

## Differences in Minoan and Mycenaean orientations in Crete

*Mary Blomberg and Göran Henriksson*

### Summary

This closer look at the orientation traditions of the Minoans and Mycenaean was occasioned by the eye-catching deviations in orientation of two small shrines built at the time when the Mycenaean were establishing their hegemony in Crete. They indicate that one of the most significant achievements of Greek culture and an important architectural influence in our own culture, the Greek temple, was the result of the new composite culture which emerged from that struggle. It is proposed that both Minoan and Mycenaean orientation traditions influenced the new culture in Crete and thus lived on to influence the Greeks. The very different pattern of Mycenaean orientations invites further study, to increase our understanding of their cosmology and thus shed more light on the great Bronze Age cultures of Greece and their later influence.

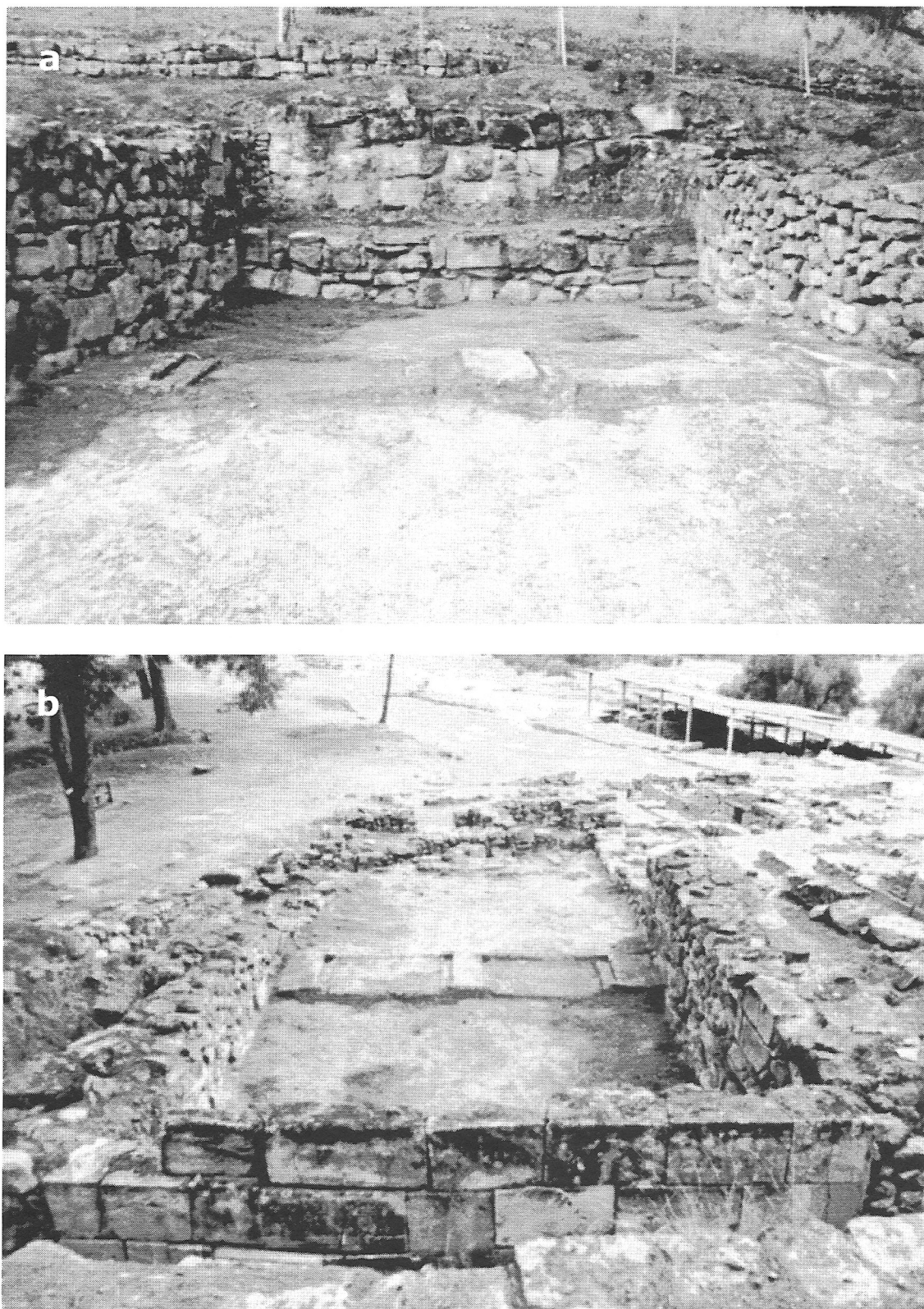
### Introduction

One of the most important problems of the Late Bronze Age in the Aegean is the nature of the relationship between the Minoan and Mycenaean cultures and the influence of these on the later Greeks. We present here some results of our study of the orientations of the cult rooms and graves of the two cultures which we think shed some light on the subject. The Mycenaean of course were themselves Greek, but it is convenient to reserve the term for the culture that developed in the Aegean after the Late Bronze Age.

The Minoans had settled in Crete at the beginning of the Early Neolithic Period, no later than the seventh millennium BC (Evans 1994), and had there developed a splendid culture. This culture was at its height in the first phase of the Late Bronze Age (Late Minoan I) which began in about 1600 BC. The Mycenaean had migrated to the Greek mainland towards the end of the Middle Bronze Age, about 2100 BC (Drews 1988), and their rude culture soon became heavily influenced by the Minoan. This has been called the Versailles effect (Wiener 1984) and can be compared to the influence of French culture on, for example, that of the Swedes and the Russians of two centuries ago. Mycenaean figured pottery, for example, is entirely the result of the contact with Crete. Earlier mainland pottery was plain or had geometric designs.

By about 1450 BC (beginning of Late Minoan II), the relationship between the two cultures had changed radically. Following a period of island-wide destruction, the Mycenaean emerged as rulers in Crete (Driessen and Macdonald 1997). Large numbers of primarily economic documents written in the Mycenaean Linear B script have been found in the Minoan palaces at Knossos and Chania. Linear B is the adaptation of the Minoan Linear A syllabic script to the Mycenaean Greek language and its use for accounting in the Minoan palaces reasonably presupposes that the Mycenaean were in command of those palaces. Another illustration of the altered relationship between the two cultures is that the Mycenaean figured pottery style, which had developed under Minoan influence, came to prevail in Crete itself and also throughout the Aegean.

According to the most widely accepted explanation for these changes, the Mycenaean took advantage of a series of natural disasters in Crete to install themselves as rulers in the island. The



*FIG. 6.1. The shrine at Ayia Triada, (a) from the north-west and (b) from the south-east. Orientation of axis of symmetry =  $295.5^\circ \pm 0.5^\circ$ .*

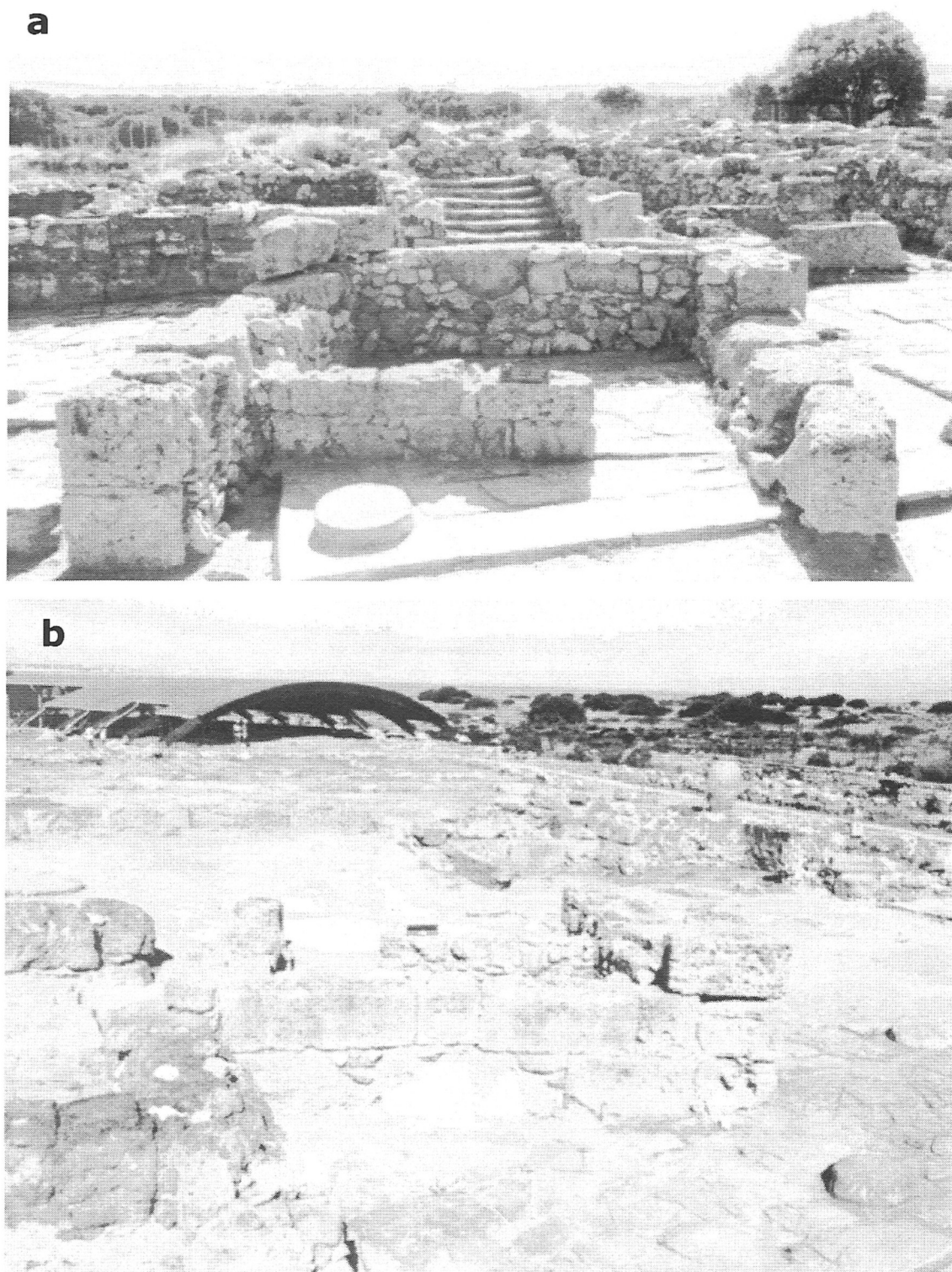


FIG. 6.2. The shrine at Mallia, (a) from the north-west and (b) from the south-east. Orientation of southern wall =  $300.9^\circ$ .

