THE INTERNAL COLONNADE OF THE HEPHAISTEION

(PLATE 56)

THE unexpected discovery, in 1939, of the foundations of an internal colonnade within the Hephaisteion,[1] contrasting with the general practice of its designer, the " Theseum architect," and the accumulation of evidence that both the foundations and the colonnade were, in fact, not parts of the original scheme but were inserted (undoubtedly by the original architect himself) as an afterthought and the entire cella building redesigned in emulation of the new contemporary design for the Parthenon may now be accepted as a definite acquisition.[2]

Far otherwise is it with regard to the details of the restoration, for which, apart from the very incomplete grave-riddled foundations themselves, there are only two items of internal evidence, a single marble block from the epistyle over the upper tier of columns (with a very peculiar jogged joint suggesting that it came from an end or a corner), together with a single vertical scratch line at the floor level on the north flank wall. One more extant block, or even one more scratch line, might have eliminated all the speculation to which we are condemned.

On the basis of this slender evidence, two main types of restoration, A with two by five column intervals and B with three by seven intervals, with minor differences yielding five sub-varieties, as well as two others that have been mentioned only to be immediately discarded, have been successively published: A1, the extant epistyle placed at the southeast corner (Dinsmoor, 1941);[3] A2, again at the southeast corner

[1] This article was written in 1953, and immediately submitted to Bert Hodge Hill for criticism. Since that time it has remained in my Hephaisteion notes, neglected but not forgotten. Now that the moment has arrived for a new edition of *The Architecture of Ancient Greece*, as it will be desirable to republish the plan of scheme A1 of the Hephaisteion (which I had shown on page 181), I desire to avoid the accusation that I am merely reproducing an older plan when later versions are available. In other words, I consider that scheme A1 is the only possible restoration.

[2] Dinsmoor, *Observations on the Hephaisteion* (*Hesperia*, Suppl. V), 1941, pp. 65-94. To be sure, Stevens (*Hesperia*, XIX, 1950, pp. 144, 159-160) suggests that it may not have been an afterthought because interior or cross-wall foundations in other buildings are not always properly bonded into the main foundations. But the question is more fundamental than the mere bonding of the foundations; it is to be considered with relation to the altered width between the flank walls after the main foundations were built, with the altered positions of both cross-walls, and evidently even with the prearranged scheme for mural paintings.

[3] Dinsmoor, *Hephaisteion*, pp. 65-94; cf. *Hesperia*, XIV, 1945, pp. 364-366. The preliminary publications of the plan in *B.C.H.*, LXIII, 1939, p. 293, and in *Arch. Anz.*, 1940, col. 166, show scheme B1 of 1939.

but turned around (Broneer, 1945);[4] B1, at the northeast corner (Travlos, 1939); B2, again at the northeast corner (discarded by Dinsmoor, 1941);[6] B3, at some intermediate point on either flank (a version of A2, proposed by Broneer in 1945 but discarded by Hill, 1949);[7] B4, at one of the west corners, or specifically at the northwest corner (Hill, 1949);[8] and B5, likewise at either of the west corners (Stevens, 1950).[9] All these varieties yield differing axial spacings and proportions. It appears that the writer's scheme A1 is distinctly in the minority; and the purpose of this article will be not to recapitulate the evidence already adduced for this scheme A1 but primarily to examine the validity of the evidence for the more popular schemes B1-5.

THE EPISTYLE BLOCK, ITS LOCATION IN PLAN.

The peculiar plan of the extant block, with an ordinary square joint at one end and a double jogged joint at the other (Fig. 1), has been interpreted in three different ways: 1) the jogged joint fitted into a socket in the east wall, either at the northeast or the southeast corner; or 2) it formed half of a socket for a hypothetical "binder" running into one or the other of the flank walls; or 3) it served as a substitute for a mitered joint at one of the two west corners.[10] In either of the first positions, the length 1.296 m. of the shorter face locates the center of the easternmost column at this distance from the east wall plane.[11] In the second interpretation, the length of the longer face is restored to 1.296 + 0.257 (half of the epistyle soffit or of the presumed width of the "binders") = 1.553 m.,[12] this being used either as the axial spacing or as the distance of the easternmost column center from the east wall plane. In either of the third positions, the longer face is restored to overlap either half

[4] Broneer, *Hesperia*, XIV, 1945, pp. 246-258; cf. *A.J.A.*, XLVI, 1942, pp. 577-581.

[5] Travlos, in *Hesperia*, IX, 1940, pl. I. Further details are unpublished, in view of the revision of his drawings to conform to my scheme A1 (published in *Hephaisteion*).

[6] *Hephaisteion*, pp. 83-85.

[7] *Hesperia*, Suppl. VIII, 1949, p. 200 note 13, fig. 6, Cn or Cs. There is another theoretically possible arrangement with "binders" but not envisaged by Broneer, and leading to scheme A rather than B; it would consist in using the epistyle block, with the same restored length 1.553 m., as a normal intermediate block, rather than against the east wall, and so requiring "binders" only above alternate columns. Thus 1.553 m. would become the normal axial spacing, and the plan would be identical with that by Stevens (B5).

[8] Hill, *Hesperia*, Suppl. VIII, 1949, pp. 190-208. Followed by I. T. Hill, *The Ancient City of Athens*, 1953, pp. 85, 231 note 7, fig. 12; also, at least in part, by Plommer, *B.S.A.*, XLV, 1950, p. 77, pl. 7, and by Stevens (see below).

[9] Stevens, *Hesperia*, XIX, 1950, pp. 143-164.

[10] For plans of all these possibilities see Hill, *op. cit.*, p. 198, fig. 6.

[11] Both Hill (*op. cit.*, p. 206) and Stevens (*op. cit.*, p. 150) suggest that antae projected from the east wall; the latter also advocated strongly projecting door jambs. But the foundations show that no such inward projections are feasible (*Hephaisteion*, p. 80).

[12] Broneer (*op. cit.*, p. 251) did not actually give this dimension, but the width of the "binder" scales 0.514 m. in his fig. 1, and is so interpreted by Hill, *op. cit.*, p. 197, fig. 5 C.

