholos 2	320	355	Marmarianē 6	223			
340	Messēnia, Tourliditsa	157	356	Orchomenos Tholos	158			

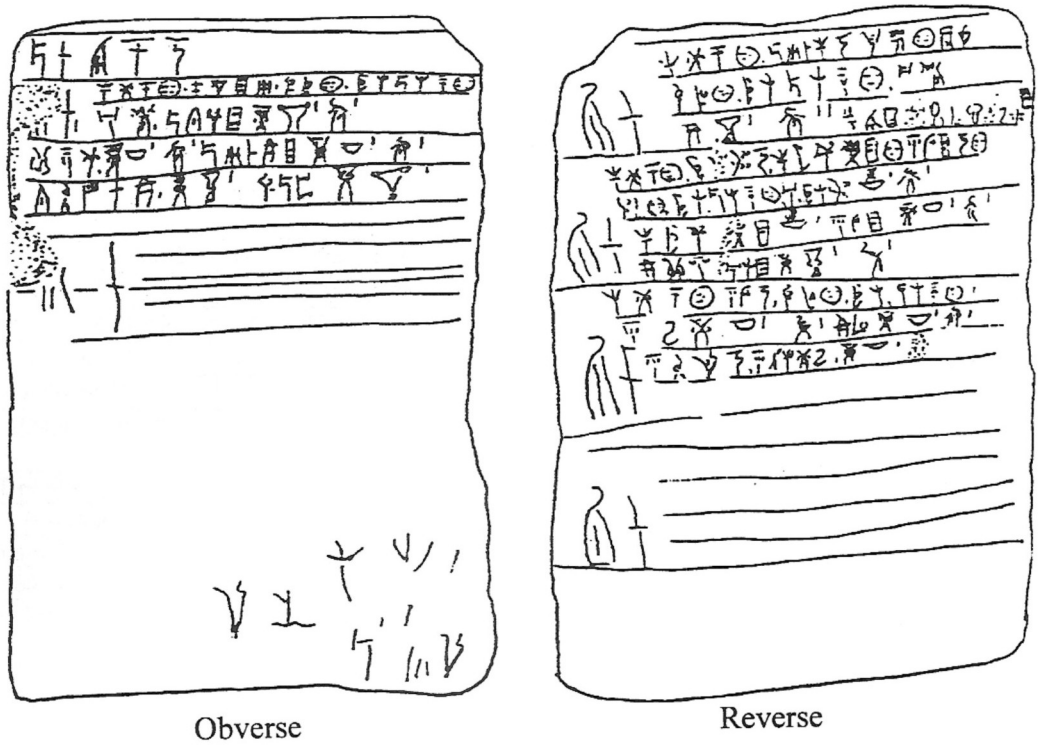


FIGURE 1. Linear B tablet introduced on the obverse by the name of the sailing month [see PALAIMA, 1995: pl. LXXIV].