methods used and the length of the process are the subjects of a large number of books and articles and many questions are still unanswered. For example: What was the earlier relationship *in Crete* between the Mycenaean and the Minoans? The adaptation of the Linear A script to write Mycenaean Greek implies a considerable period of peaceful co-operation, as the languages were not closely related. Was there only a replacement of the ruling elite, with the population still largely Minoan? To what extent and in what ways did the Mycenaean culture influence the Minoan? We have noted the wide prevalence of the Mycenaean pottery style. Even more noteworthy is the great difficulty in distinguishing in general between material aspects of the two cultures after the Mycenaean political and economic domination in Crete. Did elements of Minoan culture survive to influence Greek culture?

### The shrines at Ayia Triada and Mallia

Two remarkable small buildings, both generally considered to be shrines, were constructed in Crete not long after the Mycenaean take-over of the island, one in the ruins of the villa at Ayia Triada and the other in those of the palace at Mallia (La Rosa 1985; Pelon 1997). Their orientations are unique in Crete and may illuminate the nature of the development in the island following the take-over. They indicate that the outcome of the Mycenaean hegemony was a new, composite culture with important consequences for Greek culture. For example, it may reasonably be argued that the origins of the Classical Greek temple lie in these two small structures.

As they were built not long after the take-over, they were most likely constructed by Minoan craftsmen in the service of Mycenaean. This is especially clear in the case of the shrine at Ayia Triada. It is built largely according to Minoan techniques with well-dressed stone masonry on the exterior and smaller stones on the interior which were covered with plaster (Figs 6.1a–b). The type of threshold, the bench built against the rear wall and the presence of two doors even in such a narrow room are also Minoan features. The stone thresholds are characteristic of the uniquely Minoan pier-and-door partition system according to which there were as many doors as the width of the room allowed. The system seems to have been designed to permit maximal adjustment to weather conditions and it is one of the most typical features of Minoan architecture (Graham 1987, 86–7, figs 4 and 13). There was a fine fresco floor with a single large design consisting of dolphins, fish and an octopus (Hirsch 1977, 10–11; 1980, 459–60). The only other known floor of the same type—that is, with a single large design—was in a room of the Knossos palace (Hawke-Smith 1976, 73–4). It too was a marine scene and was laid at about the same time, which means that it was made for Mycenaean. All other fresco floors—both Minoan and Mycenaean—had small repetitive, symmetrical designs. The floor, then, is the only element in the building which may show Mycenaean influence at Ayia Triada. The orientation, although unusual in that it is to sunset, is still Minoan in spirit in that it established a relationship between the shrine and the cosmos.

The Mallia shrine is different both from the Ayia Triada building and also from anything Mycenaean, whether in Crete or in the Mainland. It is said to have been built entirely of well-dressed masonry (Pelon 1997, 342). We do not get this impression from photographs, in which the walls resemble those of the shrine at Ayia Triada (Figs 6.2a–b), but this may be due to conservation effects. The single door is far to one side and although there is a porch with side walls there were no columns. The column base on the floor of the porch belonged to the earlier, Minoan, palace (Pelon 1980, 79). Similarities to Minoan architecture are also hard to find other than the orientation to sunset which, as in the case at Ayia Triada, may be said to be Minoan in spirit.

### Orientations of Minoan and Mycenaean cult rooms and graves

Our attention was attracted to the two beautifully proportioned small buildings because of the striking deviation of their orientations from those of their surroundings (Figs 6.3a–b), a feature which has given the building at Mallia the name by which it is known in the literature, *le bâtiment oblique*. Both were oriented close to sunset at the summer solstice. At Ayia Triada the sun was observed to set  $2^\circ$  north of the mountain peak which is in line with the axis of the building ( $=295.5^\circ \pm$

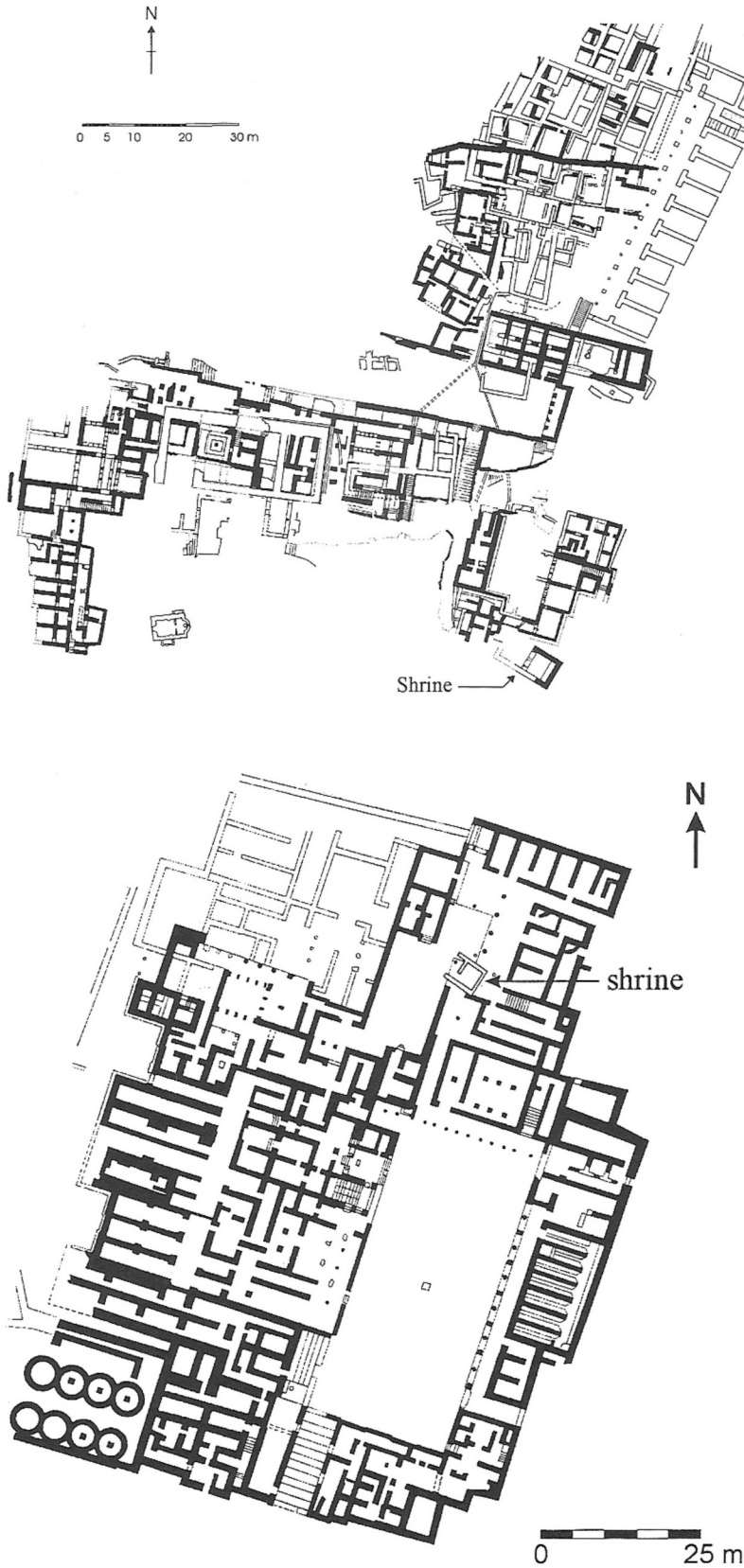


FIG. 6.3. Plans of the shrines at (a) Ayia Triada and (b) Mallia. By permission of the editors of *The Aerial Atlas of Ancient Crete*.

0.5°, Fig. 6.4a). At Mallia the southern wall of the shrine is oriented 0°.5 north of sunset (=300.9°, Fig. 6.4b).<sup>1</sup> Because of the asymmetrical position of the door, this wall would have been completely illuminated at the summer solstice. The orientation at Mallia was maintained until recently to be towards moonrise (Pelon 1997, 349), despite the fact that the only door opens to the west. This opinion was based on the fact that the foothills of the mountain Selena lie to the east of the site (van Effenterre 1980, 355).