(0.257 m.) or all (0.514 m.) of an epistyle soffit meeting it at a right angle, and so would be either 1.553 or 1.810 m. (in either case with an axial spacing of 1.553 m.); however, on the assumption that the smaller jog of 0.029 m. might have fitted into a corresponding rebate, leaving only 1.267 m. exposed, Hill proposed that the longer

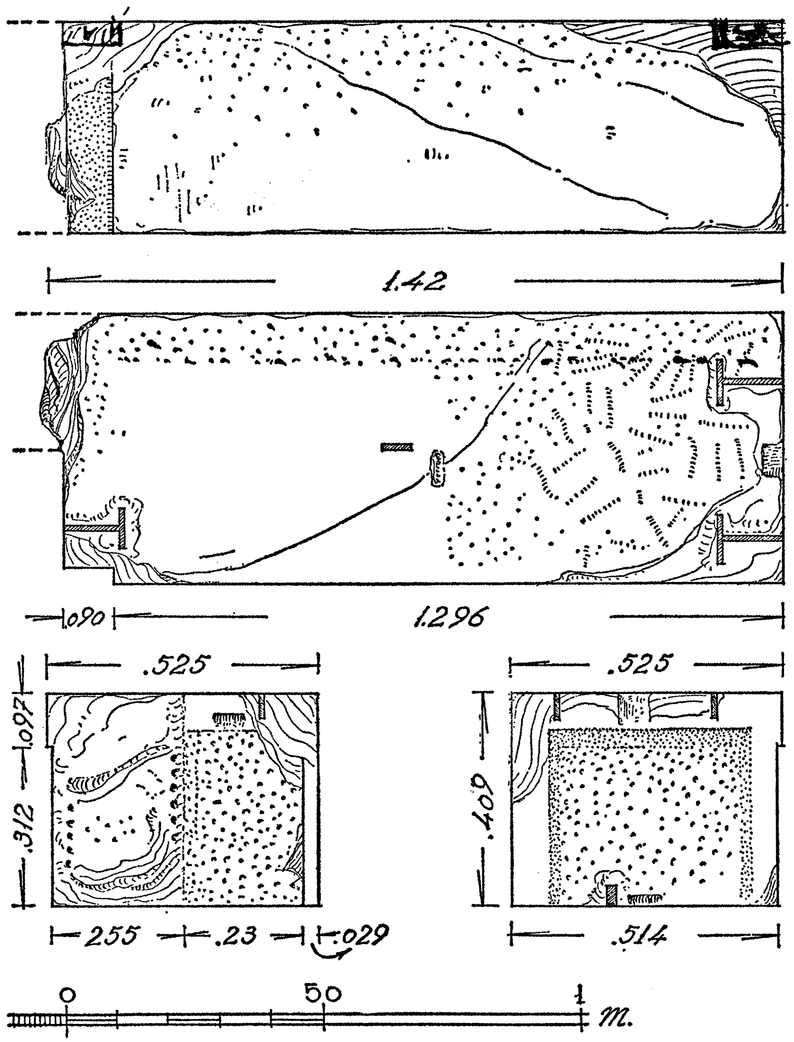

FIG. 1. Hephaisteion. Epistyle Block from Upper Tier of Interior Colonnade (modified from Travlos, 1946)

face might be reduced either to 1.524 m. or to 1.781 m. (in either case with an axial spacing of 1.524 m.). With the shorter spacing 1.524 m., Hill would assign the block either to the southwest corner (as the left end block of the west epistyle) or to the northwest corner (as the left end block of the north epistyle); but with the longer spacing 1.553 m. he would limit it to the northwest corner; and to this northwest corner it would likewise be limited (with either of the spacings 1.524 or 1.553 m.) if the spacing on the west were reduced, as he suggested, to 1.51 m. Stevens, on the other hand, regarded 1.553 as the only possible spacing throughout, so that the extant block would fit either at the southwest or at the northwest corner.

With regard to the peculiar double jogged joint, Broneer and Hill adopted the position that it would be difficult to explain, and quite unnecessary, if it were set into

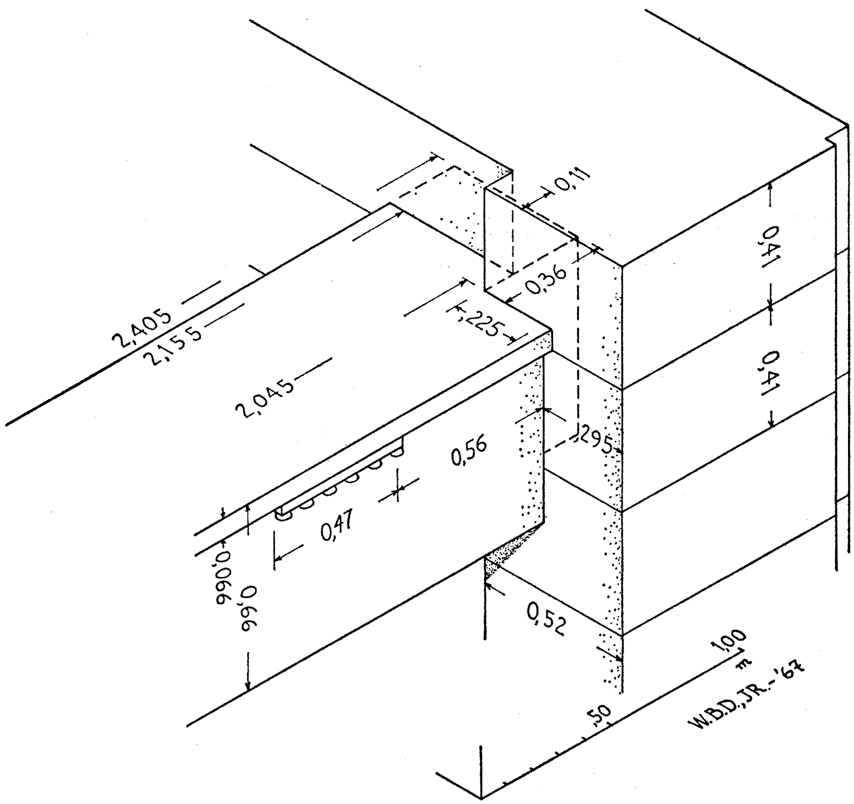

FIG. 2. Temple of Aphaia at Aigina. East End of Lower Epistyle on North Interior Colonnade

a socket in the east wall,[13] as Travlos (at first) and I had suggested. I must confess that I do not see the force of this objection, the double jogged joint serving the same function at the east wall as at a west corner, and must therefore leave this interpretation open. As for Broneer's interpretation of it as a socket for a hypothetical cross-beam to the cella wall, I had noted several structural objections; and further

