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DIGGING THE ARCHIVES: THE ORIENTATION OF GREEK TEMPLES AND THEIR DIAGONALS

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ABSTRACT

I have measured orientations of the diagonals of Greek temples using a larger sample than before (Ranieri 2010), amounting to 200 temples, including several Treasures and Megarons. In addition, for each temple, I have used the best plan among those obtainable from the archives of archaeological journals, archaeological reports, and books. This approach has allowed more accurate and reliable geometrical analyses. The results show 57 temples with an unequivocally cardinally oriented main axis. Among the remaining 143 temples, 103 (72% of 143) have their diagonal cardinally oriented, with a standard deviation of about ± 2.5°. For the other 40 temples (28% of 143), the cardinal orientation can be attributed to the diagonals of half of the rectangle of the temple. The results point to a generalized topographical practice of establishing, as the first activity prior to construction, a cardinally oriented line on the terrain.

KEYWORDS: Greek temples, orientation, ancient topography, architecture, diagonal

1. INTRODUCTION

While it is not common for Greek temples to exhibit a strict (say within ± 5°) east-west orientation of the main axis, many show an east-west orientation in the broader sense of facing east or facing sunrise. This is not a general rule, as more than a few escape from this definition. Efforts to explain the orientation of Greek temples can be dated back to the works of Nissen (1873, 1885, 1887) and Penrose (1892, 1893, 1897, 1899). Since then, many scholars (Dinsmoor (1939), Herbert (1984), Mickelson (1999), Aveni & Romano (2000), Liritzis & Vassiliou (2003, 2005, 2006), Boutsikas (2005, 2007a, 2007b), Pantazis, (2008), and Salt (2009, 2010), among others) have approached the problem with direct onsite measurements of azimuths and by contributing statistical results and interpretations mainly intended to associate the orientation with the rising or setting, on the local horizon, of celestial bodies on the day of a deity festival or the foundation date, or on the dates of important historical events. These interpretations are mostly convincing, their consistency depending on the knowledge of rituals and their associated celebration dates. However, many orientations remain not fully understood, while a large number of temples remain to be investigated. In all of these studies it is implicitly assumed that the only line on the ground that rules the angular positioning of the temple is the main axis. However, I have often noted the clear alignment of some diagonals (and not just those of temples) to a cardinal direction. This was a stimulus to undertake specific investigations on the orientation of the diagonals of the temples.

In a recent work (Ranieri, 2010), a sample of 61 structures, mainly Greek temples (57), were considered. The results showed that the deviation of the diagonals from cardinal orientations was within about ±5 degrees. A more recent "case study" work on seven temples of Himera and Pyrgi (Ranieri, 2011) produced even more strict correspondences (less than ±1.5°).

In the light of these previous results a new, more in-depth investigation on the orientations of the diagonals has been done and is presented in this paper. The archives of archaeological journals and books, nowadays more and more accessible online, have been searched to collect the originals and/or the most reliable plans. The study includes a total of 200 Greek temples. Aside from being a larger sample, a major effort was made to clarify whether the north arrow on the plan was intended to indicate the true Astronomical North (AN in the following) or the Magnetic North (MN in the following). As the direction of the diagonal directly depends on the shape of the rectangle, another special effort was made to identify the exact shape.

2. HISTORICAL MAPS OF ARCHAEOLOGY

Since the eighteenth century the process of mapmaking has involved determining only once for a given area, the Astronomical North by means of suitable instruments (surveying transit, small telescopes, etc.) and then using the compass as the primary tool for all locations of the area. In several historical maps - and is not a short list - useful information on temples' orientation could be retrieved (see examples in figures 1, 2, 3 and 4). The good surprise, especially on the oldest plans, was that the north arrow was often placed with great care along with placing both AN and MN arrows, with the indication of the value of the magnetic deviation (Mdev in the following) and the date to which it was related. Frequently a date could be found somewhere else on the plan. The knowledge of the date is most important because it allows us to retrieve an estimate of Mdev from the Historical Geomagnetic data of NOAA (National Oceanic and Atmospheric Administration), a control which was done on all the plans. When the date was not present on the plan, it was deduced from the archaeological reports.

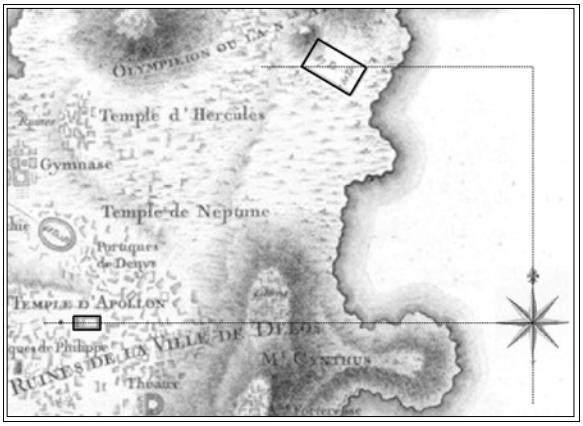

Figure 1 Delos. Detail of the map of Choiseul-Gouffier (1782) showing the diagonal of the temple of Hercules and the main axis of the temple of Apollo, both oriented E-W.

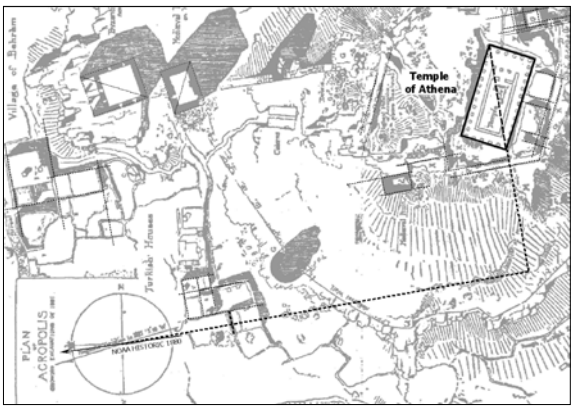

Figure 2 Assos. Detail of the map of Francis Henry Bacon (Clarke 1882), showing the diagonal of the temple of Athena precisely E-W after correcting the north with geomagnetic data from NOAA.

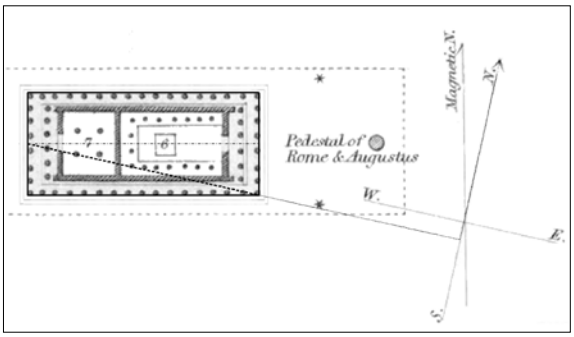

Figure 3. Athens. Detail of Cockerell's (1832) plan of the Parthenon. The temple has the diagonal of the semi stylobate rectangle precisely orthogonal to the meridian line.