These two buildings not only differ in orientation with respect to their immediate surroundings but they also differ with respect to the orientations of all earlier cult rooms *in settlements* both in Crete and in Mainland Greece. The generally acknowledged cult rooms in the Minoan palaces lie in the west wings with their doors opening to the east (Shaw 1977). This seems to have been true also for the assumed cult rooms in the large villas; however the acceptance of these rooms as primarily religious is problematic. At Knossos and Phaistos the rooms of the west wings are oriented to sunrise at the equinoxes. The more southerly orientation at Knossos is due to the mountain ridge in the east (Blomberg and Henriksson, in press). The orientation of the

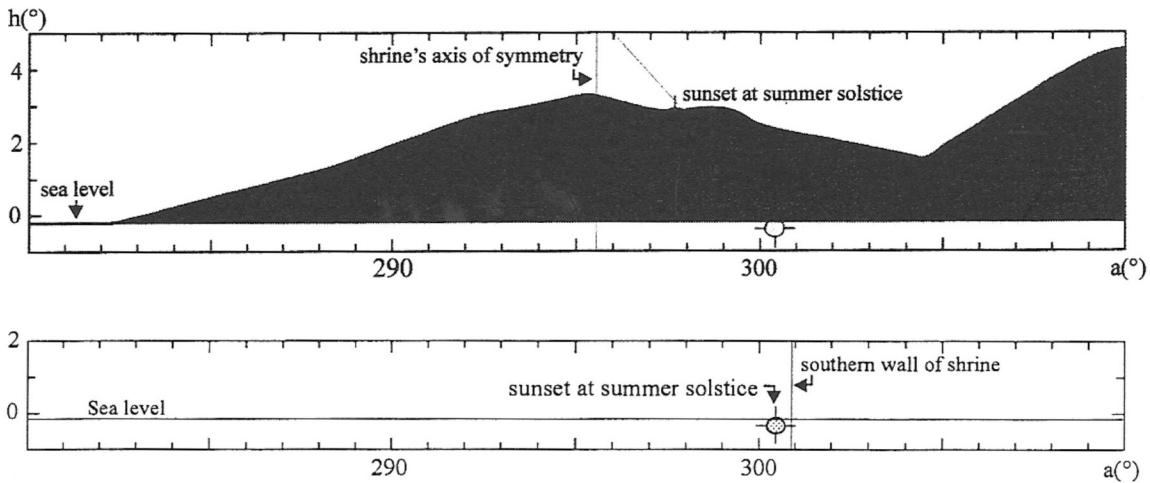


FIG. 6.4. Sunset at the summer solstice as seen from the shrines at (a) Ayia Triada and (b) Mallia. Calculated for 1350 BC when sunset would have been observed at 18:54:00 from Ayia Triada and at 19:13:40 from Mallia, local solar mean time and assuming that  $t = +20^{\circ}$ . The details provide the possibility of checking the correctness of our program.

rooms of the west wing at Zakros is to the southernmost point of moonrise (southern major standstill), and at Mallia it is to sunrise one month before the spring equinox and after the autumn equinox (Fig. 6.5a). If we compare the Mycenaean palatial cult rooms, the *megara* (Fig. 6.5b), there seems to be no interest in orientations to the rising or setting points of the sun or moon. This also holds true for other Mycenaean cult rooms. There may, of course, have been other reasons for Mycenaean orientations, for example significant features in the landscape, and this should be investigated.

To fill out the picture we tabulated the orientations of a representative number of graves in Crete and in the mainland. We chose to compare Late Bronze Age tombs with passages, or *dromoi*, as these were the most usual graves in both areas at the time. Also the type is argued to have originated in Crete and been taken over by the Mycenaean (Hood 1960). The

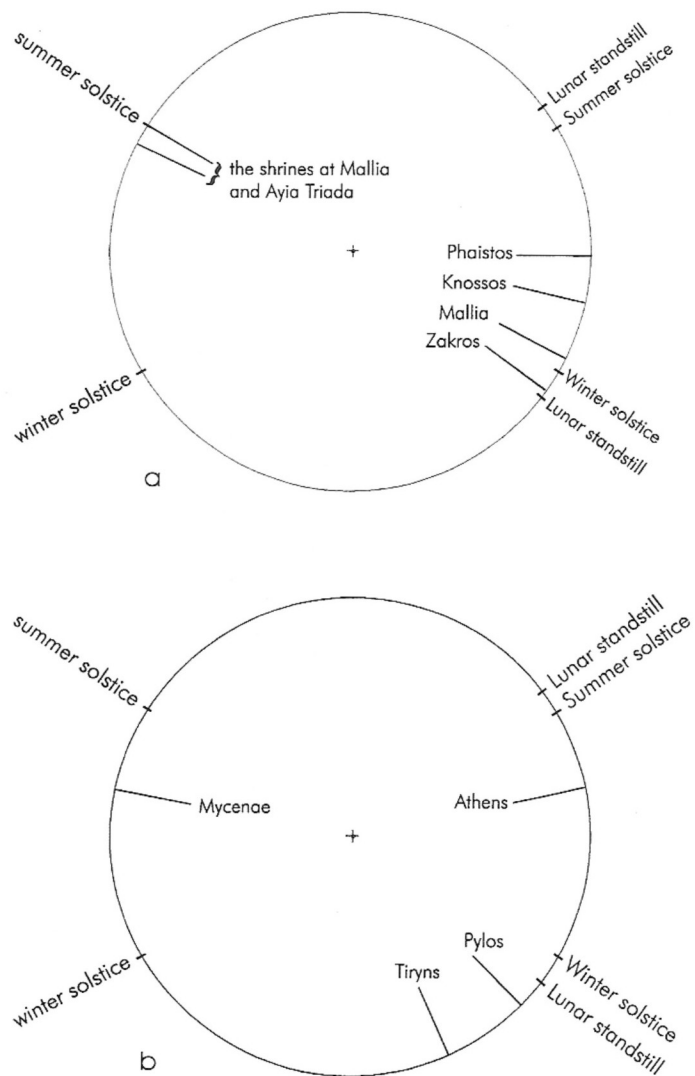


FIG. 6.5. Orientations of palatial cult rooms, (a) in Crete and (b) in the Greek mainland.

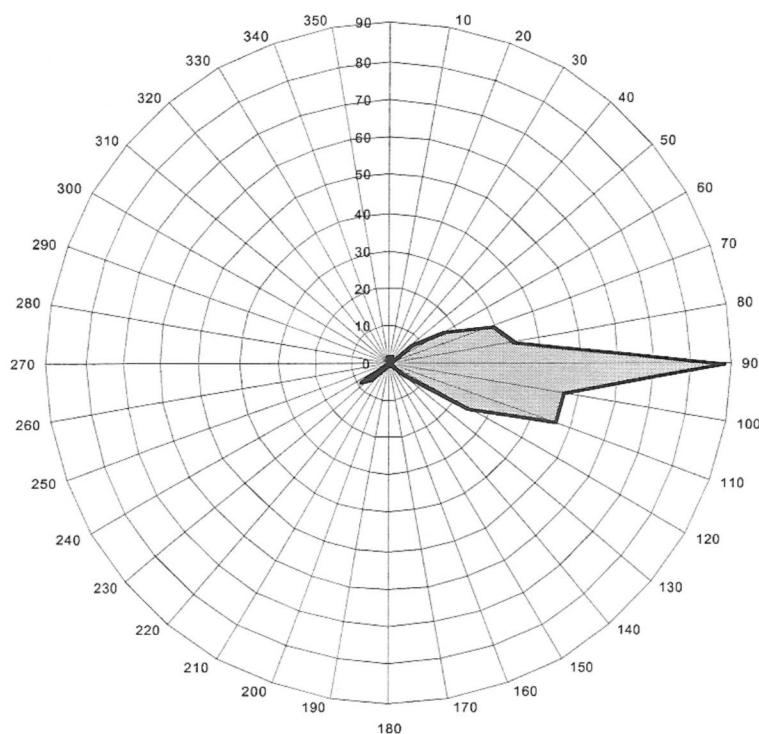


FIG. 6.6. Frequency distribution of the orientations of 323 chamber tombs with passages from 15 sites in Crete.