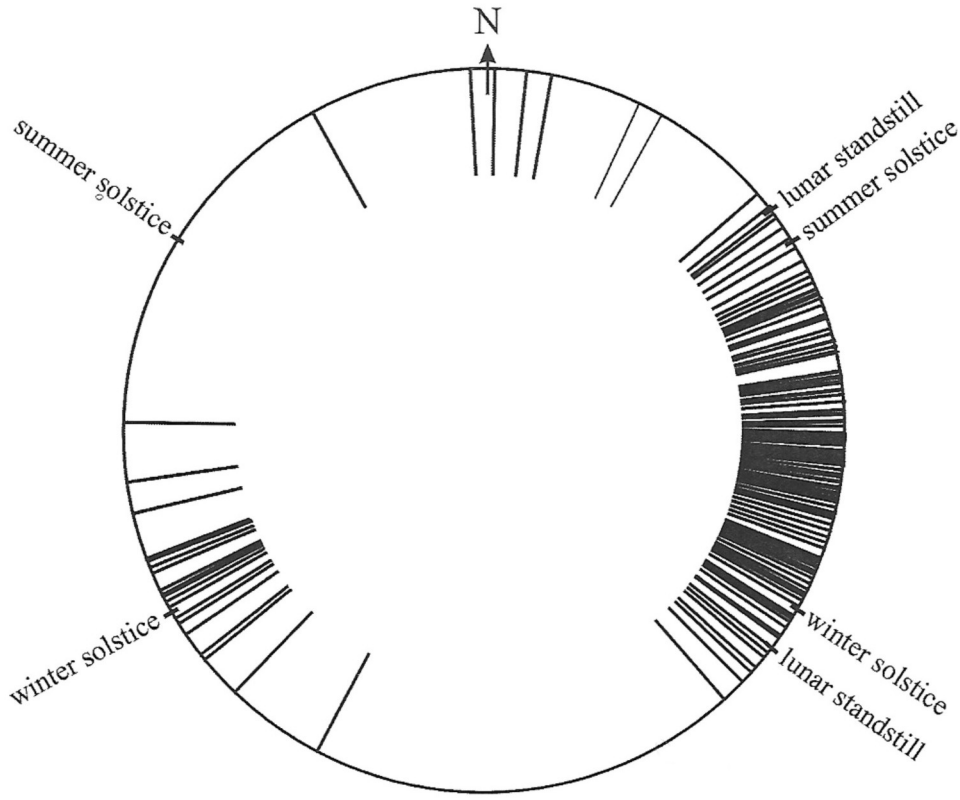


FIGURE 2. Orientations of 323 passage graves from 15 sites in Crete.
Thicker lines signify more than one grave with the same orientation.