[13] Broneer, *op. cit.*, p. 247; Hill, *op. cit.*, pp. 194-195.

conclusive objections, such as that the top of course XVI of the cella wall has dowel and pry holes showing that the outer ends of the hypothetical cross-beams never existed, were brought forward by Hill.[14] At this point, therefore, we may discard both of Broneer's two solutions (A2, B3). As for the solutions favored by Hill and Stevens, it must be said that the double jogged joint would be most unusual at a west corner where we should expect, at least in the inner half toward the nave, a 45 degree miter.[15] But this objection perhaps should not be pressed in view of the peculiar corner jointing sometimes found in the Hephaisteion. In other words, either an end position at the east (A1, B1-2) or a corner position at the west (B4-5) would be structurally possible; but it would seem at first glance that, wherever placed, the jogged joint is just as inexplicable in one as in the other.

There is, however, important precedent for the use of a jogged joint at the east end. The same treatment occurs on the lower interior epistyle, at least (the upper not being preserved), in the temple of Aphaia at Aigina, where the face toward the nave is 0.36 m. shorter than the rear face, the latter forming a tongue only 0.475 m. thick as contrasted with the full soffit width of 0.70 m., only this tongue being housed in the east wall (Fig. 2). The explanation at Aigina, though not given in Fiechter's publication,[16] is fairly obvious: it was to avoid cutting into the door jamb,

[14] Dinsmoor, *Hesperia*, XIV, 1945, pp. 364-365; Hill, *op. cit.*, pp. 191, 193, 199-200.

[15] As Hill admitted, *op. cit.*, p. 197, fig. 5 D. It is true that at all eight internal corners of the outer epistyle the joints are jogged to a slight extent, 0.022/0.031 m. (Hill, *op. cit.*, p. 196, fig. 4); but apart from these slight amounts the joints are all mitered at 45 degrees, as demonstrated wherever the arrangement is visible at two of the four corners of the peristyle, and at one of the four points where the pronaos epistyle bonds into the outer flank epistyle. In other words, the single slight jogs of 0.022/0.031 m. are the only deviations from the normal 45 degree mitered joints at internal corners, and are not strictly comparable with the double jogged joint of the interior epistyle.

[16] Fiechter in Fürtwangler, *Aegina,* pl. 44 at left (not described in the text). The width 0.475 m. for the tongue is not there given but is scaled from the drawing and also determined by the following calculation, which at the same time interprets the fragment. The distance between the axes of the internal colonnades being 3.85 m. and the lower epistyle soffit width 0.70 m., the clear interval between the epistyle faces was 3.15 m., or 1.575 m. on either side of the axis of the temple. The doorway width at the bottom is given by Fiechter as 2.59 m. (Cockerell 8′ 5.75″ = 2.584 m.) and that at the top as 3.56 —(0.48 + 0.52) = 2.56 m. (Fiechter's pl. 43; Cockerell only 7′ 11.5″ = 2.426 m. which is probably subject to correction). The lower epistyle was approximately at the level of the door lintel soffit, and thus about 1.575 —½ (2.56) = 0.295 m. from the reveal of the doorway. The projecting enframement on the inner side of the north jamb, against which the epistyle fragment in question abutted, is 0.52 m. wide (that on the south being 0.48 m.), thus extending 1.28 + 0.52 = 1.80 m. from the temple axis, or 1.80—1.575 = 0.225 m. beyond the epistyle face. The rebate on the end of the epistyle fitted around the door enframement, which projected 0.11 m. from the inner wall face, so that the epistyle was bonded into the east wall for a width of 0.70 —0.225 = 0.475 m., and for a depth of 0.36 —0.11 = 0.25 m. This position is corroborated by the terminal interregula space of 0.56 m., which is the normal interregula space of 0.67 m. reduced by the door enframement projection of 0.11 m. That the columns were so spaced as to give a full interregula space of 0.67 m. both at east (diminished by 0.11 m.) and west, as

which would otherwise have been reduced to the precarious thickness of 1.575 —1.28 = 0.295 m. at the level of this epistyle. Presumably the same was true of the missing lower epistyle in the Hephaisteion, which occupied course X and part of XI, while the door lintel, as Hill has plausibly demonstrated, occupied courses XIII and XIV at the level of the peristyle and porch epistyles.[17] Thus the door lintel soffit was 5.410 m. above the floor, so that the clear width of the door lintel would have been at least 2.705 m. and perhaps more (somewhat greater than I had previously restored it); and if for the moment we assume the correctness of my distance 4.688 m. between the axes of the internal colonnades, *ca.* 0.68 m. for the lower epistyle soffit, and so *ca.* 4.01 m. between the epistyle faces, it is evident that if the complete width of the epistyle had been housed in the east wall, at a distance of *ca.* 2.005/2.685 m. from the axis, the distance between the door jamb and the socket would have been only *ca.* 2.005 —1/2 (2.705) = 0.653 m. or perhaps considerably less, again a somewhat precarious condition. If, on the other hand, only the outer half of the epistyle were allowed to penetrate the east wall, the distance between the door jamb and the socket would have been increased to *ca.* 0.653 + 1/2 (0.68) = 0.993 m. or perhaps less, at any rate much stronger in construction. While the jogged joint would thus be explainable at the east ends of the lower epistyle, it is evident that the extant upper epistyle would have been considerably above the top of the door lintel in courses XIII-XIV, so that here a jogged joint would not have been required for reasons of stability. Nevertheless we may perhaps infer that this peculiar jointing was repeated also at the upper level by analogy. In other words, we now have a further explanation for the use of jogged joints against the east wall, even if my former attempt to justify their use in connection with the separate construction of the outer and inner faces of course XVII be judged inadequate.[18]

The Scratch Line and the Axial Rectangle Length.