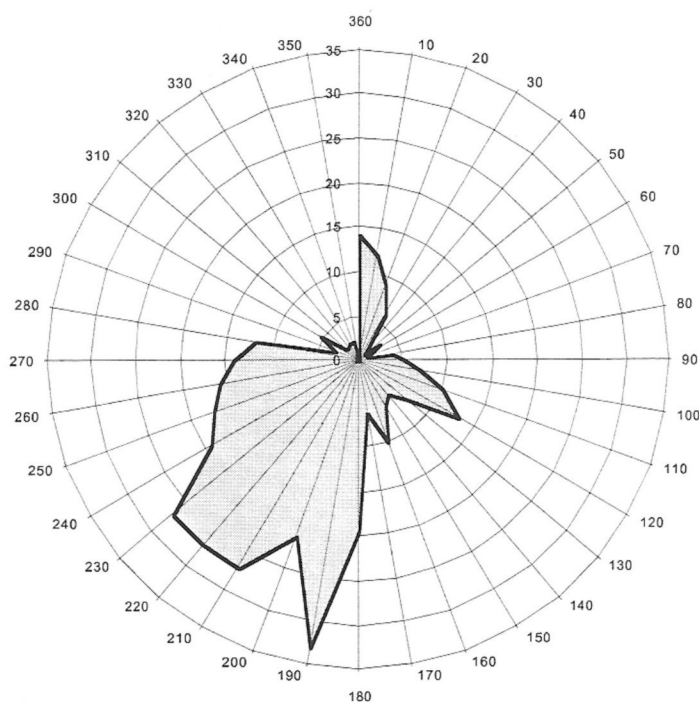


FIG. 6.7. Frequency distribution of the orientations of 372 chamber tombs with passages from 25 sites in mainland Greece.

orientations of the graves at Prosymna in the mainland and at Armenoi in Crete have been published (Blegen 1937; Papathanassiou, Hoskin and Papadopoulou 1992; 1993; Papathanassiou and Hoskin 1996), while the remainder were determined by us by measuring published plans (Blegen 1973; Bosanquet 1901–2; Bulle 1906–9; Demakopoulou 1990; Evans 1904; 1905; Forsdyke 1926–7; Frödin and Persson 1938; Heartley and Skeat 1930–1; Hood and De Jong 1952; Hood, Huxley and Sandars 1958–9; Hope Simpson 1958–9; Hutchinson 1956; Iakovidis 1980; Immerwahr 1971; Kontorli-Papadopoulou 1987; Papadopoulos 1976; Papazoglou-Manioudaki 1994; Persson 1931; 1942; Pini 1968; Popham 1974; 1980; Protonotariou-Deilaki 1990; Wace 1932; Wells 1990).

The clear preference for orientations to the east in Crete is also evident in the graves and from as early as about 2500 BC (Goodwin 1998). Eighty-seven per cent are oriented within the limits of moonrise which encompass only 20% of the circle. Especially notable is the fact that 40% of the orientations are within 10° of due east (Table 6.1; Fig. 6.6). The margin of error for 69% of these graves—those published by Papathanassiou, Hoskin and Papadopoulou (1992; 1993), and Papathanassiou and Hoskin (1996)—is less than  $\pm 1^\circ$ . The margin of error for those determined by us from published plans is estimated to be less than  $\pm 5^\circ$ .

The orientations of Mycenaean graves give an entirely different pattern. We observe no consistent relationship to

TABLE 6.1. Grave orientations in Crete

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
1	Armenoi, zone A, 1	82	47	Armenoi, zone A, 86	112	93	Armenoi, zone A, 206	65
2	Armenoi, zone A, 2	98	48	Armenoi, zone A, 87	88	94	Armenoi, zone A, 207	89
3	Armenoi, zone A, 3	56	49	Armenoi, zone A, 88	100	95	Armenoi, zone A, 208	82
4	Armenoi, zone A, 4	103	50	Armenoi, zone A, 89	92	96	Armenoi, zone A, 209	84
5	Armenoi, zone A, 25	65	51	Armenoi, zone A, 90	83	97	Armenoi, zone A, 210	89
6	Armenoi, zone A, 26	76	52	Armenoi, zone A, 91	94	98	Armenoi, zone A, 211	112
7	Armenoi, zone A, 27	81	53	Armenoi, zone A, 92	126	99	Armenoi, zone A, 212	120
8	Armenoi, zone A, 28	93	54	Armenoi, zone A, 93	123	100	Armenoi, zone A, 213	128
9	Armenoi, zone A, 29	83	55	Armenoi, zone A, 94	110	101	Armenoi, zone A, LIII	86
10	Armenoi, zone A, 30	76	56	Armenoi, zone A, 95	75	102	Armenoi, zone A, LIV	92
11	Armenoi, zone A, 31	78	57	Armenoi, zone A, 96	83	103	Armenoi, zone A, ?	95
12	Armenoi, zone A, 32	74	58	Armenoi, zone A, 98	82	104	Armenoi, zone A, ?	94
13	Armenoi, zone A, 33	72	59	Armenoi, zone A, 160	72	105	Armenoi, zone A, ?	81
14	Armenoi, zone A, 34	98	60	Armenoi, zone A, 161	72	106	Armenoi, zone A, ?	92
15	Armenoi, zone A, 35	94	61	Armenoi, zone A, 162	78	107	Armenoi, zone B, 6	101
16	Armenoi, zone A, 36	74	62	Armenoi, zone A, 163	75	108	Armenoi, zone B, 7	99
17	Armenoi, zone A, 37	68	63	Armenoi, zone A, 167	92	109	Armenoi, zone B, 8	133
18	Armenoi, zone A, 38	54	64	Armenoi, zone A, 168	70	110	Armenoi, zone B, 9	119
19	Armenoi, zone A, 39	52	65	Armenoi, zone A, 171	81	111	Armenoi, zone B, 10	115
20	Armenoi, zone A, 40	78	66	Armenoi, zone A, 172	72	112	Armenoi, zone B, 11	109
21	Armenoi, zone A, 41	84	67	Armenoi, zone A, 173	76	113	Armenoi, zone B, 12	112
22	Armenoi, zone A, 42	62	68	Armenoi, zone A, 174	77	114	Armenoi, zone B, 13	104
23	Armenoi, zone A, 43	56	69	Armenoi, zone A, 175	60	115	Armenoi, zone B, 14	98
24	Armenoi, zone A, 44	64	70	Armenoi, zone A, 176	78	116	Armenoi, zone B, 15	122
25	Armenoi, zone A, 45	64	71	Armenoi, zone A, 177	68	117	Armenoi, zone B, 16	88
26	Armenoi, zone A, 46	64	72	Armenoi, zone A, 179	69	118	Armenoi, zone B, 17	97
27	Armenoi, zone A, 47	72	73	Armenoi, zone A, 180	70	119	Armenoi, zone B, 18	99
28	Armenoi, zone A, 48	75	74	Armenoi, zone A, 181	70	120	Armenoi, zone B, 19	98
29	Armenoi, zone A, 65	81	75	Armenoi, zone A, 182	68	121	Armenoi, zone B, 20	96
30	Armenoi, zone A, 66	68	76	Armenoi, zone A, 183	83	122	Armenoi, zone B, 21	96
31	Armenoi, zone A, 67	88	77	Armenoi, zone A, 185	78	123	Armenoi, zone B, 22	96
32	Armenoi, zone A, 68	90	78	Armenoi, zone A, 186	95	124	Armenoi, zone B, 24	92
33	Armenoi, zone A, 69	90	79	Armenoi, zone A, 187	93	125	Armenoi, zone B, 49	100
34	Armenoi, zone A, 70	92	80	Armenoi, zone A, 189	109	126	Armenoi, zone B, 51	105
35	Armenoi, zone A, 71	82	81	Armenoi, zone A, 190	58	127	Armenoi, zone B, 52	102
36	Armenoi, zone A, 72	86	82	Armenoi, zone A, 191	58	128	Armenoi, zone B, 53	110
37	Armenoi, zone A, 73	100	83	Armenoi, zone A, 192	84	129	Armenoi, zone B, 55	122
38	Armenoi, zone A, 74	92	84	Armenoi, zone A, 196	84	130	Armenoi, zone B, 57	106
39	Armenoi, zone A, 75	101	85	Armenoi, zone A, 198	68	131	Armenoi, zone B, 63	113
40	Armenoi, zone A, 76	72	86	Armenoi, zone A, 199	66	132	Armenoi, zone B, 64	122
41	Armenoi, zone A, 77	72	87	Armenoi, zone A, 200	106	133	Armenoi, zone B, 81	92
42	Armenoi, zone A, 78	76	88	Armenoi, zone A, 201	102	134	Armenoi, zone B, 82	95
43	Armenoi, zone A, 79	74	89	Armenoi, zone A, 202	92	135	Armenoi, zone B, 83	92
44	Armenoi, zone A, 80	58	90	Armenoi, zone A, 203	93	136	Armenoi, zone B, 131	99
45	Armenoi, zone A, 84	89	91	Armenoi, zone A, 204	85	137	Armenoi, zone B, 132	118
46	Armenoi, zone A, 85	96	92	Armenoi, zone A, 205	88	138	Armenoi, zone B, 139	98



TABLE 6.1. Grave orientations in Crete [continued]