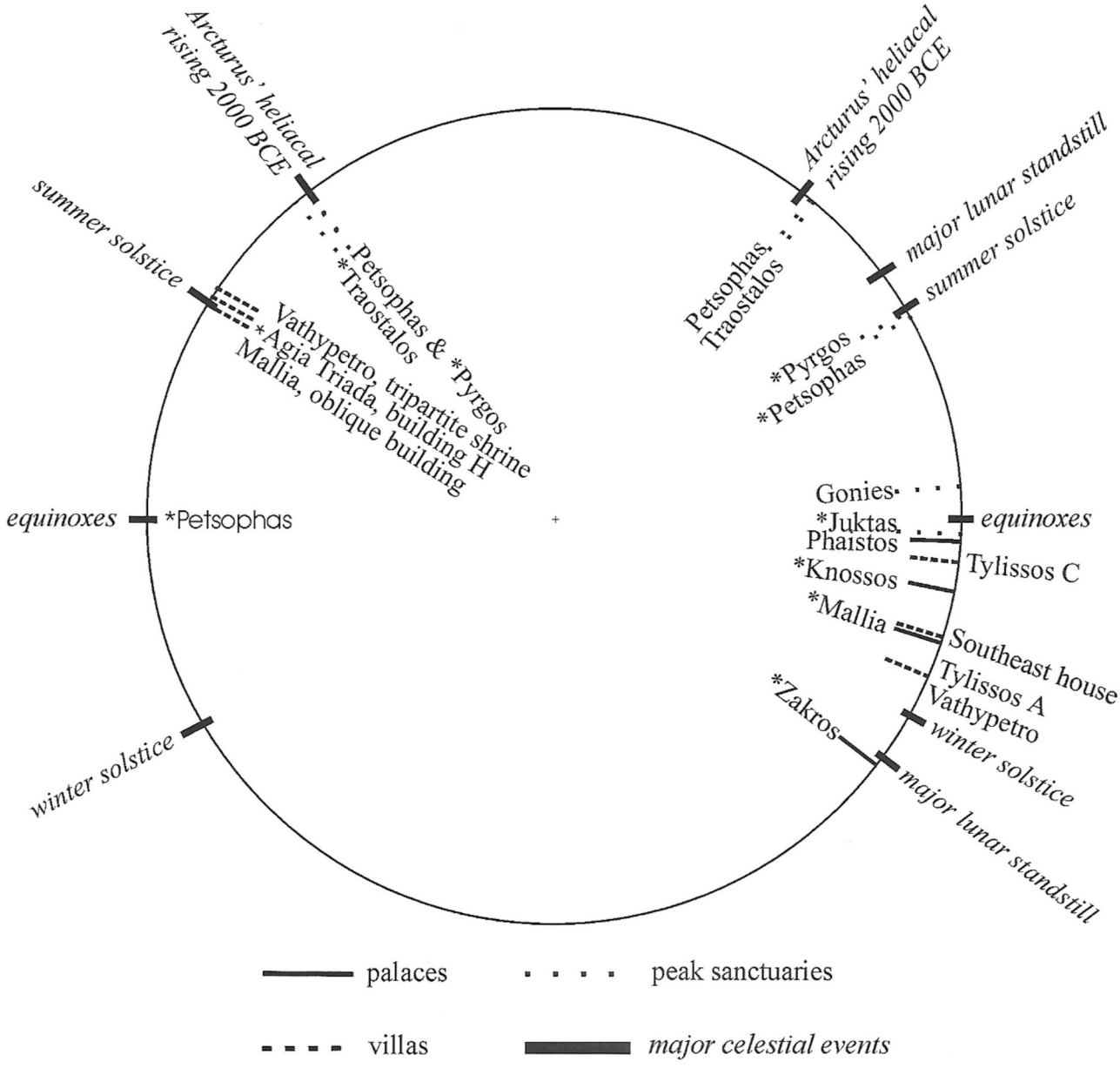


FIGURE 3. Orientations of 15 major Minoan monuments: 4 palaces, 6 peak sanctuaries and 5 villas.

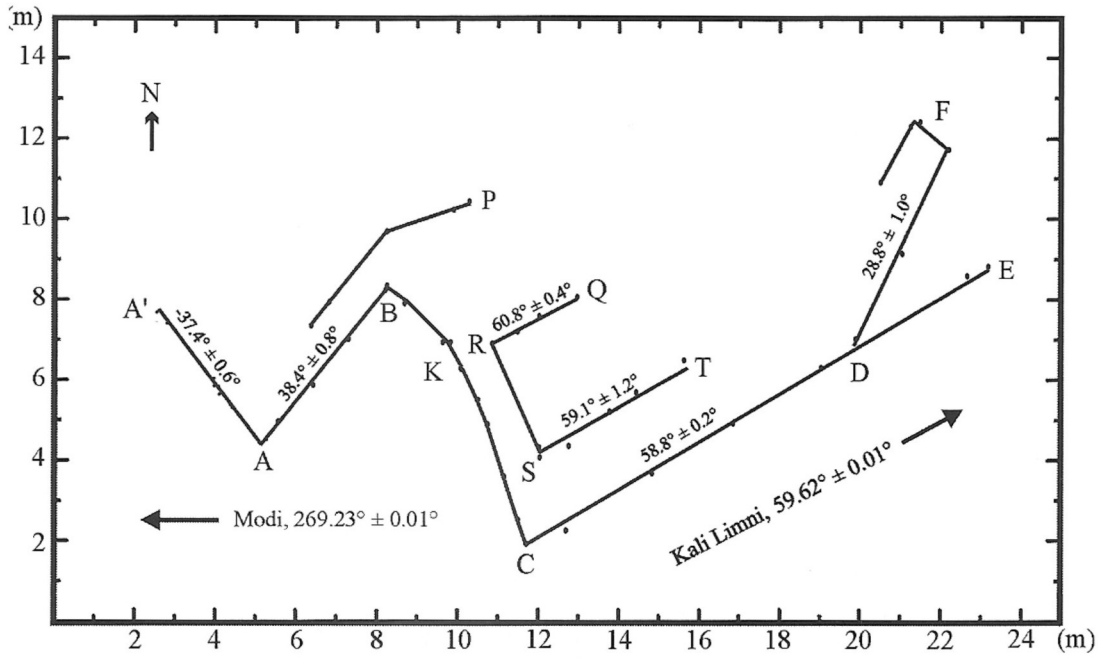


FIGURE 4. Plan of the Minoan peak sanctuary on Petsophas, Eastern Crete.