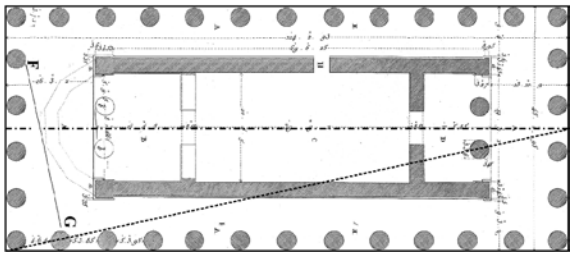

Figure 4. Stuart's (1827) plan of the Hephaisteion. The diagonal of the semi stylobate rectangle is precisely orthogonal to the meridian line. (F-G in Stuart's drawing). In the report the author writes: "This temple stands nearly east and west, and on the pavement of the portico a line is cut, which seems to have been intended for a meridian." (Stuart 1827, Chap 1, page 71).

3. THE ORIENTATION OF THE DIAGONALS AND THE SHAPE OF THE STYLOBATE

While redrawing the main axis on the plan in Computer-Aided Drawing (CAD) is a relatively easy job, drawing reliable diagonal lines is somewhat more complicated, as their orientation directly depends on the shape of the stylobate rectangle. To minimize the uncertainties, each temple underwent a CAD geometrical analysis to achieve consistency between dimensions (expressed in integer numbers of length-units) and squaring combinations of integers as Pythagorean (or quasi-Pythagorean) triads of integer numbers (Ranieri, 1997). The method assumes that the ancients used known valid combinations (triads) of integer number to achieve the perfect (or quasi-perfect) orthogonality of the temple rectangle, associating the smaller number with the shorter side, the second number with the longer side and the greater number with the diagonal.

The results are listed in column 4 of table I (see Appendix). For reasons of space only a few, although rather representative, graphical results are presented here (figures 5, 6, 7, 8, 9, 10) The notation in letters (as D=…, V=…, WB=…, etc.), corresponds to the names assigned to the triads in Ranieri (1997). The multiplication factor that appears in parentheses allows one to arrive at the proper dimension of the temple. The dimensions are in units of pg, the Greek foot (*piede greco*), the values of which were

determined from the geometrical analyses and are labeled in the graphs.

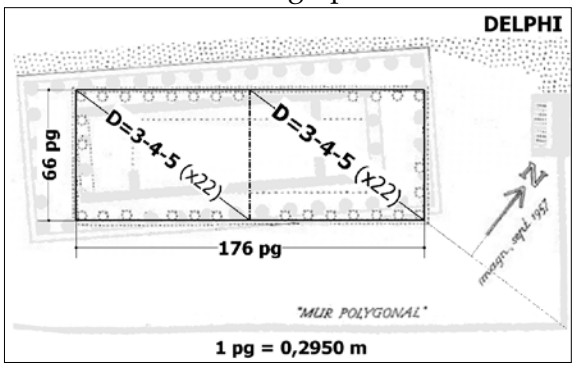

Figure 5. Delphi. The older temple of Apollo, exhibiting a precisely E-W oriented diagonal of the half rectangle of the stylobate, which has the 4:3 proportion of the Pythagorean triad D=3-4-5 (elaboration based on Hansen 1960).

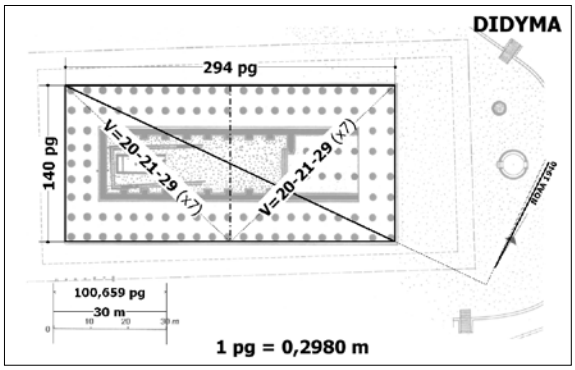

Figure 7. Didyma. Plan of the temple of Apollo with an east-west orientation of the main diagonal; half rectangles exhibit the 21:20 proportion of the Pythagorean triad V=20-21-29 (elaboration based on Knackfuß 1941).

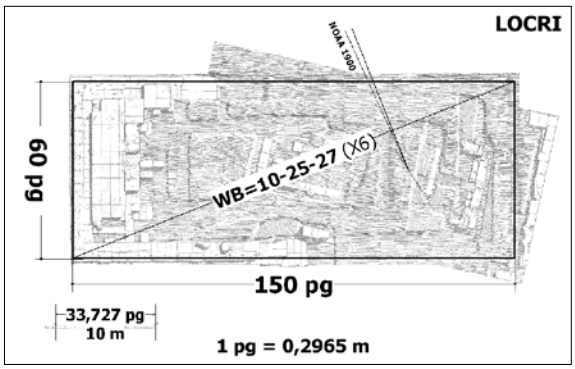

Figure 9. Locri. The Ionic temple exhibiting E-W orientation of the diagonal with the 5:2 proportion of the Quasi-Pythagorean triad WB=12-25-27. (elaboration based on Koldewey 1899, Table 1).

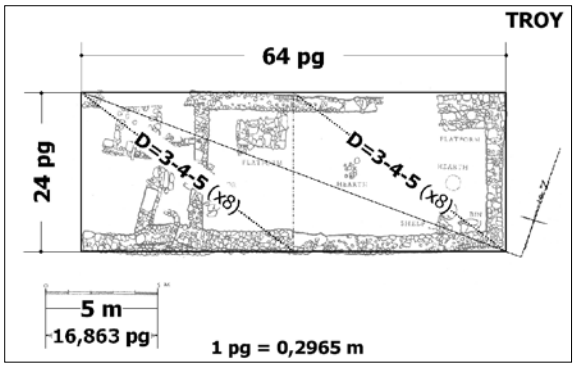

Figure 6. Troy. The Megaron IB with the same proportion of the older temple of Apollo in Delphi, and precise E-W orientation of the main diagonal (elaboration based on Blegen 1950).

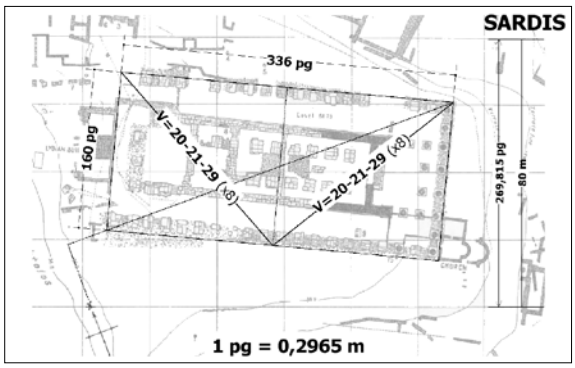

Figure 8. Sardis. The temple of Artemis, with same proportions as Didyma's temple of Apollo but with a different multiplier (elaboration based on Butler 1922).