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
139	Armenoi, zone B, 140	92	185	Armenoi, zone C, 120	120	231	Zafer Papoura 14	120
140	Armenoi, zone B, 141	108	186	Armenoi, zone C, 121	114	232	Zafer Papoura 15	102
141	Armenoi, zone B, 142	102	187	Armenoi, zone C, 122	104	233	Zafer Papoura 16	96
142	Armenoi, zone B, 143	114	188	Armenoi, zone C, 123	112	234	Zafer Papoura 17	95
143	Armenoi, zone B, 157	122	189	Armenoi, zone C, 124	113	235	Zafer Papoura 18	95
144	Armenoi, zone B, 158	116	190	Armenoi, zone C, 125	122	236	Zafer Papoura 19	96
145	Armenoi, zone B, 159	112	191	Armenoi, zone C, 126	99	237	Zafer Papoura 20	95
146	Armenoi, zone B, 164	112	192	Armenoi, zone C, 127	114	238	Zafer Papoura 21	96
147	Armenoi, zone B, 165	102	193	Armenoi, zone C, 128	101	239	Zafer Papoura 22	95
148	Armenoi, zone B, 169	96	194	Armenoi, zone C, 129	122	240	Zafer Papoura 29	94
149	Armenoi, zone B, 170	89	195	Armenoi, zone C, 130	100	241	Zafer Papoura 32	98
150	Armenoi, zone B, 193	106	196	Armenoi, zone C, 133	114	242	Zafer Papoura 35	113
151	Armenoi, zone B, 194	119	197	Armenoi, zone C, 134	100	243	Zafer Papoura 39	93
152	Armenoi, zone B, 197	117	198	Armenoi, zone C, 135	92	244	Zafer Papoura 40	95
153	Armenoi, zone B, ?	102	199	Armenoi, zone C, 136	92	245	Zafer Papoura 49	100
154	Armenoi, zone B, ?	124	200	Armenoi, zone C, 137	124	246	Zafer Papoura 50	97
155	Armenoi, zone B, ?	107	201	Armenoi, zone C, 138	122	247	Zafer Papoura 52	100
156	Armenoi, zone C, 23	108	202	Armenoi, zone C, 144	130	248	Zafer Papoura 53	99
157	Armenoi, zone C, 50	98	203	Armenoi, zone C, 145	128	249	Zafer Papoura 54	99
158	Armenoi, zone C, 54	107	204	Armenoi, zone C, 146	102	250	Zafer Papoura 56	96
159	Armenoi, zone C, 56	118	205	Armenoi, zone C, 147	118	251	Zafer Papoura 69	115
160	Armenoi, zone C, 58	120	206	Armenoi, zone C, 148	98	252	Zafer Papoura 80	95
161	Armenoi, zone C, 59	128	207	Armenoi, zone C, 149	92	253	Zafer Papoura 81	96
162	Armenoi, zone C, 60	101	208	Armenoi, zone C, 150	103	254	Zafer Papoura 82	92
163	Armenoi, zone C, 61	112	209	Armenoi, zone C, 151	102	255	Zafer Papoura 84	105
164	Armenoi, zone C, 62	118	210	Armenoi, zone C, 152	97	256	Zafer Papoura 85	95
165	Armenoi, zone C, 100	118	211	Armenoi, zone C, 153	97	257	Zafer Papoura 86	94
166	Armenoi, zone C, 101	124	212	Armenoi, zone C, 154	83	258	Zafer Papoura 89	95
167	Armenoi, zone C, 102	108	213	Armenoi, zone C, 155	115	259	Zafer Papoura 90	94
168	Armenoi, zone C, 103	112	214	Armenoi, zone C, 156	113	260	Zafer Papoura 93	98
169	Armenoi, zone C, 104	113	215	Armenoi, zone C, 214	106	261	Zafer Papoura 94	97
170	Armenoi, zone C, 105	93	216	Armenoi, zone C, 215	118	262	Zafer Papoura 95	92
171	Armenoi, zone C, 106	110	217	Armenoi, zone C, 216	126	263	Zafer Papoura 96	98
172	Armenoi, zone C, 107	82	218	Armenoi, zone C, 217	129	264	Zafer Papoura 97	118
173	Armenoi, zone C, 108	96	219	Armenoi, zone C, 218	132	265	Zafer Papoura 98	94
174	Armenoi, zone C, 109	117	220	Armenoi, zone C, 219	135	266	Zafer Papoura 99	96
175	Armenoi, zone C, 110	112	221	Armenoi, zone C, 220	118	267	Zafer Papoura 100	139
176	Armenoi, zone C, 111	116	222	Armenoi, zone C, I	110	268	Knossos, Temple Tomb	84
177	Armenoi, zone C, 112	112	223	Armenoi, zone C, LI	106	269	Mavro Spelio 1	241
178	Armenoi, zone C, 113	115	224	Armenoi, zone C, ?	94	270	Mavro Spelio 3	239
179	Armenoi, zone C, 114	118	225	Zafer Papoura 8	110	271	Mavro Spelio 4	244
180	Armenoi, zone C, 115	114	226	Zafer Papoura 9	99	272	Mavro Spelio 6	238
181	Armenoi, zone C, 116	109	227	Zafer Papoura 10	72	273	Mavro Spelio 7	242
182	Armenoi, zone C, 117	113	228	Zafer Papoura 11	97	274	Mavro Spelio 9	208
183	Armenoi, zone C, 118	126	229	Zafer Papoura 12	106	275	Mavro Spelio 12	248
184	Armenoi, zone C, 119	101	230	Zafer Papoura 13	96	276	Mavro Spelio 13	232

TABLE 6.1. Grave orientations in Crete [continued]

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
277	Mavro Spelio 14	271	293	Gypsades 15	25	309	Knossos, Isopata 5	104
278	Mavro Spelio 15	236	294	Lower Gypsades	257	310	Knossos, Isopata 6	91
279	Mavro Spelio 16	231	295	Knossos, hospital site, 1	125	311	Phaistos 4	92
280	Mavro Spelio 18	262	296	Knossos, hospital site, 3	114	312	Phaistos 5	106
281	Mavro Spelio 19	248	297	Knossos, hospital site, 5	89	313	Phaistos 6	106
282	Mavro Spelio 21	224	298	Knossos, Sellopoulo, 3	243	314	Phaistos 7	90
283	Mavro Spelio 22	243	299	Knossos, Sellopoulo, 4	243	315	Phaistos 9	95
284	Gypsades 1	91	300	Knossos, Ay. Ioannis	249	316	Phaistos 10	92
285	Gypsades 3	68	301	Knossos, Kephala	239	317	Phaistos 11	92
286	Gypsades 4	87	302	Knossos, W. of Temple Tomb	331	318	Phaistos 12	100
287	Gypsades 5	92	303	Knossos, Isopata ?	67	319	Phaistos 13	107
288	Gypsades 6	49	304	Knossos, Isopata ?	10	320	Phaistos ?	96
289	Gypsades 7	29	305	Knossos, Isopata ?	101	321	Chrysolakkos	82
290	Gypsades 8	359	306	Knossos, Isopata 2	357	322	Palaikastro	190
291	Gypsades 9	91	307	Knossos, Isopata 3	6	323	Archanes tholos A	78
292	Gypsades 10	53	308	Knossos, Isopata 4	1			

TABLE 6.2. Grave orientations in Mainland Greece

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
1	Mycenae «Clytemnestra» grave	168	24	Mycenae 517, Kalkani	358	47	Dendra 5	240
2	Mycenae Grave circle A	259	25	Mycenae 518, Kalkani	10	48	Dendra 6	249
3	Mycenae C-T grave	115	26	Mycenae 519, Kalkani	7	49	Dendra 7	248
4	<i>Atrous</i> grave	101	27	Mycenae 520, Kalkani	282	50	Dendra 8	251
5	Mycenae 1	285	28	Mycenae 521, Kalkani	248	51	Dendra 9	226
6	Mycenae 2	195	29	Mycenae 522, Kalkani	217	52	Dendra 10	247
7	Mycenae 3	200	30	Mycenae 523, Kalkani	199	53	Dendra 11	238
8	Mycenae 4	259	31	Mycenae 524, Kalkani	217	54	Dendra 12, <i>Cuirass tomb</i>	255
9	Mycenae 5	276	32	Mycenae 525, Kalkani	17	55	Dendra 13	240
10	Mycenae 6	338	33	Mycenae 526, Kalkani	13	56	Dendra 14	231
11	Mycenae 7	307	34	Mycenae 527, Kalkani	2	57	Dendra 15	262
12	Mycenae 8	77	35	Mycenae 528, Kalkani	7	58	Dendra 16	256
13	Mycenae 9	174	36	Mycenae 529, Kalkani	14	59	Dendra Tholos	256
14	Mycenae <i>Fig tree tomb</i>	104	37	Mycenae 530, Kalkani	2	60	Pylos tholos III	233
15	Mycenae ?	114	38	Mycenae 531, Kalkani	224	61	Pylos tholos IV	227
16	Mycenae 102	102	39	Mycenae 532, Kalkani	15	62	Pylos E-4	178
17	Mycenae 502	116	40	Mycenae 533, Kalkani	4	63	Pylos E-6	170
18	Mycenae 504	97	41	Mycenae ? Kalkani	217	64	Pylos E-8	182
19	Mycenae 505	90	42	Mycenae ?, Kalkani	221	65	Pylos E-9	178
20	Mycenae 513, Kalkani	341	43	Dendra 1	258	66	Pylos E-10	181
21	Mycenae 514, Kalkani	16	44	Dendra 2	263	67	Pylos K-1	193
22	Mycenae 515, Kalkani	5	45	Dendra 3	260	68	Pylos K-2	269
23	Mycenae 516, Kalkani	1	46	Dendra 4	259	69	Asine 1, north-east	13

TABLE 6.2. Grave orientations in Mainland Greece [continued]