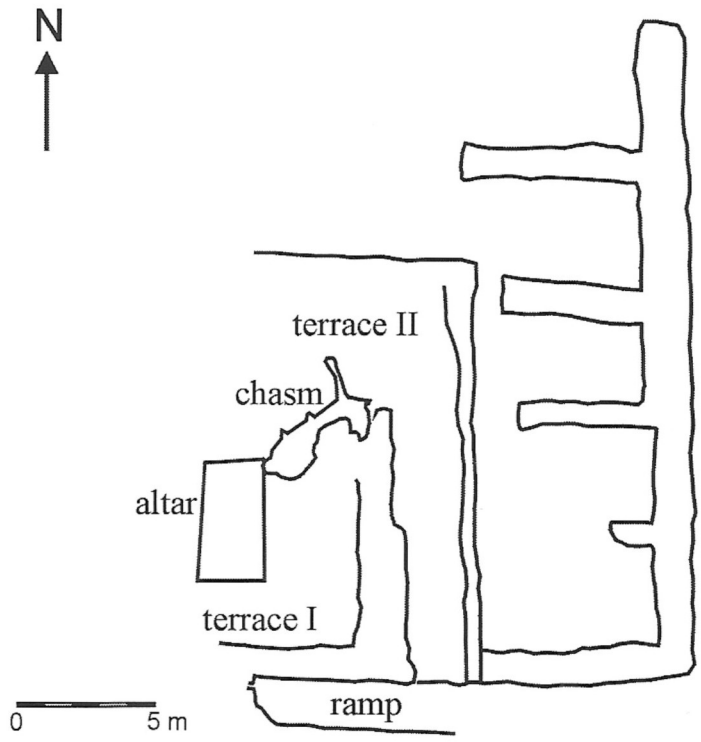


FIGURE 5. Plan of the Minoan peak sanctuary on Juktas, central Crete.

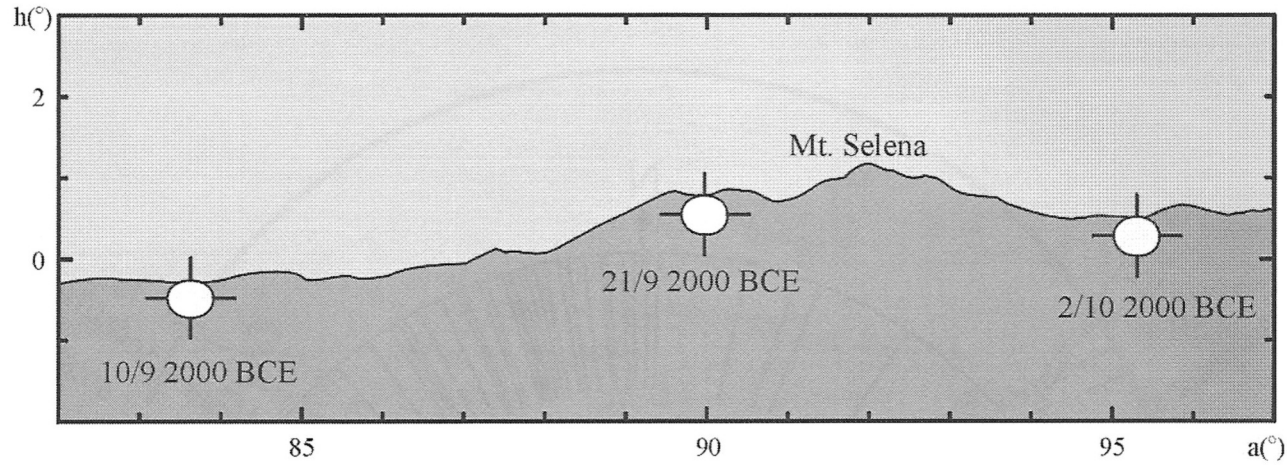


FIGURE 6. The Sun rises on the morning of the Equinoxes in a saddle formed by two peaks opposite the peak sanctuary on Juktas, and 11 days later it rises where two mountains intersect. There is no corresponding well–marked position to the North, where the Sun rises 11 days before the Autumn Equinox.