The vertical scratch line on the north wall sill, which Stevens discovered in 1939 and pointed out to me, I had interpreted by elimination of other possibilities as the guide line for the axis of the west colonnade;[19] and this explanation was accepted by Hill and Stevens.[20] I had measured its distance from the west orthostates as 1.463 m., or 1.473 m. from the wall plane; Stevens made both dimensions 0.001 m.

properly represented in the longitudinal sections both by Cockerell and by Fiechter (*op. cit.*, pl. 37), is shown by Fiechter's measurements of the column spacings, 2.065 + (4 x 2.28) + 2.06 = 13.245 m. between the internal wall faces, fitting the above-mentioned fragment of the east end block as restored to a length of 0.235 + 0.67 + 0.47 + 0.56 + 0.11 = 2.045 m.

[17] Hill, *op. cit.*, p. 194. The wall courses are here numbered in accordance with my system (*Hephaisteion*, p. 11 note 19), III being the orthostates and IV-XVI the plinth courses.

[18] *Hephaisteion*, pp. 81-83; regarded as inadequate by Hill, *op. cit.*, p. 201, fig. 8 (there placing the epistyle in course XVI).

[19] *Hephaisteion*, p. 91.

[20] Hill, *op. cit.*, p. 198; Stevens, *op. cit.*, pp. 144, 146.

greater. The internal length of the cella being 12.125 m. between the orthostates or 12.145 m. between the wall planes (measured by Stevens as 12.132 and 12.152 m. respectively, the latter by Koch as 12.15 m.),[21] the scratch line is 10.662 m. from the east orthostates or 10.672 m. from the east wall plane (10.668 and 10.678 m., Stevens). Employing the extant epistyle length 1.296 m. as the distance from the east wall plane to the first column center, but as yet without knowledge of the scratch line, Travlos at first had placed the west colonnade axis at the same distance (1.296 m.) from the west wall, thus obtaining an axial rectangle length of 12.145 — (2 x 1.296) = 10.849 m. This length, and the resulting axial spacing of 1/6 (10.849) = 1.592 m., are now to be rejected. But the revision of this scheme, which I suggested (and finally rejected in 1941), utilizing the scratch line and thus obtaining an axial spacing of 1/6 (9.376) = 1.563 m., must still be kept in mind.[22] The reversal of the process, in which Hill employed an epistyle length of 1.553 m., or of 1.553 — 0.029 = 1.524 m., as the distance from the axis of the west colonnade to the second column center from the west, would locate the center of the easternmost column, with five more spacings of 1.553 or 1.524 m., either 10.672 — (6 x 1.553) = 1.354 m. or 10.672 — (6 x 1.524) = 1.528 m. from the east wall plane, giving an axial rectangle length of 9.318 or 9.144 m. Stevens adopted Hill's greater alternative, his dimensions giving 10.678 — (6 x 1.553) = 1.360 m. from the east wall plane to the first column center, with an axial rectangle length of 9.318 m. Thus the surviving schemes would yield the following results:

A1 1.296 + (4 x 2.344) = 10.672 m., and 10.672 + 1.473 = 12.145 m. (Dinsmoo
B2 1.296 + (6 x 1.563) = 10.672 m., and 10.672 + 1.473 = 12.145 m.
B4 1.354 + (6 x 1.553) = 10.672 m., and 10.672 + 1.473 = 12.145 m. (Hill)
or 1.528 + (6 x 1.524) = 10.672 m., and 10.672 + 1.473 = 12.145 m. "
B5 1.360 + (6 x 1.553) = 10.678 m., and 10.678 + 1.474 = 12.152 m. (Stevens)

The axial spacings in the flank colonnades would thus vary from 1.524 m. (B4), 1.553 m. (B4-5), or 1.563 m. (B2), to 2.344 m. (A1).

Another factor was brought into the question by Stevens, who stated that the tops of the orthostates of the north wall seem to be rubbed just opposite the three westernmost column positions according to his scheme (axial spacing 1.553 m.) as if by the thighs of people squeezing behind the columns in order to pass around the statue pedestal; and he concluded that these would be almost sufficient, even if we did not possess the epistyle block, to indicate that the axial spacing was 1.553 m. Stevens also referred to a slight waviness in the surface of the later plaster on the north wall behind the positions of the second and third of these columns, counted from the west,

[21] Stevens, *op. cit.*, fig. 4.
[22] *Hephaisteion*, p. 91.

as if the plasterers had insufficient elbow room for obtaining a true surface.[23] I must confess, however, that with complete absence of prejudice I was unable to detect this rubbing of the orthostates, except conceivably opposite the northwest corner column which is common to all schemes, and even this seems doubtful; but opposite the position for the second column the orthostate is broken down to knee level, and opposite the third column no such traces are visible to my eyes. Likewise in the plaster on the plinth courses above, so thin that only the slightest deviation from a true plane would be possible, I can detect no significant irregularity opposite either of the two column positions in question, as contrasted with a slight hollowing of the surface on course IV only 0.90 m. from the west wall, not corresponding to any column and where the workers had plenty of room; I must conclude that such irregularities are merely the results of careless plastering, unaffected by the column positions. In other words, this type of evidence seems to be non-probative with respect to the column spacing.

For subsequent comparison with the flank foundations it should be recalled that the top course of the rear foundation, according to two medieval ledges hewn on the course below, extended 1.935 m. from the west wall plane.[24] The vertical scratch line 1.473 m. from the west wall, therefore, was 0.462 m. behind this foundation face. If we assume that the marble stylobate was set back 0.025 m. from this top foundation face, as was the case on the south flank,[25] the west stylobate edge should have been 0.437 m. from the scratch line. This is the chief evidence proving that the scratch line did not indicate the stylobate face (which in any case did not come into contact with the north wall) but rather the axial line of the rear colonnade, from which the stylobate would have projected 0.437 m.

The Flank Stylobates and the Axial Rectangle Width.