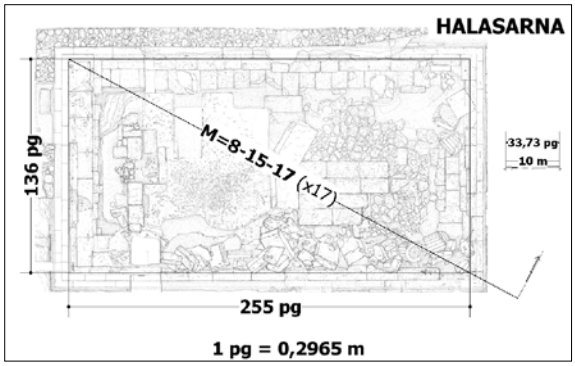

Figure 10. Halasarna (Kos). The sanctuary of Apollo with an E-W oriented diagonal exhibiting the 15:8 proportion of the Pythagorean triad M=8-15-17 (elaboration based on Antoniou plan in Kokkorou 2009).

4. CLASSIFICATION OF THE CARDINAL ALIGNMENTS OF GREEK TEMPLES

To better present the results of this work, diagonals that are close to be parallel to a cardinal direction are referred to in what follows as "Leading" diagonals. Temples will be classified as follows (fig.11).

1- "DIAG" type: one of the two diagonals of the main rectangle of the temple is a "Leading" diagonal.

2- "LONG" type: one of the two diagonals of the symmetrical halves of the main rectangle cut along the main axis of the temple is a "Leading" diagonal.

3- "SHORT" type: one of the two diagonals of the symmetrical halves of the main rectangle cut along the shorter axis of the temple is a "Leading" diagonal.

4- "AXIS" type: when "Leading" is the main axis of the temple.

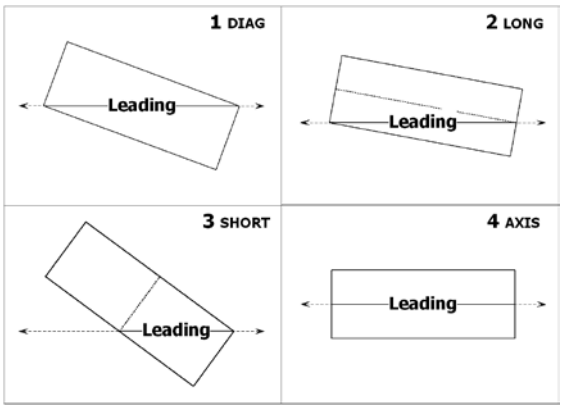

Figure 11. The four types of cardinal orientation of Greek temples.

5. RESULTS

The search for plans of Greek temples in archives was halted when the study reached a total of 200 plans judged as reliable. The working sample of this investigation on the diagonals was reduced to 143 temples by excluding 57 AXIS types (main axis orientation close to cardinal, within ±10°). The results are summarized as follows:

DIAG. 103 temples, (72% of 143 and 51.5% of 200) are of the DIAG type (temples from 1 to 103 in Table I). The orientations of their "Leading" diagonals are shown in fig. 12 (upper line of graphs), in comparison with the angular distribution of their main axes (left). It is evident that the diagonals condense around the cardinal orientations in comparison nt of to the quasi-random behavior of their main axes. "Leading" diagonals of this DIAG type group are distributed (see associated histogram) within a standard deviation of 2.4° around a mean of 0.0°.

LONG. 27 temples (19% of 143 and 13.5% of 200) are of the LONG type (temples from 104 to 130 in Table I). The orientations of their "Leading" diagonals are shown in fig. 12 (middle line of graphs), in comparison with the angular distribution of their main axes. Again, diagonals evidently condense around the cardinal orientations while their main axes are disseminated along 360°. "Leading" diagonals of this LONG-type group are distributed within a standard deviation of 2.8° around a mean of 0.1° (see associated histogram).

SHORT. The remaining 13 temples (9% of 143 and 6.5% of 200) are of the SHORT type (temples from 131 to 143 in Table I). The orientation of their "Leading" diagonals also condense around cardinal directions (lower line of graphs in fig. 12), with a distribution centered around an average value of 0.5° and a standard deviation of about 2.1° (see associated histogram).

AXIS. 57 temples were found (28.5% out of 200) with main-axis orientation close to cardinal, within 10° (temples from 134 to 200 in Table I). They are not shown in fig. 12 (they occupy the shaded sectors) .

For two temples that were not included in the sample but that had apparently reliable plans, I could not find any correspondence within a few degrees to any cardinal direction (not in Table I and not shown in fig. 12).

Other relevant public rectangular structures, not included in this paper, have given similar results.