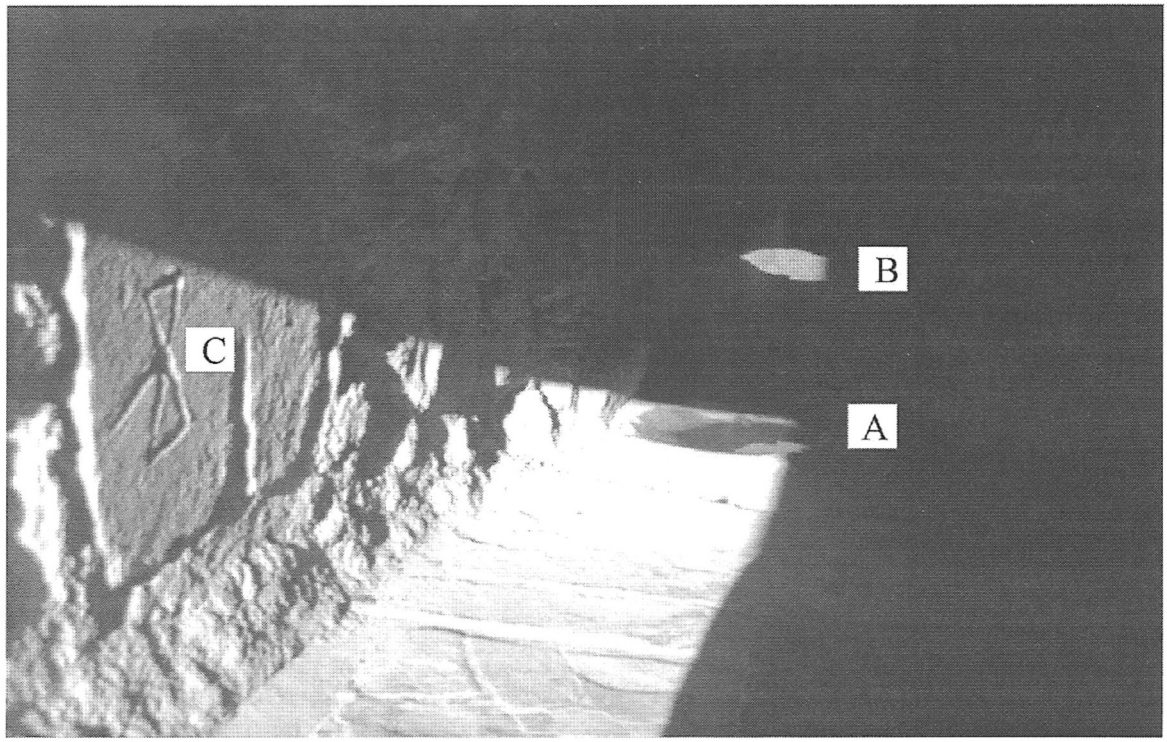


FIGURE 7. The first rays of the Sun on the morning of the Equinoxes strike a shallow bowl (A) built into the floor of the darkest part of the Central Palace Sanctuary in the palace at Knōssos. A reflection (B) is cast on the western wall, and the shadow on the southern wall touches the tip of the incised double axe (C).