The total width of the cella was measured by me as 6.210 m. between the orthostates and 6.230 m. between the wall planes (6.233 and 6.253 m., Stevens).[26] Within this width, obviously, could be placed only half as many column spacings as in the length. And it would normally be assumed that these would have been identical with those employed on the flanks, i. e., 3 x 1.524 = 4.572 m., 3 x 1.553 = 4.659 m., 3 x 1.563 = 4.689 m., or 2 x 2.344 = 4.688 m. Actually, however, only in three schemes is the axial spacing made identical at the rear, the width of the axial rectangle being half of the length. For Hill argued that it could not have been as great as

[23] Stevens, *op. cit.*, pp. 150, 152, 161, fig. 2.

[24] *Hephaisteion*, pp. 67, 72, fig. 28.

[25] *Ibid.*, pp. 70-72, 88, 90, fig. 29.

[26] Stevens, *op. cit.*, fig. 4. But Stuart and Revett had measured 20′ 4.5″ = 6.210 m. between the orthostates, in agreement with me, and Ivanoff had measured 6.237 m. between the wall planes in the opisthodomos, closely in agreement with me.

1.553 m. at the rear, where he preferred 1.524 or even 1.51 m. Thus he would have either uniform spacing (1.524 m.) on all three sides, or a difference of 0.029 m. between the flank (1.553 m.) and rear spacing (1.524 m.), or possibly a difference of 0.014 m. (flank 1.524, rear 1.51 m.) or even of 0.043 m. (flank 1.553, rear 1.51 m.). The various axial spacings advocated for the west colonnade yield the following results:

A1	2 x 2.344 = 4.688 m.;	and 4.688 + 2 x 0.771 = 6.230 m.	(Dinsmoor)
B2	3 x 1.563 = 4.688 m.;	and 4.688 + 2 x 0.771 = 6.230 m.	
B4	3 x 1.524 = 4.572 m.;	and 4.572 + 2 x 0.829 = 6.230 m.	(Hill)
or	3 x 1.51 = 4.53 m.;	and 4.53 + 2 x 0.85 = 6.230 m.	"
B5	3 x 1.553 = 4.659 m.;	and 4.659 + 2 x 0.797 = 6.253 m.	(Stevens)

The reason for the reduction of the axial spacing at the rear in one of the restorations (B4) is the fairly well defined position of the stylobate edge on the flanks as indicated by a ledge cut on the top course of the south colonnade foundation,[27] 1.225 m. from the orthostate or 1.235 m. from the wall plane (1.215 and 1.225 m., Stevens), the distance to a corresponding but missing ledge on the less complete north foundation thus being 6.230 —(2 x 1.235)= 3.760 m. (Stevens giving 6.253 —(2 x 1.225)= 3.803 m.). I had indicated, to be sure, how the exposed upper edge of the marble flank stylobate might have been cut back 0.02/0.03 m. on the analogy of the back of the peristyle stylobate, or more exactly 0.025 m. as indicated by my measurement of 3.810 m. at the east threshold.[28] But Stevens did not take advantage of this amelioration, his greater dimension for the total width (6.253 m.) and slighter projection of the foundation ledge (1.225 m.) giving 3.803 m. without cutting back the stylobate edge. In the following table are shown the variant distances from the flank column centers to the ledge, or to the stylobate edge as cut back 0.025 m.:

A1	1.235 —0.771 = 0.464 m.;	and 0.464 —0.025 = 0.439 m.	(Dinsmoor)
B2	1.235 —0.771 = 0.464 m.;	and 0.464 —0.025 = 0.439 m.	
B4	1.235 —0.829 = 0.406 m.;	and 0.406 —0.025 = 0.381 m.	(Hill)
or	1.235 —0.85 = 0.385 m.;	and 0.385 —0.025 = 0.360 m.	"
B5	1.225 —0.797 = 0.428 m.;	0.428 m.	(Stevens)

It will be noted that in only two instances (A1, B2) do we find the same measurements that we have deduced on the rear foundation, 0.464 vs. 0.462 m. without, or 0.439 vs. 0.437 m. with the cutting back of the stylobate by 0.025 m. While this coincidence is not conclusive (since after all there might conceivably have been another ledge cut

[27] *Hephaisteion*, p. 70, fig. 29 at a′.
[28] *Ibid.*, pp. 70, 90.

on the top course, a′, at the west as there is at the south)[29] nevertheless the identity favors schemes A1 or B2, or possibly B5.

THE EPISTYLE BLOCK, ITS SECTION AND COURSE

The soffit of the epistyle being 0.514 m. wide (Fig. 1), the clear distance between the flank wall and the back of the epistyle is necessarily equal to the distance from the wall plane to the column axis diminished by half of the soffit, and thus yields a very narrow interval of 0.514/0.593 m., as follows:

A1	0.771 —0.257 = 0.514 m.	(Dinsmoor)
B2	0.771 —0.257 = 0.514 m.	
B4	0.829 —0.257 = 0.572 m.	(Hill)
	or 0.85 —0.257 = 0.593 m.	"
B5	0.797 —0.257 = 0.540 m.	(Stevens)

It is perhaps worth noting that by my calculations (A1, B2) this interval is identical with the soffit width, though of course this might be no more than coincidence. In any case, it would seem that in this restricted area, high above the floor, obscured in darkness and almost invisible, the architectural finish might logically have been greatly simplified. Thus the customary fascia and hawksbeak found elsewhere in this temple, together projecting 0.0545 m., if applied to both wall and epistyle would have reduced the width of the ceiling panel between them to the trivial amount of 0.405/0.484 m., and under the prevailing conditions of lighting and invisibility would hardly have justified the expense of cutting them.

The height of the epistyle block is 0.409 m., one face being provided with a crowning fascia 0.097 m. high and projecting 0.011 m., the other face being perfectly plain from bottom to top (Figs. 1, 3, a). The absence of any projecting moulding on one face is in agreement with two sets of drawings made by Travlos,[30] also with my repeated observations in 1937-1953. Hill was the first to suggest that there might have been a projecting fascia at the upper edge of this plain face, though he admitted that " the re-users' carefulness seems for their time beyond readily found parallel." [31] As a result, Stevens categorically stated that there was once a moulding here (Fig. 3, c),[32] a detail which I cannot follow. For one of the few certainties in this whole

[29] Such a ledge on course a′ of the rear foundation would have had to be 0.056 m. or 0.077 m. wide to fit Hill's restoration (B4), 0.033 m. wide to fit that of Stevens (B5), these being the discrepant amounts between 1.473 + 0.381 + 0.025 = 1.879 m., 1.473 + 0.360 + 0.025 = 1.858 m., and 1.474 + 0.428 = 1.902 m., respectively, and the actual projection 1.935 m. to the missing face of the top foundation course.