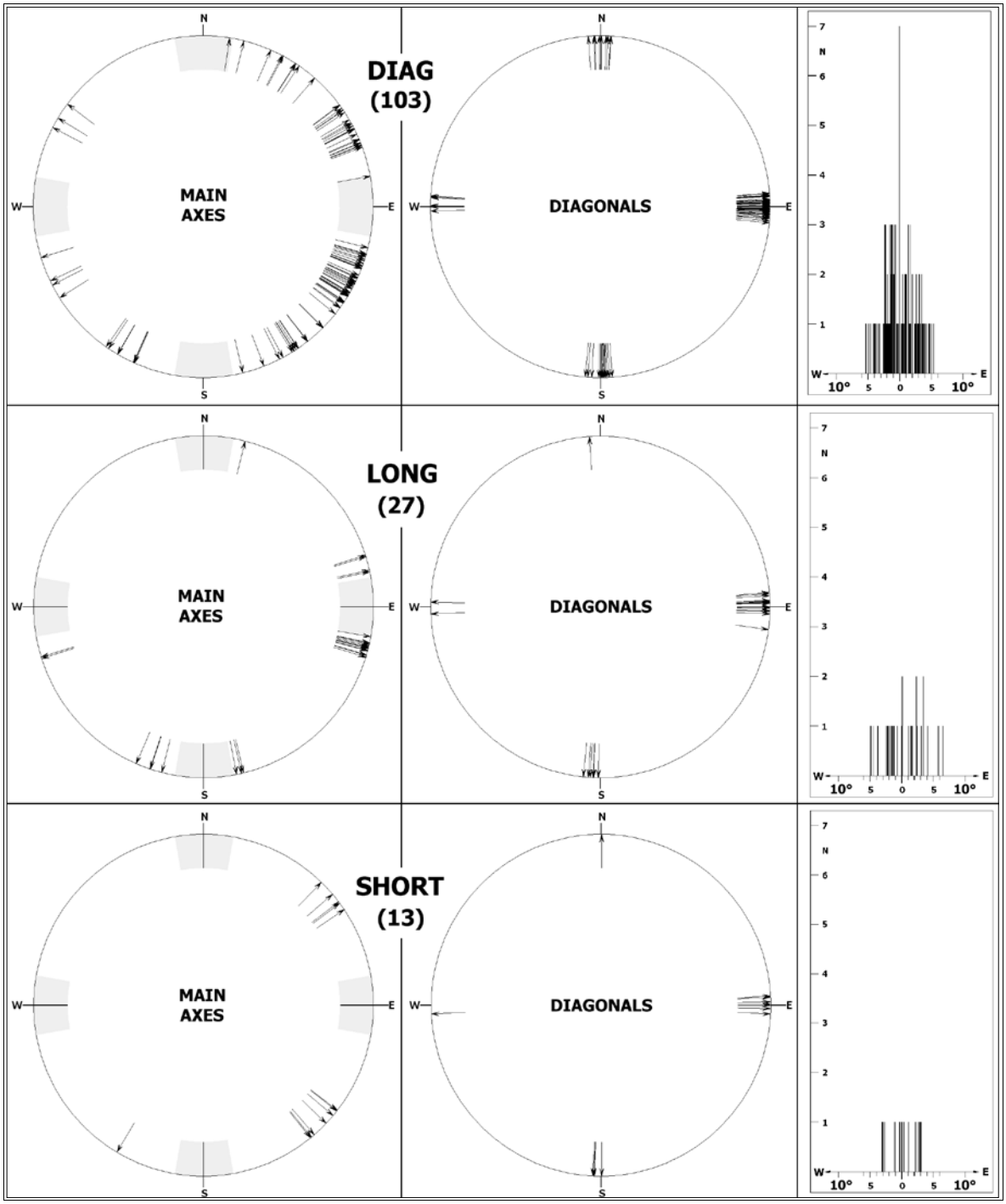

Figure 12. Orientation of the "Leading" diagonals of the 143 Greek temples, compared with the orientations of the related main axes. On the right are the corresponding histograms of their distribution. No temple with the main axis azimuth closer than 10° to any cardinal orientation (AXIS type) is included (they would occupy the shaded sectors in the diagrams).

6. THE ROLE OF DIAGONALS IN THE TOPOGRAPHY OF COMPLEXES

Diagonals, and not only the "Leading" ones, participate in the topographical layout of complex sacred areas as sanctuaries, acropolises and others. This is clearly visible in most of the plans of complex zones. Only a few can be shown in this paper (fig. 13, fig. 14, fig. 15).

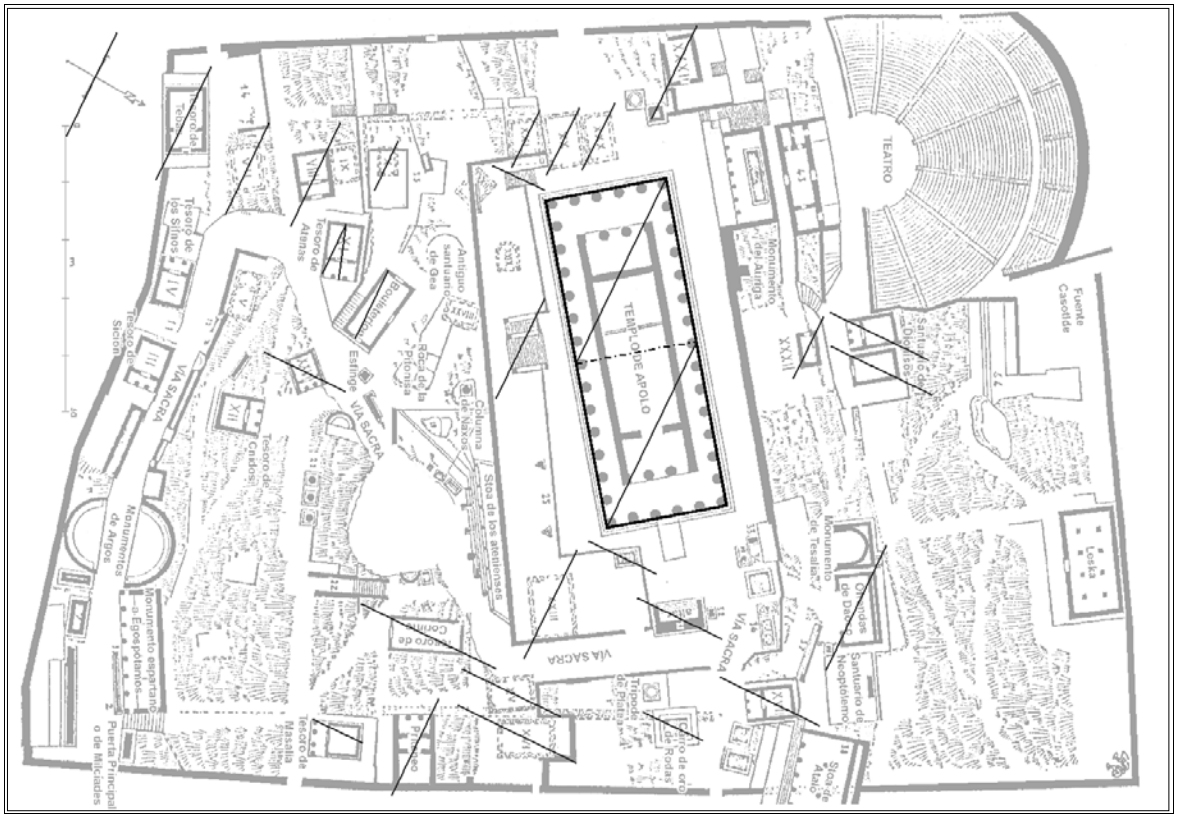

Figure 13. The sanctuary of Apollo at Delphi. "Leading" diagonals rule the angular positioning of all the structures (mostly of DIAG type, the only SHORT type being the Temple of Apollo).

