from the presence there of Greek pottery.[36] Even so, the abnormal size and expensiveness of this krater argues very strongly that it could never have been in the stock of an itinerant trader or even of any commercial shop, but must anyhow have been a special order.[37] This implies a complex series of operations. First, the order would have to be placed, with some instructions, at least about its size:[38] this could have been arranged either at Mont Lassois with an itinerant trader or by sending a local representative from Mont Lassois to the coast, presumably to Marseilles. At Marseilles the trader or the representative (or both) would then have had to pass on the order to a ship's captain or a merchant going by ship: an itinerant trader would not be likely to have overseas contacts himself and a native of Mont Lassois would be still more inexperienced. Next the captain or sea-going merchant on arriving at Gytheum (or Tarentum)—neither port necessarily his terminus—would have arranged for the making of the krater in a local bronze workshop. Later, on a return journey, this intermediary would have picked up the krater, shipped it to Marseilles, and delivered it to the itinerant trader or the customer's representative, who finally would have conveyed it to Mont Lassois, taking a craftsman along to assemble the components (unless the trader himself had the necessary skill). Presumably the cost or a large part of it would have been paid by the customer in advance, since the expenses would have been beyond the resources of a Greek trader, merchant or ship's captain; but anyhow there would have to have been a considerable degree of trust and co-operation between the various participants in this complicated transaction, which could hardly have been completed in much less than a year and was liable to the natural risks of death or shipwreck.[39] Such personal relationships must anyhow have been frequent and indeed inevitable in Greek overseas trade, since it was conducted largely by small men, and this could explain the sensitivity of, for instance, the Attic potter Nikosthenes to the Etruscan market without requiring that he should himself have visited Etruria or even dealt directly with anyone active in retail trade there.

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[36] Joffroy, *L'Oppidum de Vix* 120–3—about 25 Greek pots of the sixth century, though these are a very small part of the finds of pottery (*ib.* 152).

[37] C. Picard, *Latomus* xix (1960) 426 n. 1, offhandedly championed an itinerant trader.

[38] B. B. Shefton suggested to me that a native of Mont Lassois would not have ordered a *volute* krater (as the Vix krater is) since that type was then unfamiliar in Gaul; but an itinerant trader could have described it in words and sketches.

[39] Even if the krater was made at Mont Lassois by an imported craftsman, the procedure for procuring him must have been equallly indirect, though the risk of course might have been limited to his person.

Addenda. Add in n. 21 a cup from Amathus in Cyprus (*AIARS* xxvi, 81 no. 184, pl. 18. 9–10); and in n. 27 a simply decorated cup from Kition in Cyprus (*ib.*, 62 no. 16, pl. 3. 5).

Extended Angle Intercolumniations in fifth-century Athenian Ionic

It is a widespread feature of Doric temples that the intercolumniations nearest the angles should be somewhat narrower than normal so as to allow a regular distribution of triglyphs and metopes in the frieze. The nature and working of this adjustment have been widely discussed;[1] but little attention has been given to the contrary arrangement in two Athenian Ionic temples, where the intercolumniations nearest the angles are actually wider than normal. Of the standard handbooks on Greek architecture in English, only that of Dinsmoor notes that the angle intercolumniations of the north porch of the Erechtheion are 0·052 m larger than the central one, and even he does not discuss the fact in his main treatment of the building.[2] He also notes that the angle intercolumniations of the temple by the Ilissos are 0·051 m greater than the central one, but attributes that to later distortion of the building.[3] Shear mentions both these instances in her discussion of the possible works of Kallikrates, and accepts the wider intercolumniations of the Ilissos temple as part of the original design.[4] Following Stevens, she explains this feature in the Erechtheion as intended to allow a regular spacing of the ceiling beams, and suggests that the same explanation may apply to the Ilissos temple too.[5]

A simpler explanation of this at first sight surprising feature may lie in the application of rules of proportion. In both the Ilissos temple and its sister, the temple of Athena Nike on the Akropolis, there are four columns at each end, and so three intercolumniations. In both cases the central intercolumniation is, within a centimetre, equal to one part in three and a half of the stylobate width (Ilissos temple: stylobate width/$3\frac{1}{2}$=1·671 m, central intercol. = 1.679 m; Nike temple: stylobate width/$3\frac{1}{2}$=1·542 m, central intercol. = 1·5485 m).[6] Similarly in the east porch of the Erechtheion, with its five intercolumniations, the normal intercolumniation equals almost exactly one part in five and a half of the stylobate width (stylobate width/$5\frac{1}{2}$=2·115 m, intercol. = 2·113 m). This suggests that the normal intercolumniation was consistently derived from the stylobate width by a rule; that it was related to the stylobate width as one to the number of intercolumniations *plus a half*.[7] The embodiment of such a rule in the north porch of the Erechtheion is less precise (stylobate width/$3\frac{1}{2}$=3·062 m, central intercol. = 3·097 m), but the discrepancy, 0·035 m, may be due to rounding out the dimension to a simple number of feet. The foot standard used in the Erechtheion can be reliably determined from the building accounts as about 0·326 m,[8] and 3·097 m is exactly $9\frac{1}{2}$ such feet; if the value of stylobate width/$3\frac{1}{2}$ were calculated to the nearest palm (quarter foot), 3·097 m would be the result.