[30] *Hephaisteion*, p. 82, fig. 33; *Hesperia*, Suppl. VIII, p. 192, fig. 1.

[31] Hill, *op. cit.*, p. 190, note 1.

[32] Stevens, *op. cit.*, pp. 144, 148-149; he restores it as a simple fascia like that on the other

restoration is the absence of any moulding here. Medieval removal of such a projecting fascia would inevitably have left some indication of its lower edge at one point or another, either in the form of a projecting ridge or of a deeper hacking; we find neither, but instead a uniform plane with more pitting toward the jogged joint than toward the butt joint; and at the latter end, furthermore, the original smooth surface can be detected rising to at least 0.045 m. below the top, where it is broken away,[33] thus making it impossible to assume that there was ever a fascia 0.097 m. high on this face.

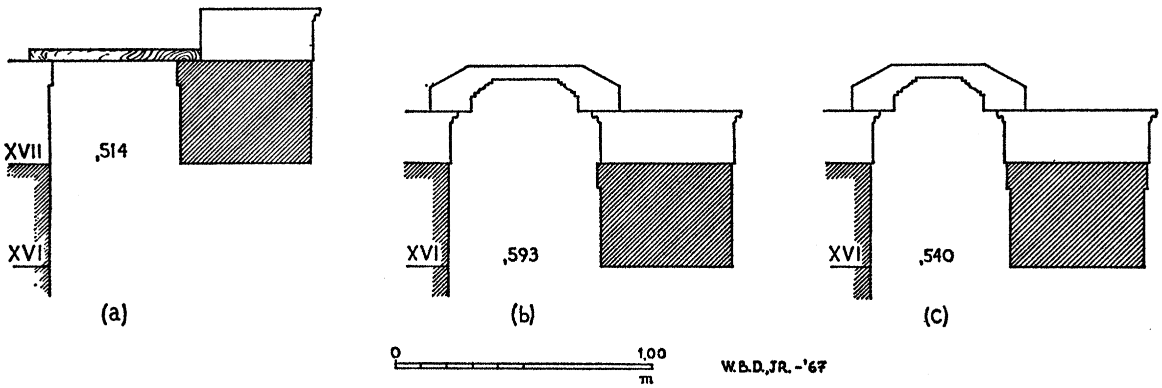

FIG. 3. Hephaisteion. Section of Upper Interior Epistyle as restored by a) W. B. Dinsmoor, b) B. H. Hill, c) G. P. Stevens

Another vital point is the treatment of the top bed: along the edge with the fascia runs a band more heavily pitted as if from exposure to the weather. I had interpreted this as the result of the collapse and disappearance of a wooden ceiling plank which rested on this edge (Fig. 3, a), at a time when the rest of the top surface was still covered by a marble interior cornice. But Hill argued that " the weathered margin is rather less definite and the contrast between it and the rest of the surface less pronounced than (my illustration) would suggest," and also that, even if the weathered band exists in fact, " it is by no means sure that the weathering we see resulted from exposure while the block was in situ." [34] He therefore disregarded it, and restored above the epistyle an interior cornice covering the entire width and profiled on both faces (Fig. 3, b), in this respect being followed by Stevens (Fig. 3, c).[35] I agree that the weathered strip is less definite than it is represented in my

face (fig. 4); but I can only conclude that this was inspired by a sense of proper architectural design, on the assumption that Hill's location of the epistyle is correct, rather than on impartial observation.

[33] Elevation of this face shown by Hill, *op. cit.*, fig. 1.

[34] Hill, *op. cit.*, pp. 203-204.

[35] *Ibid.*, p. 204, fig. 10; Stevens, *op. cit.*, fig. 4.

slightly reinforced version of the drawing made by Travlos; but I must insist that this reinforcement was justifiable interpretation, inasmuch as in no other way could this clearly perceptible band, of which I measured the width as 0.08/0.09 m. several times at different points, be made apparent to the reader. Nor is there any reason to assume that it was caused, for instance, by insertion in a medieval wall with this amount of the top surface protruding.

The internal evidence, therefore, presents two inescapable facts: one face of the epistyle was plain but must have had an interior cornice (presumably of the usual height 0.207 m.) above it, supporting a higher ceiling of the usual form with wooden cross-beams and coffers; the other face had a simple crowning fascia and supported directly a simple flat ceiling at a lower level (Fig. 3, a). On one face the crowning moulding was formed by the interior cornice, serving as an epikranitis under the ceiling; on the other, the fascia of 0.097 m. itself served as a simplified epikranitis.

The difference between the two faces of the epistyle distinguishes the front toward the nave from the back toward the wall.[36] The front was obviously that which supported the interior cornice and the higher ceiling; the back was that with the simple fascia and the lower plank ceiling.[37] As located against the east wall, with the jogged joint inserted into the wall, the epistyle block might conceivably be explained either at the northeast or at the southeast corner, were it not that the internal evidence as to the distinction between front and back compels us to adopt the southeast corner, which alone, moreover, would fit the explanation of a similar jogged joint in the missing lower epistyle on the analogy of Aigina. This eliminates the scheme (B2) which I had suggested as a possible alternate. As interpreted by Hill and Stevens, in the only two positions available to them (at the southwest corner forming the left-hand block of the west epistyle, or at the northwest corner forming the left-hand block of the north epistyle), the fascia must in either case have been on the back in agreement with my interpretation.[38] Thus the evidence of the epistyle faces would agree only with my preferred scheme (A1) or with Hill (B4) or Stevens (B5).

The height of the epistyle (0.409 m.) being such that its eastern termination might have bonded into courses XV or XVI (each 0.404 m.) or into a missing course

[36] Cf. *Hephaisteion*, fig. 32.