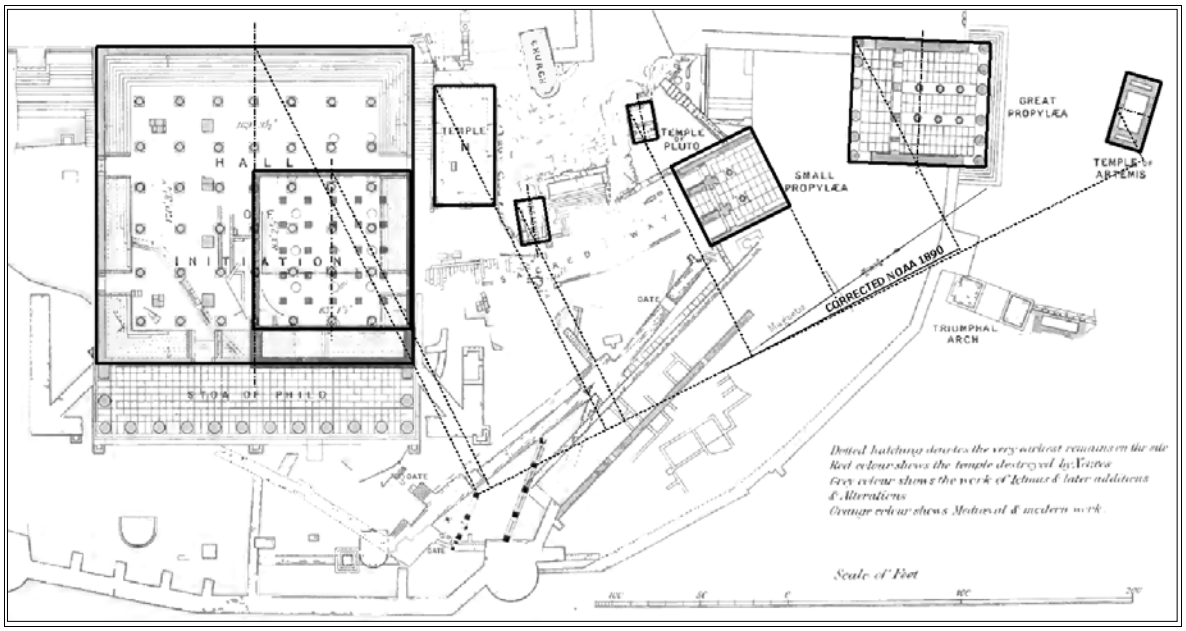

Figure 14. Portion of Dorpfeld's (1887) plan of Eleusis. After correcting with 1890 historical geomagnetic data from NOAA, the angular positioning of the structures has turned out to be coherent. All four types (DIAG, LONG, SHORT and AXIS) are present, with their E-W topographical role.

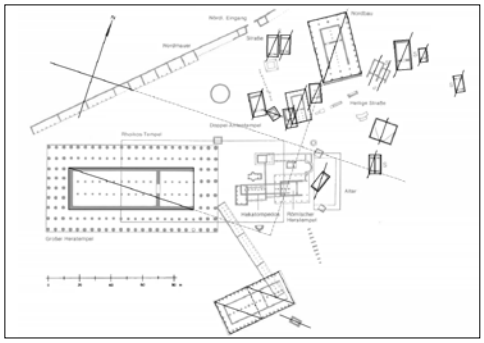

Figure 15. Samos. Heraion. The east-west orientation justifies the "Leading" diagonals of the majority of the sacred structures (redrawn, based on the plan of Kyrieleis 1980).

7. DISCUSSION AND CONCLUSIONS

Should the 200 Greek temples be representative of the totality of the Greek temples, we would conclude that any Greek temple is linked in some way (DIAG, SHORT, LONG, AXIS) to a cardinal direction. This would point to a sort of universal habit, a generalized topographical practice at the building yard of establishing a cardinally oriented line as the first construction activity on the terrain. An approximate cardinal line was easily attainable in those times through shadow-casting by gnomons, although the narrowness of the histograms and the occurrence of 85 cases with displacement from cardinal ≤1.5° (59 with displacement ≤1°) would seem to indicate more sophisticated methods, also known in those times, such as double-sighting the sun before and after midday, double-sighting a circumpolar star, or matching with a plumb line the S-N arm of the Pegasus quadrilateral. This topic would be better addressed after working on a multiplicity of single case studies. Temples appear in any case to be bound to the cardinally oriented baseline, either along the main axis or along a diagonal. In the latter cases the shape of the stylobate rectangle and the choice among DIAG, LONG and SHORT would rule the orientation of the main axis (or, vice versa, the desired orientation of the temple would rule the shape of the stylobate rectangle). In other words, should a particular orientation of the main axis be mandatory for celebrative reasons, then fixing a particular diagonal to the cardinal would in turn fix the geometric shape of the temple. More in-depth discussion and appropriate conclusions should be better arrived at in the future after further enlargement of the sample and working on case studies. I am convinced that future archaeoastronomical investigations and debates on the orientation of Greek Temples should not only consider the association of the sky alignments with the axial orientation of the temple, but will also have to take into account all the relevant topographical "reasons why", with the orientation of the diagonals *in primis*.

8. APPENDIX

TABLE I. Col.1: ID Number. Col.2: Type of cardinal alignment. Col.3: Temple. Col.4: Squaring triads of integers. The notations in letters (D=… W= WB=… etc.), when present, correspond to the names assigned to the triads in Ranieri (1997). The multiplication factor that allows one to arrive at the proper dimensions of the temple appears in parentheses. Col.5: Azimuth of the Main Axis (from east to north). Col.6 Azimuth of the "Leading" Diagonal (from east to north).

N	TYPE	TEMPLE	SQUARING TRIADS	AXIS	DIAG
1	DIAG	Cyrene, Temple of Apollo	WB=10-25-27 (x 3)	342.1	3.9
2	DIAG	Festos, Temple of Rhea	M=8-15-17 (x 13/2)	328.8	356.9
3	DIAG	Kos, Sanctuary of Asclepius, Temple A	2 x 7-27-28 (x 4)	238.5	265.8
4	DIAG	Kos, Sanctuary of Asclepius, Temple B	4/W=33-55-67	148.8	179.6
5	DIAG	Kos, Sanctuary of Apollo	M=8-15-17 (x 17)	27.1	359.0
6	DIAG	Sta-Lenika, Sanctuary of Aphrodite, Temple A	W=5-12-13 (x 38/5)	246.2	0.0
7	DIAG	Sta-Lenika, Sanctuary of Aphrodite, Temple B	G=12-35-37 (x 3)	245.9	264.9
8	DIAG	Sta-Lenika, Sanctuary of Aphrodite, Temple C	M=8-15-17 (x 7)	245.9	274.0
9	DIAG	Temple of Aegina	2 x 20-21-29 (x 23/10)	23.0	357.5
10	DIAG	Kastraki, Temple of Akraiphia	2QA=13-27-30 (x 5/2)	335.4	1.1
11	DIAG	Temple of Amphiareios	38-100-107 (x 4/3)	336.4	357.3
12	DIAG	Pheneos, Temple of Asclepius	D=3-4-5 (x 13)	321.1	270.7