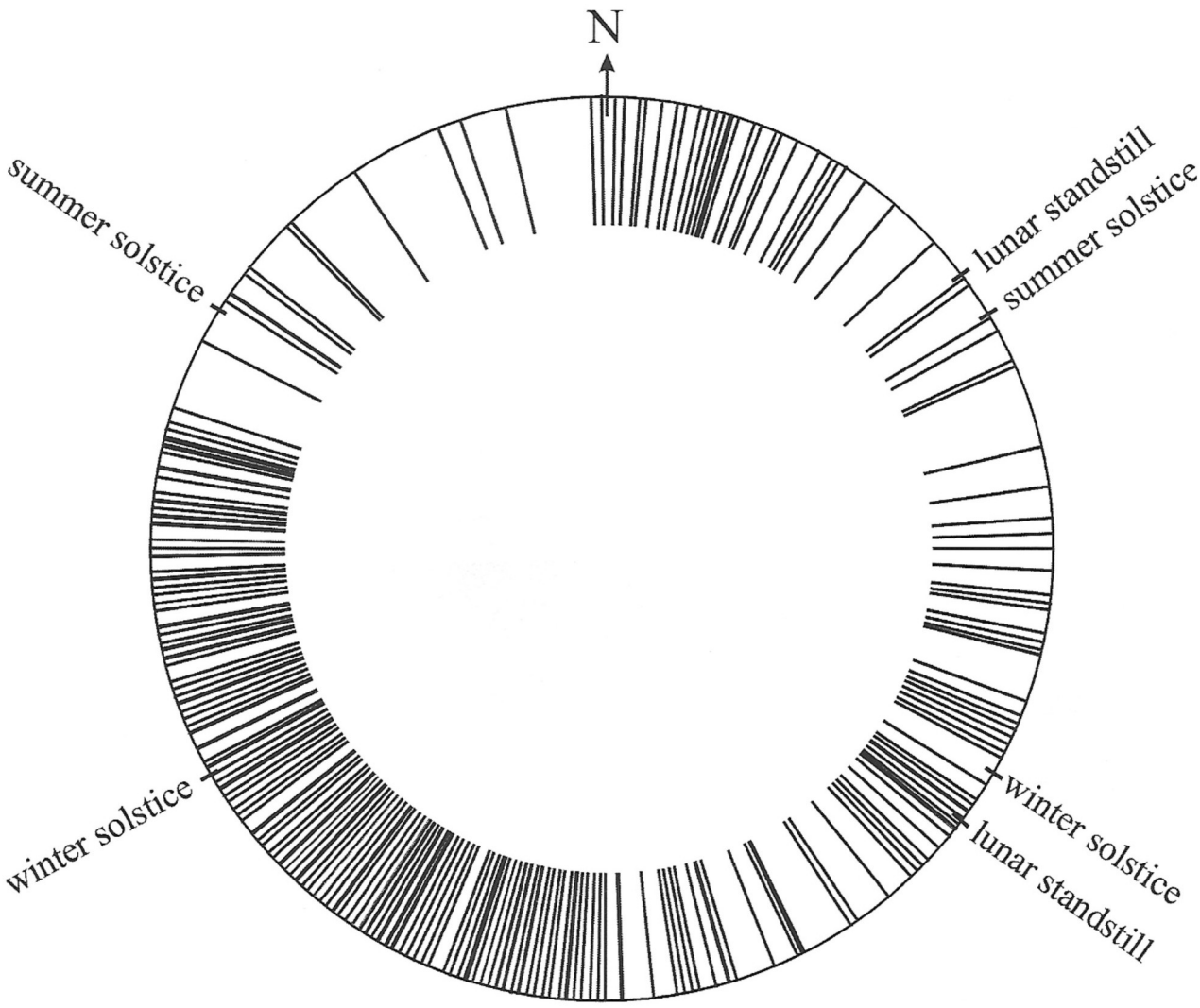