[37] Stevens (*op. cit.*, p. 164, cf. fig. 4), with the full interior cornice restored also on the back, suggests that there was a marble ceiling between the colonnade and wall on all three sides for reasons of stability, and this seems to be implied also by Hill's restoration (*op. cit.*, fig. 10). But this question of bracing for stability, with the use of stone (or marble) beams or ceiling slabs between columns and walls, raised also by Broneer (*Hesperia*, XIV, 1945, p. 248), does not seem to have interested the Greek architects (cf. *ibid.*, p. 364 [Dinsmoor]), as illustrated at Aigina, Olympia, Paestum, and in the Parthenon.

[38] Plommer, while adopting Hill's scheme and locating the extant epistyle block at the northwest corner (*op. cit.*, p. 77), nevertheless places the fascia on the side toward the nave (pl. VII), which is impossible.

XVII of similar height, I had eliminated course XV (a conclusion now generally accepted);[39] and, after weighing the possibilities between courses XVI and XVII, I had concluded in favor of the latter. The reason for this decision was that neither on the rear wall (as visible below the crown of the medieval vault) nor on the flank walls (as revealed by two holes punched through the vault) does course XVI show a crowning fascia corresponding to that on the back of the opposite epistyle face; on the other hand, dowel and pry holes demonstrated that there was on the inner face of the wall, above course XVI, another marble course which might have been 0.409 m. high with a fascia at the top.[40] Hill excavated at several additional points in the haunches of the vault and at the west end, uncovering the whole system of dowel and pry holes on the top of course XVI, proving definitely that course XVII formed an unbroken series of long narrow blocks (excluding Broneer's "binders"),[41] three across the rear and five on each flank, nearly twice as long as the wall blocks below, but irregular in length and independently jointed.[42] Hill pointed out that such greater lengths and independent jointing were characteristic of the interior cornice throughout the temple, and concluded that this was merely an ordinary interior cornice, with the epistyle below it in course XVI.

This decision obliged Hill to restore the almost invisible back of the epistyle, toward the wall, not only with its crowning fascia but also with the interior cornice above, $0.097 + 0.207 = 0.304$ m. of crowning mouldings, while the more prominent front toward the nave, somewhat incongruously, had only the interior cornice of 0.207 m.[43] This restoration of the back raises additional doubts because of the redundant superposed fascias, that on the epistyle projecting 0.011 m., while that of the interior cornice normally projects 0.016 m. from the member below it. If the interior cornice projected 0.016 m. from the wall, did it project $0.016 + 0.011 = 0.027$ m. from the back of the epistyle, or only $0.016 - 0.011 = 0.005$ m., or did it recede behind the epistyle fascia as Hill's restoration implies? It was obviously to escape part of these incongruities and to give equal richness to the visible face of the epistyle that Stevens restored a crowning fascia also on the epistyle front toward the nave,[44] where it is clear that none ever existed. Both restorations have been

[39] It is true that Plommer locates the upper epistyle in course XV, which obliges him to restore a hypothetical frieze in course XVI with the interior cornice in course XVII, in other words, a complete entablature with a height of 1.015 m. (*op. cit.*, pl. VII) which seems quite out of place in this position and would be of excessive proportions (0.434 of the height of the upper columns as he restores them).

[40] *Hephaisteion*, pp. 74-75.

[41] This constitutes a final argument for eliminating schemes A2 and B3.

[42] Hill, *op. cit.*, pp. 199-200, fig. 7; the blocks as thus determined were, from east to west, $2.035 + 4.74$ (two) $+ 2.585 + 2.785 = 12.145$ m. on the north wall and $2.13 + 2.13 + 2.425 + 2.585 + 2.875 = 12.145$ m. on the south wall, about $2.015 + 2.31 + 1.905$ m. on the west wall.

[43] Hill, *op. cit.*, fig. 10.

[44] Stevens, *op. cit.*, pp. 144, 148-149, figs. 1, 4.

forced, therefore, in order to keep the upper epistyle at the level of course XVI, to adopt solutions which contradict either logic or the facts. Both, furthermore, are obliged to interpret the fascia as an integral part of the epistyle profile, only the hypothetical interior cornice being repeated on the wall.

The conclusion that the long, independently jointed blocks in course XVII on the walls must necessarily have been the ordinary interior cornice is by no means final. The average length of the blocks on the flanks, 2.429 m., is not very different from the epistyle length 2.344 m. required by my scheme A1. And, as Hill admitted, such long and independently jointed blocks, set on edge (the bed indicates a thickness of 0.27/0.275 m.),[45] could equally well have been employed for a course 0.409 m. high aligning with the epistyle. The latter interpretation, furthermore, is forced upon us if we accept the weathered band 0.08/0.09 m. wide as evidence that the epistyle edge toward the wall once supported a simple plank ceiling (since with the epistyle in coarse XVI the dowel and pry holes on the top of wall course XVI, for a marble course XVII, would conflict with the plank ceiling), and if we accept the parallel interpretation of the 0.097 m. fascia as a simplified epikranitis which would then have been repeated on the opposite wall course XVII.

Summarizing the results obtained from the two known factors, the upper epistyle block and the scratch line, we have found that scheme B1 is eliminated because it is not related to the scratch line, schemes A2 and B3 because of the impossibility of " binders," and scheme B2 because the extant jogged jointed epistyle was not at the northeast corner. So far the technical evidence is decisive. Less decisive evidence is the form of the jogged epistyle joint, which seems most unsuitable at either of the west corners (schemes B4-5) but can be explained at the southeast corner (scheme A1), the latter being favored also by the identity of the stylobate and foundation projections from the west and flank walls. On the basis of design, moreover, the impossibility of a fascia or other moulding on the front of the epistyle and the incongruous treatment of the back with respect to the adjacent walls (which had no fascia in course XVI) would tend to eliminate schemes B4-5, whereas these conditions are perfectly compatible with the remaining scheme A1; and this is also favored by the identity of the epistyle soffit width 0.514 m. with the interval between epistyle and flank wall. Also contrary to schemes B4-5 is the weathered strip indicating a plank ceiling toward the wall, such as would be impossible in schemes B4-5 with the epistyle in course XVI.

Summary of the Design of the Columns

Before finally rejecting schemes B4-5 in favor of scheme A1, however, we must consider a few less tangible factors which will lead us in the same direction.

[45] Hill, *op. cit.*, p. 202.