13	DIAG	Assos, Acropolis Temple of Athena	41-82-92 (x 15)	340.6	2.2
14	DIAG	Athens, Agora, Hadrian Pantheon	W=5-12-13 (x 24)	338.7	1.3
15	DIAG	Bassae, archaic Temple of Apollo	GA=7-24-25 (x 7/2)	76.1	92.4
16	DIAG	Bassae, newer Temple of Apollo	W=5-12-13 (x 20)	81.1	94.1
17	DIAG	Brauron, "S. George" temple	L=16-24-29	326.3	0.0
18	DIAG	Brauron, Sanctuary of Ifigenia	M=8-15-17 (x 9/2)	301.6	270.8
19	DIAG	Corinth, Temple of Apollo	W=5-12-13 (x 15)	21.8	0.0
20	DIAG	Prinias, Temple of Apollo	15-26-30 (x 5/3)	333.3	2.1
21	DIAG	Mallia, Le Sanctuaire	51-61-70 (x 3/4)	331.3	2.2
22	DIAG	Delos, Cinthe, Temple of Artemis Eileithyia	53-138-148	291.0	270.0
23	DIAG	Delos Sanctuary of Asclepius	MA1=15-27-31 (x 4/3)	329.1	358.6
24	DIAG	Delphi, Sanctuary of Athena, Doric Treasure	23-34-41	30.6	356.5
25	DIAG	Temple of Eutrisis	Not Rectangular	329.9	359.1
26	DIAG	Temple of Gortys	15-27-31 (x 3)	332.5	1.4
27	DIAG	Ikaria, Sanct. of Dionysius and Apollo, Temple G	D=3-4-5 (x 7/2)	335.1	1.8
28	DIAG	Ikaria, Sanct. of Dionysius and Apollo, Temple H	13-20-24	325.9	358.9
29	DIAG	Kalapodi, Temple of Phase I	2Q=21-42-47 (x 1/6)	27.1	0.5
30	DIAG	Kalapodi, Temple of Phase II	P41=16-63-65 (x 3/4)	10.2	356.1
31	DIAG	Kalapodi, Temple of Phase III	2Q=22-44-49	27.1	0.5
32	DIAG	Kalapodi, Temple of Phase IV	WB=10-25-27 (x 3)	27.1	5.3
33	DIAG	Kalaureia, Temple of Poseidon	2Q=43-86-96	29.0	2.2
34	DIAG	Kalidon, Temple of Artemis	13-28-31 (x 25/7)	298.0	273.1
35	DIAG	Kea, Temple of Karthaia	2QB=9-19-21 (x 4)	66.5	91.9
36	DIAG	Lindos, Temple of Psithyros	16-23-28 (x 15/8)	236.1	271.1
37	DIAG	Temple of Mantineia	48-82-95 (x 1/2)	57.1	87.4
38	DIAG	Naxos-Sangri, Temple of Demeter	D=3-4-5 (x 10 ½)	235.1	182.0
39	DIAG	Oisyme, Archaic Temple	11-20-23 (x 2)	205.7	176.9
40	DIAG	Oisyme Classic Temple	GA/2=14-24-25 (x 11/4)	207.3	177.0
41	DIAG	Temple of Orchomenos	W=5-12-13 (x 9)	338.9	1.4
42	DIAG	Pallantion, Temple B	W=5-12-13 (x 14/5)	338.9	1.4
43	DIAG	Pallantion, Temple C	GA=7-24-25 (x 5/2)	346.0	2.3
44	DIAG	Perachora Temple of Hera Akraia	3Q=32-96-101	343.3	2.3
45	DIAG	Samos, North Building	ΦA=10-16-19 (x 35/4)	303.2	271.1
46	DIAG	Samos, South Building	33-65-73 (x 2)	22.1	355.2
47	DIAG	Samos, Temple A	L=10-15-18 (x 22/5)	323.9	357.6
48	DIAG	Samos, Temple B	MA=4-7-8 (x 11/2)	296.8	267.1
49	DIAG	Samos, Temple C	13-20-24 (x 7/2)	302.5	269.5
50	DIAG	Samos, Temple D	√3=15-26-30 (x 2)	302.5	272.3
51	DIAG	Sounion, Old Temple of Athena	D=3-4-5 (x 11/2)	325.6	2.5
52	DIAG	Sounion, New Temple of Athena	√2=12-17-21 (x 3)	329.7	4.9
53	DIAG	Sounion, Temple of Poseidon	WB=42-105-113	339.8	1.6
54	DIAG	Sparta, Menelaion	M=8-15-17 (x 19/4)	62.3	90.4
55	DIAG	Sparta, Sanctuary of Athena Chalkioikos	68-170-183 (x 1/2)	339.8	1.6
56	DIAG	Thasos, Agora, Temple of Zeus	70-135-152 (x 1/2)	331.1	358.3
57	DIAG	Thasos, Temple of Artemis	Q=12-12-17 (x 9)	315.0	270.0
58	DIAG	Thermon, Temple of Apollo	G=12-35-37 (x 15/4)	252.3	271.2
59	DIAG	Trezene, Temple in the Temenos of Hippolyte	4/W=36-60-70 (x 4/3)	329.0	0.0
60	DIAG	Trezene, Temple of Asclepius (?)	LD=16-23-28 (x 10)	326.2	0.8
61	DIAG	Temple of Camarina	G=12-35-37 (x 4)	342.9	1.9
62	DIAG	Temple of Velia	4/W=18-30-35 (x 15/4)	55.5	86.4
63	DIAG	Temple of Foce Sele	P29=115-252-277 (x 1/2)	23.4	358.9
64	DIAG	Locri, Temple in the sanctuary of Masarà	WB=10-25-27 (x 6)	335.5	357.3
65	DIAG	Metaponto, Temple D	WB=10-25-27 (x 27/5)	33.5	355.3
66	DIAG	Pompeii, Greek Temple	58-90-107	332.0	4.6
67	DIAG	Siri Eraclea, Archaic Temple	52-114-125	333.5	358.0
68	DIAG	Agrigento, Sanct. of Chthonic deities, Temple 2	44-68-81 (x 1/2)	56.8	88.0
69	DIAG	Agrigento, Sanct. of Chthonic deities, Temple 3	MC=12-23-26 (x 3/2)	61.9	89.7
70	DIAG	Eloro, Sanct. of Demeter, Temple Est of Stoa	LVC=14-23-27 (x 2)	239.6	270.9
71	DIAG	Eloro, Sanct. of Demeter, Temple West of Stoa	□A=10-16-19 (x 13/5)	239.6	271.7
72	DIAG	Gela, Acropolis, Doric Temple	3Q=6-18-19 (x 10)	341.5	0.0
73	DIAG	Himera, Archaic Temple A	21-53-57	21.1	359.5
74	DIAG	Himera, Temple B	√8=6-17-18 (x 6)	21.1	1.6
75	DIAG	Himera, Temple C	2Q=98-196-219 (x 1/4)	25.2	358.6
76	DIAG	Himera, Temple of Athena Nike	WB=140-25-27 (x 5)	20.4	358.6
77	DIAG	Monte Iato, Temple of Aphrodite	2 x D=3-4-5	343.8	4.4
78	DIAG	Naxos, Temple of Aphrodite	2 x D=3-4-5 (x 16)	24.1	3.5
79	DIAG	Temple of Aigai	MA=4-7-8 (x 10)	328.4	358.3
80	DIAG	Temple of Aizanoi	GA/2=7-12-14 (x 10)	333.3	3.6
81	DIAG	Antioca, Temple in the Sanct. of Men Askaenos	MC=12-23-26 (x 3 ¾)	328.5	356.0
82	DIAG	Didyme, Temple of Apollo	2 x V=20-21-29 (x 7)	27.1	1.6
83	DIAG	Euromos, Temple of Zeus	M=8-15-17 (x 6)	28.2	0.1
84	DIAG	Lagina, Sanctuary of Hekate, larger Temple	D=3-4-5 (x 20)	307.8	270.9