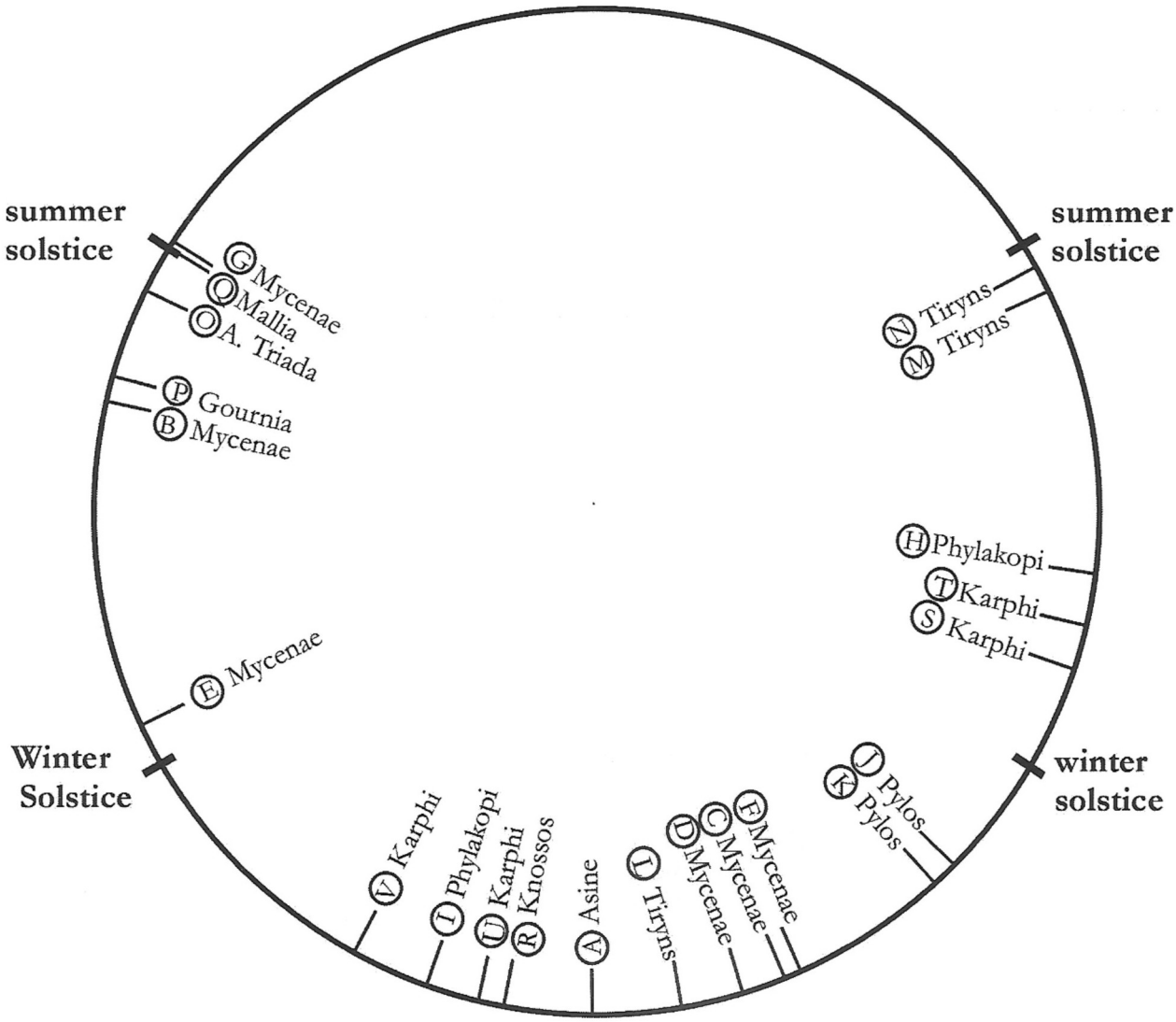