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
70	Asine 1, east	54	116	Prosymna XL	65	162	Athens, Agora 21	35
71	Asine 2	35	117	Prosymna XLI	266	163	Athens, Agora 23	304
72	Asine 3	47	118	Prosymna XLII	246	164	Athens, Agora 24	10
73	Asine 5	61	119	Prosymna XLIII	126	165	Athens, Agora 40	246
74	Asine 6	40	120	Prosymna XLIV	237	166	Perati 1	274
75	Asine 7	53	121	Prosymna XLV	262	167	Perati 2	252
76	Asine II:1	9	122	Prosymna XLVI	276	168	Perati 3	250
77	Prosymna I	240	123	Prosymna XLVII	220	169	Perati 4	265
78	Prosymna II	124	124	Prosymna XLVIII	263	170	Perati 5	237
79	Prosymna III	129	125	Prosymna XLIX	266	171	Perati 10	238
80	Prosymna IV	136	126	Prosymna L	204	172	Perati 12	193
81	Prosymna V	288	127	Prosymna LI	196	173	Perati 13	198
82	Prosymna VI	304	128	Prosymna LII	188	174	Perati 14	248
83	Prosymna VII	326	129	Prosymna WI	228	175	Perati 15	244
84	Prosymna VIII	304	130	Prosymna WII	267	176	Perati 16	241
85	Prosymna IX	284	131	Kokla I	113	177	Perati 17	263
86	Prosymna X	213	132	Kokla VIII	98	178	Perati 18	182
87	Prosymna XI	247	133	Kokla IX	110	179	Perati 19	247
88	Prosymna XII	260	134	Kokla VII	137	180	Perati 20	250
89	Prosymna XIII	128	135	Kokla VI	129	181	Perati 21	241
90	Prosymna XIV	316	136	Kokla V	117	182	Perati 23	227
91	Prosymna XV	315	137	Kokla IV	103	183	Perati 25	230
92	Prosymna XVI	231	138	Kokla II	112	184	Perati 26	198
93	Prosymna XVII	253	139	Aigion A	12	185	Perati 27	197
94	Prosymna XVIII	279	140	Aigion 1	22	186	Perati 31	204
95	Prosymna XIX	286	141	Aigion 2	31	187	Perati 33	212
96	Prosymna XX	282	142	Aigion 3	22	188	Perati 36	219
97	Prosymna XXI	285	143	Aigion 4	13	189	Perati 39	217
98	Prosymna XXII	270	144	Aigion 5	32	190	Perati 42	280
99	Prosymna XXIII	229	145	Aigion 5a	347	191	Perati 43	359
100	Prosymna XXIV	242	146	Aigion 5b	23	192	Perati 46	226
101	Prosymna XXV	231	147	Aigion 6	30	193	Perati 47	217
102	Prosymna XXVI	225	148	Aigion 7	19	194	Perati 48	276
103	Prosymna XXVII	239	149	Aigion 8	22	195	Perati 49	273
104	Prosymna XXVIII	214	150	Athens, Agora 1	20	196	Perati 50	274
105	Prosymna XXIX	155	151	Athens, Agora 3	25	197	Perati 51	227
106	Prosymna XXX	240	152	Athens, Agora 4	16	198	Perati 52	200
107	Prosymna XXXI	225	153	Athens, Agora 5	118	199	Perati 53	195
108	Prosymna XXXII	223	154	Athens, Agora 7	283	200	Perati 55	224
109	Prosymna XXXIII	219	155	Athens, Agora 8	88	201	Perati 57	308
110	Prosymna XXXIV	222	156	Athens, Agora 12	7	202	Perati 64	130
111	Prosymna XXXV	194	157	Athens, Agora 13	14	203	Perati 65	128
112	Prosymna XXXVI	196	158	Athens, Agora 14	1	204	Perati 66	195
113	Prosymna XXXVII	103	159	Athens, Agora 15	28	205	Perati 67	185
114	Prosymna XXXVIII	96	160	Athens, Agora 18	59	206	Perati 68	164
115	Prosymna XXXIX	86	161	Athens, Agora 20	1	207	Perati 74	104

TABLE 6.2. Grave orientations in Mainland Greece [continued]

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
208	Perati 75	93	254	Perati 132	227	301	Perati Σ 25	198
209	Perati 76	97	255	Perati 133	223	302	Perati Σ 26	209
210	Perati 77	125	256	Perati 134	203	303	Perati Σ 27	163
211	Perati 78	209	257	Perati 135	212	304	Perati Σ 28	181
212	Perati 87	273	258	Perati 136	209	305	Perati Σ 29	147
213	Perati 88	283	259	Perati 137	210	306	Perati Σ 30	174
214	Perati 89	275	260	Perati 139	220	307	Perati Σ 31	129
215	Perati 90	146	261	Perati 140	207	308	Perati Σ 32	114
216	Perati 91	127	262	Perati 141	191	309	Perati Σ 33	199
217	Perati 92	134	263	Perati 142	205	310	Perati Σ 34	180
218	Perati 93	188	264	Perati 143	221	311	Perati Σ 35	115
219	Perati 96	155	265	Perati 144	208	312	Perati Σ 36	132
220	Perati 97	158	266	Perati 145	198	313	Perati Σ 37	122
221	Perati 99	82	267	Perati 146	203	314	Perati Σ 38	193
222	Perati 100	134	268	Perati 147	240	315	Perati Σ 39	198
223	Perati 102	238	269	Perati 148	198	316	Perati Σ 40	186
224	Perati 103	246	270	Perati 149	220	317	Perati Σ 41	193
225	Perati 104	244	271	Perati 150	196	318	Perati Σ 43	251
226	Perati 105	217	272	Perati 151	191	319	Perati Σ 44	137
227	Perati 106	226	273	Perati 152	205	320	Perati Σ 46	200
228	Perati 107	208	274	Perati 153	203	321	Perati Σ 47	223
229	Perati 108	211	275	Perati 154	199	322	Perati Σ 48	189
230	Perati 109	185	276	Perati 155	216	323	Perati Σ 49	187
231	Perati 110	212	277	Perati 156	194	324	Perati Σ 50	258
232	Perati 111	193	278	Perati 157	192	325	Perati Σ 51	269
233	Perati 112	191	279	Perati Σ 1	221	326	Perati Σ 52	237
234	Perati 113	170	280	Perati Σ 2	257	327	Perati Σ 53	236
235	Perati 114	215	281	Perati Σ 3	239	328	Perati Σ 55	212
236	Perati 115	280	282	Perati Σ 4	263	329	Perati Σ 55	238
237	Perati 116	277	283	Perati Σ 5	239	330	Perati Σ 56	235
238	Perati 117	297	284	Perati Σ 6	118	331	Perati Σ 57	238
239	Perati 118	257	285	Perati Σ 7	141	332	Perati Σ 58	183
240	Perati 119	271	286	Perati Σ 8	213	333	Perati Σ 59	238
241	Perati 120	284	287	Perati Σ 9	190	334	Perati Σ 60	271
242	Perati 121	264	289	Perati Σ 10	164	335	Various, Attika, Vrana 10C	200
243	Perati 122	234	290	Perati Σ 11	210	336	Sparta, Arkines A	128
244	Perati 123	236	291	Perati Σ 12	209	337	Sparta, Arkines B	35
245	Perati 124	236	292	Perati Σ 13	154	338	Nichoria 3	241
246	Perati 125	229	293	Perati Σ 14	195	339	Nichoria 4	206
247	Perati 126	217	294	Perati Σ 15	166	340	Messenia, Routsis, tholos 1	331
248	Perati 127	226	295	Perati Σ 15	169	341	Messenia, Routsis, tholos 2	320
249	Perati 128	221	296	Perati Σ 16	190	342	Messenia, Tourliditsa	157
250	Perati 129	246	297	Perati Σ 18	191	343	Triphylia, tholos 1	207
251	Perati 130	239	298	Perati Σ 22	184	344	Triphylia, tholos 2	179
252	Perati 131a	226	299	Perati Σ 23	190	345	Triphylia, Kopanaki tholos	203
253	Perati 131b	218	300	Perati Σ 24	206	346	Triphylia, Malthi, tholos 1	291

TABLE 6.2. Grave orientations in Mainland Greece [continued]

No.	Site & grave designation	°	No.	Site & grave designation	°	No.	Site & grave designation	°
347	Triphylia, Malthi, tholos 2	282	356	Marmariane 4	161	365	Nemesis	133
348	Triphylia, Vassiliko	121	357	Marmariane 6	223	366	Thorikos B	185
349	Triphylia, Kakovatos A	164	358	Orchomenos tholos	158	367	Phocis, Medeon A1	266
350	Triphylia, Kakovatos B	211	359	Volimidhia A8	181	368	Phocis, Medeon T239	227
351	Triphylia, Kakovatos C	215	360	Keph. Kontogenadas A	215	369	Dimini B	296
352	Krini (Patras) 3	290	361	Kallithea 0	262	370	Thessaly, Pteleon A	145
353	Marmariane 1	208	362	Epidauros-Limera A	1	371	Thessaly, Pteleon C	142
354	Marmariane 2	190	363	Keph. Metaxata Ad	29	372	Thessaly, Pteleon E	255
355	Marmariane 3	214	364	Keph. Metaxata Ad	21			

the positions of the sun or moon. The orientations of only 11% lie within the limits for moonrise, and 42% within the limits for both moonrise and moonset. If there is any preference, it seems to be for the south-west quadrant where 56% of the orientations lie (Table 6.2; Fig. 6.7). The margin of error for 15% of the graves—those published by Blegen (1937)—is less than  $\pm 1^\circ$ . As in the case of the graves in Crete, the margin of error for those determined by us from published plans is estimated to be less than  $\pm 5^\circ$ .

Most of the chamber tombs in Crete are, in fact, from the period of the Mycenaean domination. Only a few of them, however, have been identified as belonging to Mycenaeans and this has been done on the basis of the relatively large amounts of weaponry and armour. These are the so-called *Warrior Graves* near Knossos and their orientations all lie within the limits of sunrise (Hood and De Jong 1952). As for the other graves in the Knossos area, it has not been possible to distinguish them as belonging either to Mycenaeans or to Minoans since the two cultures had become materially almost indistinguishable. There remained differences in religious values however, as indicated by the orientations. The Minoan pattern of relationships between the cosmos and their cult rooms and tombs remained unchanged. The Mycenaeans had no discernible influence on orientations in Crete. They seem instead to have adopted those of the Minoans for their own graves. On the mainland, on the other hand, they did not alter the pattern of orientations for their graves.