85	DIAG	Lagina, Sanctuary of Hekate, smaller Temple	D=3-4-5 (x 15)	143.1	180.0
86	DIAG	Sardis, temple of Artemis	2 x V=20-21-29 (x 8)	333.9	359.3
87	DIAG	Ariassos, Temple of the Hellenistic city centre	D=3-4-5 (x 20/3)	308.1	271.2
88	DIAG	Pergamon, Temple of the Sanctuary of Demeter	2:1 – No Scale	334.1	0.7
89	DIAG	Delphi, Sanctuary of Apollo, Tes. VIII	21-27-34	36.4	358.3
90	DIAG	Delphi, Sanctuary of Apollo, Tes. IX	16-22-27	36.6	0.5
91	DIAG	Delphi, Sanctuary of Apollo, Tes. XV	ΦP=28-45-53 (x 2/3)	303.9	271.8
92	DIAG	Delphi, Sanctuary of Apollo, Tes. XVII	76-114-137 (x 1/4)	303.9	270.3
93	DIAG	Delphi, Sanctuary of Apollo, Tes. XX	L=10-15-18 (x 11/5)	35.2	1.2
94	DIAG	Delphi, Sanctuary of Apollo, Tes. XXI	15-21-26 (x 4/3)	34.5	359.0
95	DIAG	Delphi, Sanctuary of Apollo, Tes. XXIII	15-21-26 (x 9/5)	212.2	176.3
96	DIAG	Delphi, Sanctuary of Apollo, Tes. XXIV	46-92-103 (x 1/2)	296.7	270.7
97	DIAG	Delphi, Sanctuary of Apollo, Tes. XXV	D=3-4-5 (x 23/4)	48.9	86.5
98	DIAG	Delphi, Sanctuary of Apollo, Tes. XXVIII	15-21-26 (x 5/4)	29.5	354.6
99	DIAG	Delphi, Sanctuary of Apollo, Tes. XXX	15-21-26 (x 7/5)	34.4	359.4
100	DIAG	Delphi, Sanctuary of Apollo, Tes. XXXI	D=3-4-5 (x 7)	36.5	359.1
101	DIAG	Eleusis, Mycenaean Megaron	12-17-21 (x 2)	328.6	3.8
102	DIAG	Mycenae, Megaron	MA1=15-27-31 (x 12)	152.4	181.5
103	DIAG	Troy, Megaron IB	2 x D=3-4-5 (x 8)	197.3	176.7
104	LONG	Claros, Temple of the Sanctuary of Apollo	M=8-15-17 (x 10)	344.0	358.9
105	LONG	Dreros, Temple of Apollo Delphinios	π/2=7-11-13 (x 7/2)	71.6	89.3
106	LONG	Lato, Temple of Lassithi	44-68-81 (x 1/2)	163.3	181.3
107	LONG	Argos, Heraion, Classical Temple	2QB=9-19-21 (x 13/2)	343.6	356.9
108	LONG	Athens, Temple of Hephaestus	6-143-156	347.8	0.1
109	LONG	Athens, Acropolis, Parthenon	2S=52-117-128 (x 2)	12.5	0.0
110	LONG	Athens, Acropolis, Pre-Parthenon	√8=6-17-18 (x 14)	11.0	1.0
111	LONG	Athens, Temple of Aphrodite	98-152 (x 1/4)	75.6	93.5
112	LONG	Athens, Agora, Temple of Apollo Patros	Φ=21-34-40 (x 3 4/21)	346.2	3.4
113	LONG	Athens, Eleusinion	MA=4-7-8 (x 8)	284.3	268.4
114	LONG	Athens, Agora, Temple of Apollo Delphinios	9-21-23 (x 5)	350.0	2.1
115	LONG	Athens, Temple in SE corner of Agora	19-35-40 (x 2)	101.1	85.9
116	LONG	Epidauros, Temple of Asclepion	MC=12-23-26 (x 3 1/3)	350.0	4.6
117	LONG	Brauron, Temple of Artemis	M=8-15-17 (x 9/2)	345.3	0.0
118	LONG	Delos, Heraion	MB=12-22-25 (x 2)	282.8	267.5
119	LONG	Delphi, Sanctuary of Apollo, Tes. of Siphnos	63-90-110 (x 1/3)	197.6	178.3
120	LONG	Lepreon, Temple of Demeter	M=8-15-17 (x 9/2)	16.2	1.3
121	LONG	Magnesia, Temple of Artemis	M=8-15-17 (x 13)	197.3	182.4
122	LONG	Naxos-Yria, Temple of Dionysius	M=8-15-17 (x 15 ¾)	255.1	266.6
123	LONG	Nemea Temple of Zeus	2 x GC=9-40-41 (x 3 ¾)	12.6	4.7
124	LONG	Pallantion, Temple A	L=10-15-18 (x 2)	346.0	4.4
125	LONG	Pallantion, Temple C	2S=24-54-59 (x 19/12)	346.0	358.5
126	LONG	Pallantion, Temple D	MB=12-22-25 (x 5/2)	346.0	1.3
127	LONG	Sparta, Temple in of Artemis Orthia	2S=24-54-59	345.3	357.8
128	LONG	Eloro, Temple of Demeter	P27=39-80-89 (x 5/4)	343.7	1.3
129	LONG	Gela, Acropolis, Temple of Athena	75-148-166	192.7	0.6
130	LONG	Mileto, Temple of Athena	38-60-71 (x 3/2)	249.2	266.8
131	SHORT	Temple of Kastro	D=3-4-5 (x 23/6)	58.1	1.8
132	SHORT	Pyrgi, Temple B	2 x D=3-4-5 (x 33/2)	217.2	270.2
133	SHORT	Aulis, Temple of Artemis	2 x D=3-4-5 (x 11)	323.5	0.4
134	SHORT	Delphi, Sanct. of Apollo, Kings of Argos	3Q=6-18-19 (x 4)	326.3	0.0
135	SHORT	Delphi, Sanct. of Apollo, New Temple of Apollo	2 x D=3-4-5 (x 25)	40.5	3.1
136	SHORT	Delphi, Sanct. of Apollo, Old Temple of Apollo	2 x D=3-4-5 (x 22)	36.7	0.0
137	SHORT	Dodona, Temple of Themis	π/2=7-11-13 (x 3)	319.7	267.3
138	SHORT	Samos, Heraion, Temple of Hermes-Aphrodite	2Q=4-8-9 (x 20)	46.1	1.1
139	SHORT	Metaponto, Urban sanctuary, Temple A	2S=24-54-59 (x 10/3)	309.0	267.3
140	SHORT	Metaponto, Urban sanctuary, Temple B	33-64-72 (x 2)	316.2	270.3
141	SHORT	Histros, temple of Aphrodite	2 x V=20-21-29 (x 3/2)	310.7	267.1
142	SHORT	Eleusis, Temple of Artemis and Poseidon	2 x VC=21-23-31	309.9	357.0
143	SHORT	Eretria, Temple of Apollo	WA=10-23-25 (x 7)	321.7	2.7
144	AXIS	Delphi, Marmaria, old Temple of Athena	30-61-68 (x 3/2)	276.0	---
145	AXIS	Delphi, Marmaria, new Temple of Athena	MA=4-7-8 (x 10)	264.2	---
146	AXIS	Aigeria, Tycheion in gimnasium sanctuary	MA=4-7-8 (x 4)	359.1	---
147	AXIS	Asea, Temple of Athena Soteira and Poseidon	70-156-171 (x 1/2)	276.1	---
148	AXIS	Asea, Temple of Haghios Ilias	WB=10-25-27 (x 6)	0.0	---
149	AXIS	Assos, Temple of the Agora	LD=16-23-38 (x 2)	4.2	---
150	AXIS	Athens, Agora, Odeion	13-20-24 (x 15/10)	91.3	---
151	AXIS	Athens, Agora, Temple of Ares	WA=10-23-25 (x 5)	0.9	---
152	AXIS	Athens, Agora, Temple of Artemis	2 x V=20-21-29	179.9	---
153	AXIS	Athens, Agora, SW Temple	MC=12-23-26 (x 3)	2.2	---
154	AXIS	Athens, Temple of Zeus Olympeion	□=5-13-14 (x 28)	0.2	---
155	AXIS	Chios, Emporium, Temple of Athena	□=21-34-40	0.0	---
156	AXIS	Tegea, Sanctuary of Athena Alea	W=5-12-13 (x 14)	0.0	---