The question naturally arises why the application of a consistent rule should sometimes give extended angle intercolumniations (as in the Ilissos temple and the north porch of the Erechtheion) and sometimes normal ones (as in the temple of Athena Nike and the east porch of the Erechtheion). The answer is that the effect of such a rule will depend on the distance between the edge of the

[1] E.g. D. S. Robertson, *Greek and Roman Architecture*² (1943) 106–9; J. J. Coulton, *Greek Architects at Work* (1977) 62–4.

[2] W. B. Dinsmoor, *The Architecture of Ancient Greece* (1950) (hereafter *AAG*) 340; no discussion *ibid.* 187–95. The feature is not mentioned in the following discussions of the Erechtheion: D. S. Robertson, *op. cit.* (n. 1) 127–35; A. W. Lawrence, *Greek Architecture*³ (1973) 164–6; G. Gruben, *Die Tempel der Griechen*² (1976) 193–206.

[3] *AAG* 339.

[4] *Hesp.* xxxii (1963) 391, 413.

[5] L. D. Caskey *et al.*, *The Erechtheum* (1927) 80; *Hesp.* xxxii (1963) 413.

[6] Figures in this paragraph are from *AAG* 339–40.

[7] Compare the probable use of a similar rule in Doric temples of the same period (*BSA* lxix [1974] 83–4, Rule 3). In terms of the abbreviations used there, the present rule may be expressed as $I=W/(N+\frac{1}{2})$, or, if worked in reverse, $W=I(N+\frac{1}{2})$.

[8] *AAG* 195 n. 1; W. B. Dinsmoor in *Atti del VII Congresso Internazionale di Archeologia Classica* (1961) i 358–9.

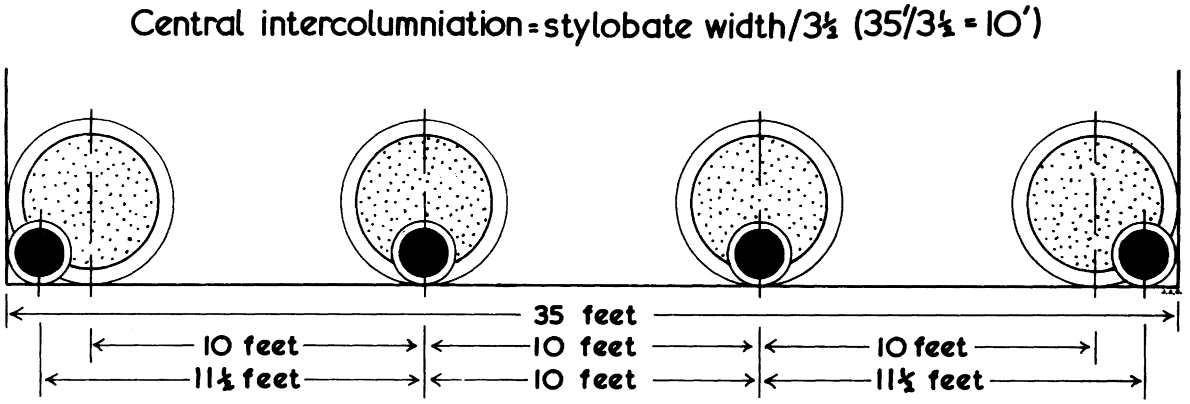

FIG. 1. Differing effects of different-sized columns placed according to the same rule on the same stylobate: *(a)* regular column spacing with relatively large columns (dotted); *(b)* extended angle intercolumniations with relatively small columns (solid).

stylobate and the axis of the corner column, the position of which is not governed by this rule, but by the diameter of the column and the projection of the column base. If the columns are relatively small and have only slightly projecting bases, the axis of the corner column will come nearer to the corner of the stylobate than if the columns are relatively large and have strongly projecting bases (see FIG. 1). Thus whereas the column diameter of the Ilissos temple is only 0·323 of the central intercolumniation, in the Nike temple it is 0·335; and whereas the column diameter is only 0·264 of the central intercolumniation in the north porch of the Erechtheion, in the east porch it is 0·327.[9] A very similar effect seems observable in fifth-century Doric. The intercolumniation of the Hephaisteion, with its six-columned fronts, equals one part in five and a third of the stylobate width, while in the Stoa at Brauron, with eleven columns, it is one part in ten and a third of the stylobate width; the same rule seems to be applied in both buildings. But in the Hephaisteion, where the column diameter is 0·394 of the intercolumniation, the result is angle contraction, while in the Stoa at Brauron, where the column diameter is only 0·252 of the intercolumniation, the angle intercolumniations are extended.[10]