## Origins of the Greek temple

The Mallia shrine has been related to the Greek temple in its early form, the so-called temple *in antis*, which is said to derive from the Mycenaean megaron (Pelon 1997, 343; Dinsmoor 1950, 20–1). The alleged similarity to Mycenaean architecture was based on two arguments: the shrine was built after the Mycenaeans were politically dominant in Crete and it was said to be similar to the Mycenaean megaron, when in fact it shows little similarity. The resemblance to the early Greek temple is also superficial, consisting merely of a room preceded by a porch. The shrine at Ayia Triada, with its axial symmetry, vestibule and symmetrically placed doors, shows a greater similarity to the megaron form, but since it was long considered to have been built in Late Minoan I, before the Mycenaean hegemony, the similarity was never noted (Banti 1941–3, 40–2).

The megaron is regarded as having been the political and religious centre of the Mycenaean palace and having derived from earlier mainland houses of the Middle Bronze Age (Taylour 1983, 83), but the similarities cited are general. There is also an unaccountable lapse of time as all surviving examples are late—after about 1300 BC—and all are very much alike. They show strict axial symmetry: there is a large room, the megaron proper, with one or more entrance doors and a central hearth surrounded by four columns, an anteroom or vestibule, a porch with roof supported by side walls, and columns symmetrically placed with respect to the door or doors (Taylour 1983,

figs 75 and 80). There is better reason to consider the megaron to be another example of the Versailles effect, as in the case of the graves with passages; the axial symmetry and the porch with columns and side walls before the main room is found in Minoan houses as early as 1600 BC (Graham 1987, fig. 31,2).

We propose that, rather than being derived from the Mycenaean megaron, the form of the small shrines at Mallia and Ayia Triada was an independent development from the Minoan pattern for ceremonial rooms and that this occurred at about the same time that the pattern was also being developed in the mainland into the megaron system of the Mycenaean palaces. We also propose that these shrines were independently the prototypes of the later Archaic Greek temple which developed into the canonical peripteral temple of the Classical Period. The typical Archaic Greek temple consisted of the main room with a door on the axis, a porch with side walls, and symmetrical columns. Some examples had a row of piers or columns down the centre of the room to support the roof. The orientation is usually to the east, within the limits of sunrise. The hearth surrounded by columns, one of the most characteristic features of the Mycenaean megaron, is extremely rare in temples.

The most significant new feature of the two small shrines is that they are the first completely detached buildings *in settlements* devoted to religion and thus are in fact the earliest true temples both in Crete and in the mainland. All earlier Mycenaean and Minoan cult rooms, aside from the remote mountain sanctuaries in Crete, were parts of other buildings. Because of their fine proportions and the high quality of their construction, the two shrines succeed in imparting a sense of monumentality despite their small size. They are clearly important innovations in Bronze Age architecture. It should also be noted that they were not erected on the sites of earlier sacred areas or buildings.

The unique shrines are best explained as representing the earliest attempts to satisfy new religious needs emerging from the new social, economic and political situation in Crete following the Mycenaean take-over. The acceptance on the part of the Mycenaeans of Minoan architectural techniques and cosmological ideas is similar to their adoption of Minoan grave types and orientations. This suggests that the two peoples were not destructively hostile to each other, that each was prepared to accommodate the other and that, in the process, a

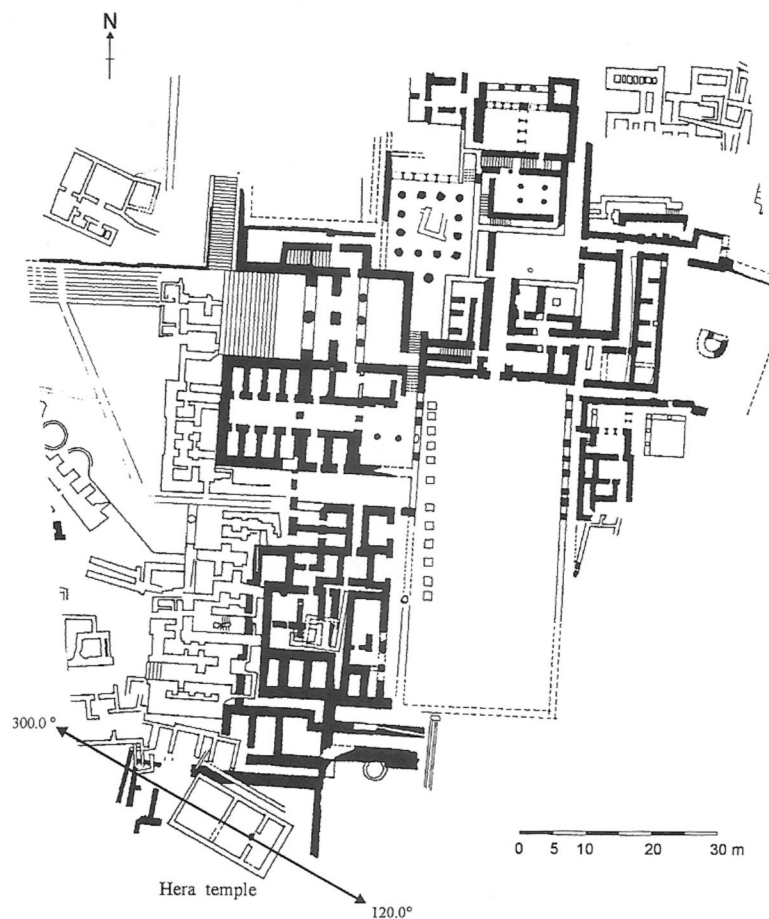


FIG. 6.8. Plan of the temple to Hera at Phaistos. Eastern orientation of the axis of symmetry =  $120.0^\circ$ . By permission of the editors of *The Aerial Atlas of Ancient Crete*.

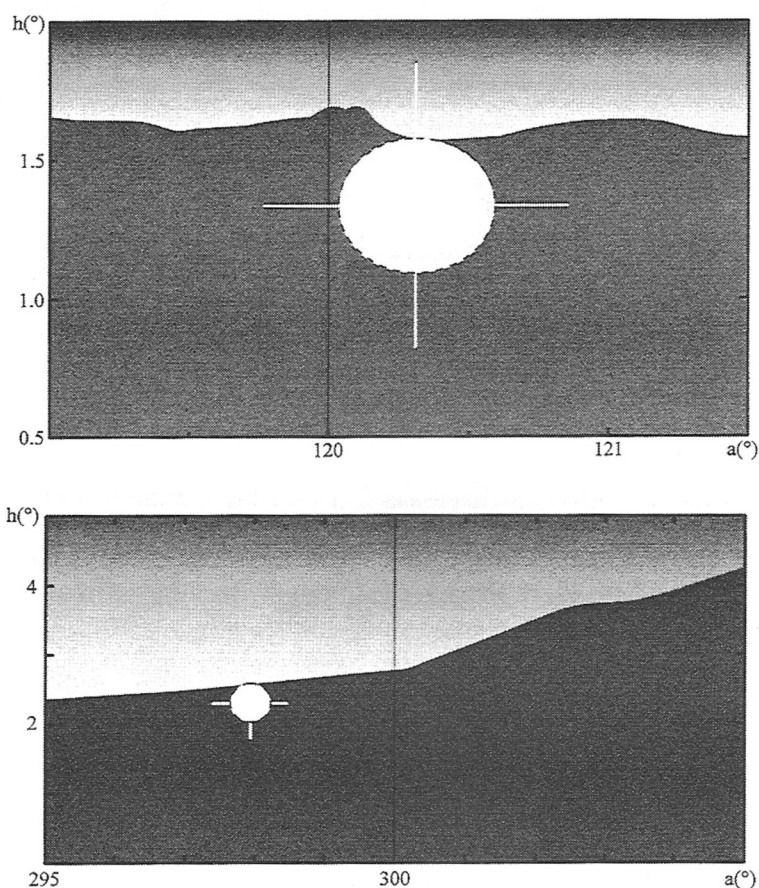


FIG. 6.9. (a) Sunrise as observed from the temple of Hera at the winter solstice, 20 Dec 900 BC at 07:23.15 local solar mean time: azimuth of the sun =  $120.31^\circ$ , altitude =  $1.58^\circ$ . (b) Sunset at the summer solstice, 22 Jun 900 BC at 18:56.45 local solar mean time: azimuth of the sun =  $297.9^\circ$ , altitude =  $2.56^\circ$ . The vertical lines correspond to the respective orientations of the axis of symmetry of the temple ( $120.0^\circ/300.0^\circ$ ).

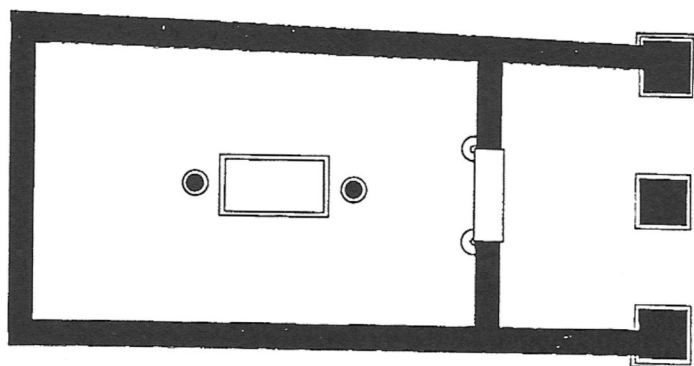


FIG. 6.10. Plan of the Archaic temple at Prinias in Crete.

new, composite culture emerged. Could the unusual orientation to the west have been a compromise acceptable to the Mycenaeans since it is the general direction of their homeland or because sunset at the summer solstice was an important date in the Mycenaean calendar?