FIGURE 8. Orientations of 370 passage graves from 25 sites in Mycenæan Hellas. Thicker lines signify more than one grave with the same orientation.



Ⓐ Asine, room 32, house G
Ⓑ Mycenaean palace megaron
Ⓒ Mycenae, cult centre, megaron
Ⓓ Mycenae, cult centre, temple
Ⓔ Mycenae, cult centre, fresco complex
Ⓕ Mycenae, cult centre, fooms 25, 28, 24
Ⓖ Mycenae, cult centre, Tsountas' house shrine
Ⓗ Phylakopi, west shrine
Ⓘ Phylakopi, east shrine
Ⓙ Pylos, megaron
Ⓚ Pylos, room 93
Ⓛ Tiryn, megaron
Ⓜ Tiryns, rooms 110, 110A
Ⓝ Tiryns, room 117
Ⓞ A. Triada, building H
Ⓟ Gournia, sanctuary
Ⓠ Mallia, batiment oblique
Ⓡ Knossos, shrine of the double axes
Ⓢ Karphi, room 1
Ⓣ Karphi, room16-17
Ⓤ Karphi, room 58
Ⓥ Karphi, room 116

FIGURE 9. Orientations of 22 Mycenæan cult rooms.

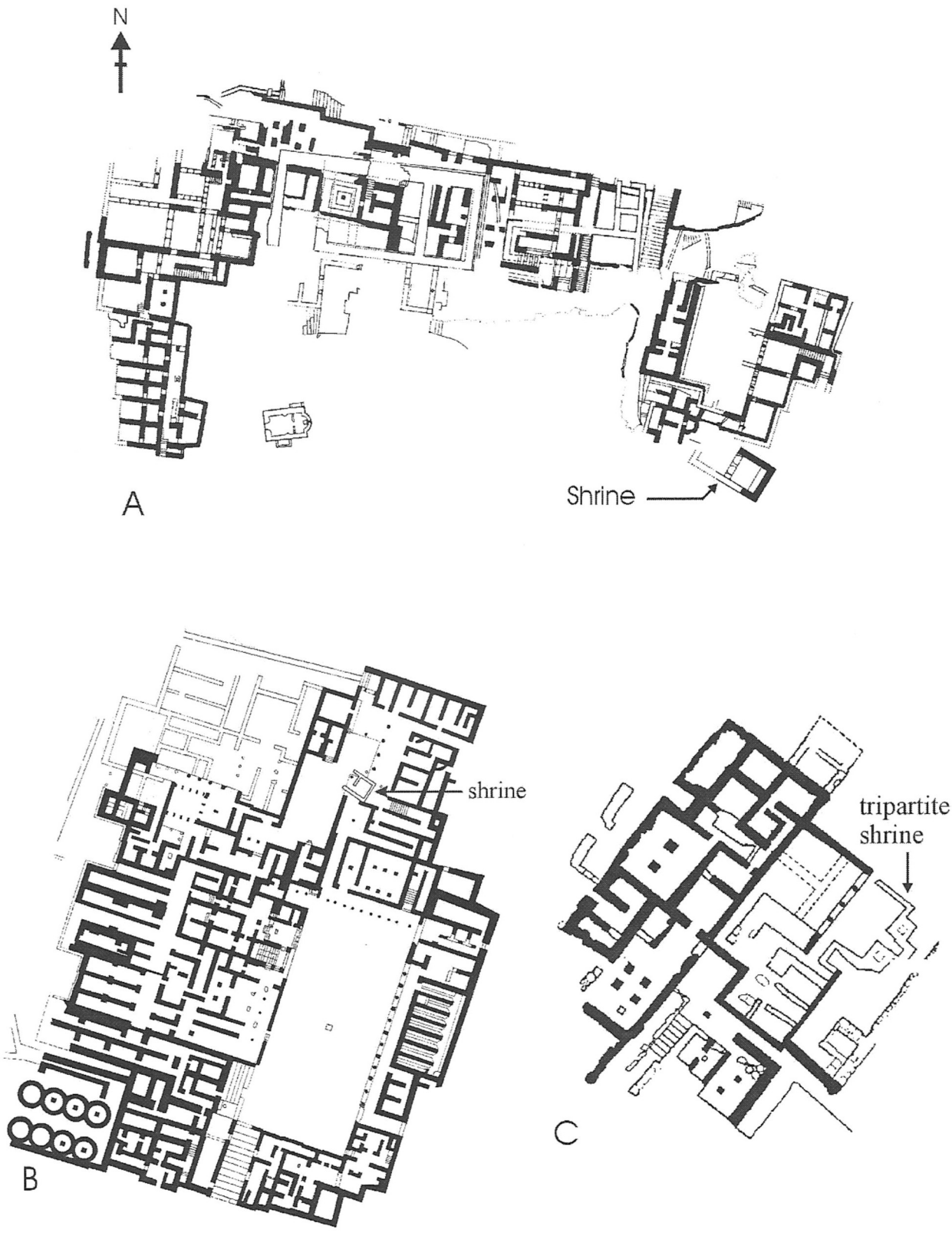


FIGURE 10. The shrines at Hagia Triada (A), Mallia (B), and Vathypetro (C).