I have suggested elsewhere[11] that the real existence of rules such as the one proposed here can be assessed by their simplicity, the accuracy with which they explain the actual dimensions found, the number of buildings to which they apply, and the coherence, in other respects, of the group of buildings to which they apply. The significance of the present rule by the first two criteria can be judged from what has already been said; to the author it naturally seems adequate. But the number of buildings is small—only four instances in three buildings. Unfortunately it is hard to increase this number. Well-preserved Ionic temples earlier than 400 B.C. are very few compared to Doric ones, and of those few, two are the colossal ones at Samos and Ephesos, where the evidence for stylobate sizes is not entirely reliable, and the intercolumniations are extremely varied. In favour of the proposed rule, however, it can be said that the buildings to which it applies do at least form a coherent group in space, time, and style—so coherent in fact that they have on other grounds been attributed to a single architect.[12]

One might perhaps go on to ask whether the apparent application of a single rule in these three buildings does not provide further evidence that they are indeed the works of the same man. But here again the lack of comparable contemporary buildings makes the answer hard, for one cannot establish what other architects did, or whether the rule was a widely applied one. TABLE 1 gives the results produced by testing the rule on a number of Ionic and Corinthian buildings.[13]

The Maraza temple at Lokroi Epizephyrioi might seem to embody our rule, for the remainders in column 5 of TABLE 1 are not huge; but the uniformity of the intercolumniations (except on the east front) suggests that the stylobate size was derived from the intercolumniation and not *vice versa,* while the comparatively large remainders in column 7 suggest that the stylobate size was *not* derived simply by our rule worked in reverse. More telling, because closer in place and date, the propylon to the Pompeion at Athens (*c.* 400 B.C.) definitely does not follow our rule; but this must be partly because its function required a substantially widened central intercolumniation. In the temple of Athena at Priene the results are similar to those at Lokroi: it seems likely that the stylobate size was derived from the intercolumniation (not *vice versa*), and that this derivation was not simply by our rule worked in reverse. In fact since the width of the column plinths is exactly half the intercolumniation, a rectangle enclosing all the plinths would measure $5\frac{1}{2} \times 10\frac{1}{2}$ intercolumniations, and the stylobate necessarily projects slightly beyond the plinths. Other classic Ionian temples of the Hellenistic period, at Sardeis, Didyma and Magnesia on the Maeander more certainly did not apply our rule.

However, the non-peripteral naiskos at Didyma and the temple of Zeus at Magnesia do conform to our rule, and so too does a group of peripteral temples of the

[9] The effect is more directly shown by the less familiar proportion, lower torus diameter/intercolumniation, for which the figures are: Ilissos temple 0·449, Nike temple 0·483, Erechtheion N. porch 0·398, E. porch 0·464.

[10] *BSA* lxix (1974) 83, Rule 3 and n. 64; J. J. Coulton, *Greek Architects at Work* (1977) 62–4.

[11] *BSA* lxix (1974) 61; *BSA* lxx (1975) 61–2.

[12] Most fully by I. M. Shear, *Hesp.* xxxii (1963) 375–424; see also J. S. Boersma, *Athenian Building Policy from 561/0 to 405/4 B.C.* (1970) 75–6.

[13] The figures are taken from *AAG* 337–40, supplemented by: *Kerameikos* x, W. Hoepfner, *Das Pompeion* (1976) pl. 25; G. Roux, *L'Architecture de l'Argolide* (1961) 229–30, 257; *Ist.Mitt* xviii (1968) 213–14; T. Wiegand, *Didyma* i (1941) 108; C. Humann, *Magnesia am Maeander* (1904).