The further development towards the Greek temple can be followed via the example at the south-west corner of the palace at Phaistos, which is just 3 km from Ayia Triada (Fig. 6.8). This is the so-called temple to Magna Mater or Hera, one of the divinities mentioned in the Linear B tablets along with a few other gods worshipped also by the Greeks. The dates of its construction are unclear; it may be no later than 900 BC (Myers, Myers and Cadogan 1992). Although the location of the entrance could not be determined, the intended orientation must have been to sunrise at the winter solstice ( $120.0^\circ$ ) where we have a distant double peak as foresight (Fig. 6.9a). Sunset at the summer solstice occurred south of the orientation of the temple due to the high close ridge in that direction (Fig. 6.9b).

A further step in the temple's development can be seen in the early Archaic example from Prinias in Crete, built about 700 BC (Fig. 6.10). Here the typical features have been established: axial symmetry, one door on the axis, a porch with side walls extended to the edge, and orientation to the east. A difference is the use of the pier instead of

columns to support the roof of the porch. On the inside, two columns flank an altar used for burnt offerings. This has some similarity to the hearth and columns of the megaron but, as noted above, the inside hearth is very rare in Greek temples. Burnt offerings were usually made on an altar just outside. Small temples of this type continued to be made down into Roman times, contemporaneous with the elaborated version with surrounding colonnade which appeared towards the end of the Archaic period. Both types were usually oriented to the east, as were most Minoan religious monuments, but exceptions are more numerous, perhaps as the result of Mycenaean influence.

Our proposal of the development by the Greeks of a temple form which had its origins in the composite culture of Late Bronze Age Crete makes a lot of sense. The form arose as a solution to the new religious needs of a society struggling to accommodate two cultures. It may even have been used in the Bronze Age for gods common to both Mycenaeans and Greeks. Zeus, Hera, Ares, Artemis, and Dionysos are mentioned in the Linear B texts. Greek culture itself had been formed in a period of great change following the rapid decline of Mycenaean culture and the immigration of new Greek-speaking tribes. We know from contemporary documents that the Greeks were proud of the greatness of their Bronze Age past. The surviving legends of the warlike, heroic Mycenaeans and the wise, just Minoans were beacons in their Dark Age and they had great influence on the developing Greek culture. Greek lawgivers, for example, were inspired by the legendary Minoan kings who were believed to have received laws directly from Zeus (Plato 1942 [4th cen. BC], 624 A–B). We do not know to what extent the Greeks distinguished the Minoan culture from that of the Mycenaean. Their constellations were grounded in the mythology of both (Aratos 1989 [3rd cen. BC], 24–73). We can follow the calendar back through the Mycenaeans to the Minoans, but we do not know to what extent the Greeks were clear about its origins (Blomberg and Henriksson 1996).

## **Orientations of Greek temples**

It is interesting to compare the orientations of Archaic and Classical Greek temples in Fig. 6.11 (based on Dinsmoor 1939, fig. 3) with Figs 6.5–6.7. Although 73% of the temples were oriented to the east within the limits of sunrise, other orientations do occur. Dinsmoor showed that the Parthenon was aligned to the point of sunrise behind Mt Hymettos on the festival day for Athena—to whom the temple was dedicated—in the year the temple was built. He argued that the Hephaisteion in Athens was oriented to sunrise on the festival day of the god Hephaistos. It was extremely important in Greek religion that the festivals of the deities be celebrated on the proper days. It is thus not surprising that a temple should have been oriented to sunrise on the festival day of its deity in the year when the temple was built. Festival days occurred in connection with specific phases of the moon. This explains the need and continued use of the Minoan luni-solar calendar by the Greeks.

We wonder to what is owed the Greek preference for eastern orientations. We have seen that there is no detectable Mycenaean interest in placing monuments in greater cosmic relationships through orientation. Any earlier need to influence Minoan practice in this respect, when the two cultures were in a sensitive period of accommodation, as may have been the case with the two small shrines, must have diminished with time. The Minoan practice of eastern orientations, on the other hand, was one expression of Minoan cosmology. The continued use of the Minoan luni-solar calendar could have been the vehicle for the survival of some of their beliefs. If it were the Greek custom to orient temples to sunrise on specific days, as Dinsmoor has shown in the case of the Parthenon, it may well have been derived from a Minoan practice. The eastern distribution of Minoan orientations is similar to that of Greek temples, except that there are fewer exceptions. It was mentioned in the study of the c. 220 orientations of the graves at Armenoi in Crete that they may have been oriented to sunrise or moonrise on a significant day (Papathanassiou, Hoskin and Papadopoulou 1992). Thus the idea could have remained in memory or even as a still-living tradition. It is possible that Mycenaean reasons for their orientations also survived and that these account for the larger percentage of Greek orientations outside the limits of sunrise.



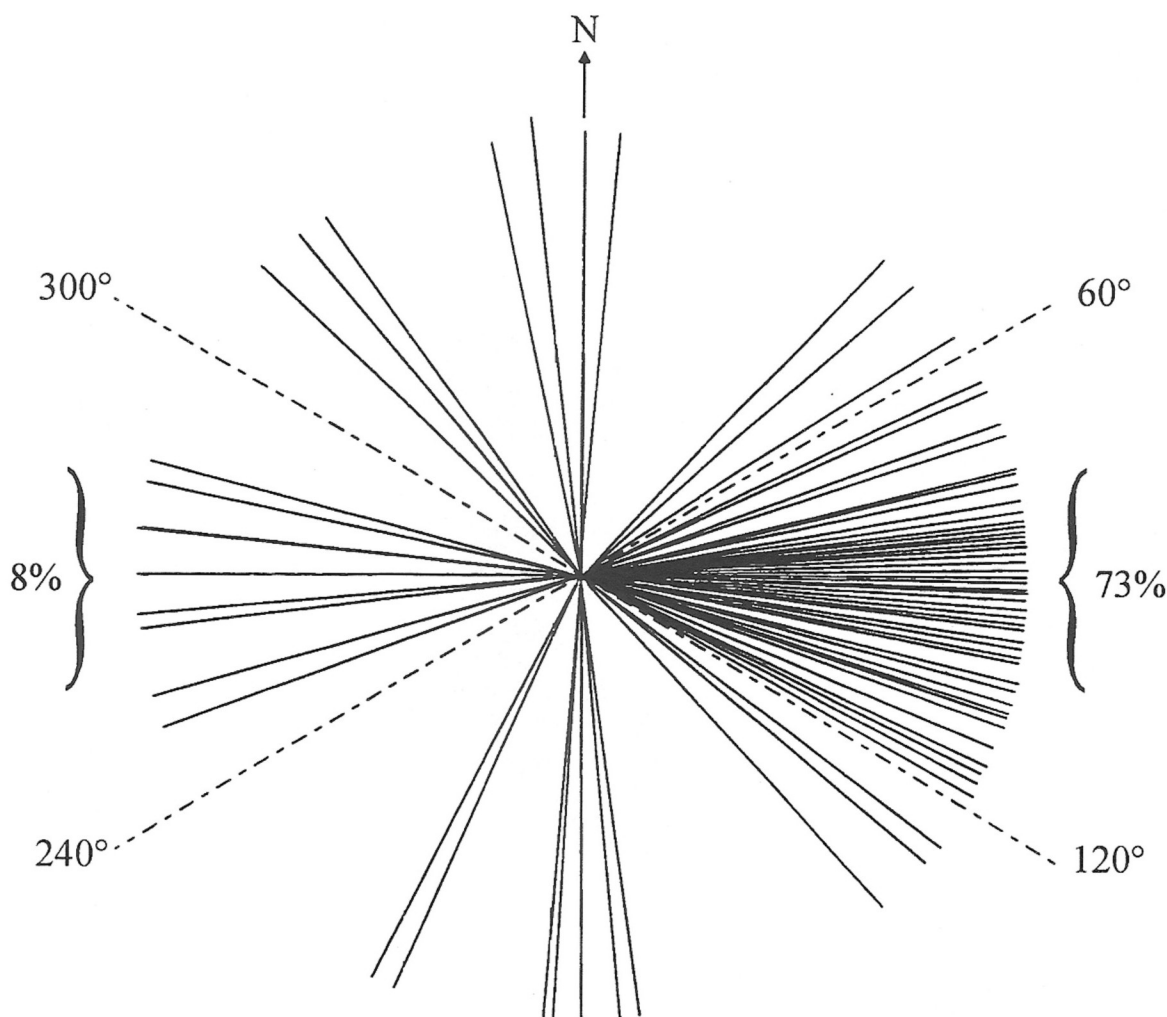


FIG. 6.11. Orientations of 110 Greek temples, after Dinsmoor (1939, fig. 3).

## Note

1. The measurements of the walls of the shrines were taken with a SOKKIA SET 4C Total Station on two separate occasions, and the orientation of the co-ordinate system was obtained from timed observations of the sun, which are considered accurate to better than  $0.01^\circ$ . The contours of the landscape were calculated from theodolite measurements and corrections were made for parallax. With such precise measurements we can be confident that errors from this source are reduced to a minimum.

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