157	AXIS	Delos, Dodecatheion	4/W=15-25-29 (x 2)	357.6	---
158	AXIS	Delos, Letoon	3/W=20-25-32 (x 3/2)	266.1	---
159	AXIS	Delos, Anios	18-25-31 (x 1/2)	264.3	---
160	AXIS	Delos, Temple A	2QB=9-19-21(x 5/2)	275.3	---
161	AXIS	Delos, Temple to the Foreign Gods	M=8-15-17 (x 3)	270.0	---
162	AXIS	Epidauros, Temple of Apollo	GA/2=7-12-14 (x 4)	360.6	---
163	AXIS	Isthmia, Temple of Poseidon	2S=24-54-59 (x3 1/3)	355.1	---
164	AXIS	Isthmia, Archaic Temple of Poseidon	50-135-144	356.2	---
165	AXIS	Olympia, Temple of Zeus	2S=24-54-59 (x 4)	2.2	---
166	AXIS	Olympia, Temple of Hera	WB=10-25-27 (x 6)	0.7	---
167	AXIS	Ramnous, Temple of Nemesis	P29=115-252-277 (x 2/7)	0.0	---
168	AXIS	Ramnous, Temple of Themis	GA/2=7-12-14 (x 3)	2.7	---
169	AXIS	Samotracia, Sanctuary of the Great Gods	2 x V=20-21-29 (x 50/21)	180.7	---
170	AXIS	Stymphalos, Temple of Athena	2 x Q=12-12-17 (x 5/3)	359.0	---
171	AXIS	Thasos, Temple 2 in the Sanctuary of Athena	2V2=9-20-22 (x 6)	176.6	---
172	AXIS	Caulonia, Doric Temple	WB=10-25-27 (x 5 2/5)	4.3	---
173	AXIS	Paestum, Temple of Hera I (s.c. Basilica)	P30=84-187-205	357.0	---
174	AXIS	Paestum, Doric Temple (s.c. Pace)	45-86-97	4.2	---
175	AXIS	Paestum, temple of Athena (s.c. Cerere)	2S=24-54-59 (x 2)	4.1	---
176	AXIS	Paestum, Temple of Hera II (s.c. Nettuno)	41-101-109 (x 2)	355.3	---
177	AXIS	Agrigento, Temple of Asclepius	2S=24-54-59 (x 5/4)	359.8	---
178	AXIS	Agrigento, Temple of Heracles	D=3-4-5 (x 28 ½)	2.6	---
179	AXIS	Agrigento, Temple of Concord	WA=10-23-25 (x 27/4)	1.4	---
180	AXIS	Agrigento, Sanctuary of Chthonic Deities, Temple 1	WB=10-25-27 (x 9/5)	358.9	---
181	AXIS	Camerina, Temple of Athena	W=5-12-13 (x 11)	358.2	---
182	AXIS	Segesta, Temple	W=5-12-13 (x 16 2/3)	358.1	---
183	AXIS	Selinunte, Temple A	WB=10-25-27 (x 27/5)	355.3	---
184	AXIS	Selinunte, Temple B	2S=24-54-59 (x 19/54)	358.3	---
185	AXIS	Selinunte, Temple C	2 x D=3-4-5 (x 27)	356.1	---
186	AXIS	Selinunte, Temple D	WA=10-23-25 (x 8)	356.1	---
187	AXIS	Selinunte, Temple E	2 x D=3-4-5 (x 57/2)	353.4	---
188	AXIS	Selinunte, Temple F	WB=10-25-27 (x 42/5)	357.3	---
189	AXIS	Selinunte, Temple G	2VC1=5-11-12 (x 34)	356.7	---
190	AXIS	Selinunte, Temple O	WB=10-25-27 (x 28/5)	353.9	---
191	AXIS	Selinunte, Triolo, temple of Hera	W=5-12-13 (x 5)	3.5	---
192	AXIS	Siracusa, Ortigia, Temple of Apollo	37-94-101 (x 2)	354.1	---
193	AXIS	Siracusa, Ortigia, Temple of Artemis	WB=10-25-27 (x 38/5)	359.6	---
194	AXIS	Siracusa, Ortigia, Temple of Athena	WB=10-25-27 (37/5)	359.6	---
195	AXIS	Siracusa, Temple of Zeus	75-210-223	354.4	---
196	AXIS	Pergamon, Temple of Athena	42-74-85	86.2	---
197	AXIS	Callipolis, Temple of Demeter & Kore	L=10-15-18 (x 2)	0.0	---
198	AXIS	Labraunda, Temple of Zeus	D=3-4-5 (x 15)	357.3	---
199	AXIS	Priene, Temple of Athena	68-130-147	0.0	---
200	AXIS	Dime, Temple of Soknopaios	LD=16-23-28 (x4)	273.9	---

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