TABLE I

	(1) stylobate size	(2) intercol.	(3) stylobate / intercol.	(4) stylobate / (no. of intercols+½)	(5) (4)−intercol.	(6) intercol. × (no. of intercols+½)	(7) (6)−stylobate
Lokroi Epiz., Maraza T., fronts	17·320	2·641	6·558	2·665	+0·024	17·167	−0·153
sides	43·728	2·641	16·557	2·650	+0·009	43·577	−0·151
Athens, Ilissos T.	5·849	1·679	**3·484**	**1·671**	**−0·008**	5·876	+0·027
Athens, Nike T.	5·397	1·548	**3·485**	**1·542**	**−0·006**	5·420	+0·023
Erechtheion, E. porch	11·633	2·113	**5·505**	**2·115**	**+0·002**	11·621	−0·012
N. porch	10·717	3·097	**3·460**	**3·062**	**−0·035**	10·840	+0·123
Athens, Pompeion propyl.	11·507	3·873	2·971				
Epidauros, Temple L	6·35	1·86	3·414				
Gt. Propyl.	12·987	2·39	5·434				
Priene, Ath. T., fronts	19·53	3·531	5·531	3·551	+0·020	19·420	−0·110
sides	37·17	3·532	10·512	3·540	+0·008	37·086	−0·084
Sardeis, Art. T., sides	99·16	5·002	19·824				
Didyma, Apo. T., fronts	51·13	5·301	9·645				
sides	109·34	5·296	20·646				
naiskos	*c.* 8·48	*c.* 2·427	**3·494**	**2·423**	**−0·004**	**8·495**	**+0·015**
Teos, Dion. T., sides	34·98	3·268	10·705				
Magnesia/M, Zeus T.	7·38	2·12	**3·481**	**2·109**	**−0·011**	7·420	+0·040
Art. T., sides	57·89	3·94	14·693				
Messa, Aphrod. T., fronts	22·098	2·943	**7·509**	**2·946**	**+0·003**	**22·073**	**−0·025**
sides	39·756	2·943	**13·509**	**2·945**	**+0·002**	**39·731**	**−0·025**
Chryse, Apo. T., fronts	22·578	2·976	7·587	3·010	+0·034		
sides	40·436	2·976	13·587	2·995	+0·019		
Aphrodisias, Aph.T., sides	32·57	2·582	12·614				
Aizanoi, Zeus T., sides	36·590	2·520	**14·520**	**2·523**	**+0·003**	**36·540**	**−0·050**
Athens, Olymp., fronts	41·11	5·494	**7·483**	**5·481**	**−0·013**	41·205	+0·095
sides	107·89	5·540	**19·475**	**5·533**	**−0·007**	108·030	+0·140
Sagalassos, Ant. Pi. T., fronts	13·87	2·53	**5·482**	**2·522**	**−0·008**	**13·915**	**+0·045**
sides	26·635	2·53	**10·528**	**2·537**	**+0·007**	**26·565**	**−0·070**
Euromos, Zeus T., fronts	14·375	2·616	**5·495**	**2·614**	**−0·002**	**14·388**	**+0·013**
sides	27·455	2·616	**10·495**	**2·615**	**−0·001**	**27·468**	**+0·013**
Knidos, Cor. T., sides	14·635	1·955	**7·486**	**1·951**	**−0·004**	**14·662**	**+0·027**

Note 1. Where the fronts of a temple have widely varying column-spacing, only the flanks are included in the table.

Note 2. Where the proposed rule was apparently not used, the figures are not given beyond column 3; where it probably was used, the figures are **in bold type.**

Hellenistic and Imperial periods, mostly in Asia Minor. Most striking is the Olympieion at Athens, where the stylobate size was determined by the unfinished archaic temple,[14] so that the intercolumniations had to be derived from the stylobate size, not *vice versa*, and in fact those on the flanks are 0·05 m greater than those on the fronts; for both fronts and flanks the proposed rule works well. It also works reasonably well for the temples at Messa, Chryse, Aizanoi, Euromos, Sagalassos and Knidos. In most of these cases the uniform intercolumniation on fronts and flanks suggests that our rule was worked in reverse, to give the required stylobate size from a predetermined intercolumniation. These later temples can obviously not be connected directly with the Athenian fifth-century ones, but their conformity to the same rule does increase the probability that it was a rule consciously applied.

Our conclusions, then, can be summarised as follows. The unusual feature of extended angle intercolumniations in the Ilissos temple and the Erechtheion at Athens can be simply explained by the assumption that the architect(s) of these temples and that of Athena Nike (Kallikrates?) consistently used a rule: let intercolumniation to be stylobate width as one is to the number of intercolumniations *plus a half.* This rule was certainly not universal in fifth-century Athens, and there is no clear evidence for other use of it before the Hellenistic period. It seems then to have been used, usually in reverse (so as to determine stylobate size from intercolumniation), in a further nine buildings, mainly in Asia Minor but including the Olympieion at Athens.

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[14] Archaic temple: *c.* 41·0 × 107·75 m; Hellenistic temple: 41·11 × 107·89m (*AAG* 91, 280; G. Gruben, *op. cit.* [n. 2] 230, 234). Welter's figures (*Ath. Mitt* xlvii [1922] 70) are unreliable. If Dinsmoor is right in suggesting that the archaic Olympieion was to have 21 columns on the flanks (*AAG* 91), the stylobate proportions would conform fairly closely to *BSA* lxix (1974) 82, Rule 1 (stylobate width/8 × 21 = 107·625 m; stylobate length = *c.* 107·75 m).