The definitely restored height of the lower tier of columns, 3.912 m. (orthostates plus six wall courses IV to IX, 12 Doric feet, as defined by the horizontal top of the medieval plaster),[46] would be increased by the height of the missing lower epistyle, *ca.* 0.580 m. according to me (A1) or 0.512 m. according to Hill and Stevens (B4-5 = course X), leaving for the upper columns *ca.* 2.566 m. (my A1, reaching to the upper epistyle in course XVII) or 2.230 m. (B4-5, reaching to the upper epistyle in course XVI).[47] Thus the aggregate height of both colonnades would be 7.058 or 6.654 m.; and the proportionate heights of the two tiers of columns themselves would be as 1.000:0.656 or 1.000:0.570. The latter would agree with the heavier proportions at Aigina and Paestum;[48] but the lighter proportions of the Parthenon I had restored as 1.000:0.632 or even 1.000:0.753 (the latter in the interior of the Parthenon at Nashville, Tennessee, Pl. 56, which I restored at full size in 1927), the difference resulting from the transfer of one wall course (0.524 m. high) from one tier of columns to the other. Comparison of the latter results, however, obliges me to state that the lower tier of columns at Nashville is one course too low, and that the proportion of 1.000:0.632 is correct.[49] Thus the proportionate height of the upper

[46] *Hephaisteion,* pp. 76-77; cf. Hill, *op. cit.,* p. 204, note 20; Stevens, *op. cit.,* fig. 4. On the other hand, Plommer decides that to fit his restoration the lower epistyle should align with course IX (*op. cit.,* p. 78, pl. 7), thus making the lower columns only 3.400 m. high. But this disregards the evidence of the later plaster, stopping at the bottom of course X (the soffit level) on both the flank walls and the west cross-wall (*Hephaisteion,* p. 77).

[47] Hill, *op. cit.,* pp. 204-205; Stevens, *op. cit.,* fig. 4. It seems unnecessary to discuss further the heights proposed by Plommer, 3.400 m. for the lower columns (courses III-VIII) and 2.338 m. for the upper (courses X-XIV).

[48] I had formerly used for Paestum the heights 6.050 m. and 3.390 m. as measured by Labrouste, the former corroborated by my own measurement of 6.048 m. Krauss has since (1943) published the heights as 6.063 m. and 3.410 m., the former apparently excessive. We may adopt 6.048 m. (my measurement) for the lower and 3.410 m. (Krauss) for the upper, giving the ratio 1.000:0.564.

[49] The aggregate height of both tiers of columns and the intervening epistyle inside the Parthenon would reach to a course line 12.074 m. above the floor; the remainder of the height of the statue of Athena, the total of which was 39 Doric feet (Pliny, *N.H.,* XXXVI, 18) or 12.747 m., was taken up by the height of the upper epistyle and the crowning interior cornice. (I must reject the theory that Pliny reckoned with Roman feet of about 0.295 m., giving a height of only 11.544 m. as proposed by Miss Perry, Vannoy, and Stevens; we are not to suppose that Pliny personally measured the statue in Roman feet, however; he undoubtedly borrowed it, in the approved ancient manner, from a book of the Periclean age. Likewise the dimensions of the similar statue of Zeus at Olympia were given by Kallimachos of Alexandria, not in the smaller feet of his own time and place, but in the feet of 0.3264 m. with which it was erected, as may be verified from the dimensions of the pedestal.) Thus the column heights in the two tiers of the Nashville Parthenon were 6.374 and 4.821 m., in the ratio of 1.000:0.753; and with lower diameters of 1.115 and presumably 0.818 m. the column proportions became 5.717 diameters in the lower and 5.893 diameters in the upper. But by shifting one wall course from the upper to the lower tier, the columns would have been 6.898 and 4.297 m. high, in the ratio of 1.000:0.632, the lower 6.187 and the upper 5.241 diameters in height. The general tendency to employ more stunted proportions for the upper columns (e. g., only about 4.002 diameters at Paestum and 4.106 diameters at Aigina, as compared with about 4.314 and 5.231 diameters, respectively, for the lower columns), and the gradually increasing

columns in the Hephaisteion must have been much greater than 1.000:0.570, becoming in fact 1.000:0.656, close to the Parthenon ratio of 1.000:0.632, thus favoring scheme A1.

No detailed calculations as to column diameters were included by Hill except that he restored the bottom diameter as the maximum of 0.63 m., which I may here note is improbable since these lower columns would then have been as much as 6.21 diameters in height, with no other equally slender column proportions elsewhere in the temple.[50] Nevertheless Stevens retained the same dimension of 0.63 m. at the bottom, diminishing to 0.515 m. at the necking, while the upper columns were made 0.40 m. in diameter at the necking, with continuous diminution;[51] but again I may note that this diameter at the top is too small with relation to the epistyle soffit of 0.514 m. These dimensions are sufficient to illustrate the impracticality of schemes B4-5. Such difficulties were not, on the other hand, encountered in scheme A1. The bottom diameter has been estimated as 0.734 m.; which would give for the lower column a height of 5.330 diameters; and the normal proportion of about 7:9 between the upper diameter and the lower, with further allowance for the height of the epistyle, would cause the upper shaft to diminish from 0.533 m. at the bottom to 0.422 m. at the top; or, if we thicken the upper shaft slightly (by about 0.024 m.) for the sake of stability, as at Aigina, the diameters would be 0.557 m. at the bottom and 0.447 m. at the top, in better proportion to the upper epistyle soffit.[52]

Continuing the rather elusive question of proportions, it may be remarked that the axial spacing of the columns, given in schemes B4-5 as 1.51/1.553 m., seems almost incredibly small as compared not only with those at Olympia (3.50 m.), at Paestum (3.486 m.), and in the Parthenon (2.604 m.), but even with temples of the same scale as the Hephaisteion at Aigina (2.28 m.) and the Argive Heraion (2.205 m.), as well as Bassai (2.675 m. with Ionic columns). Similarly with respect to the assumed lower diameter of 0.63 m., the maximum for schemes B4-5, this likewise seems too small as compared with internal Doric columns in other temples of this scale, 0.74 m. in the older temple at Sounion and 0.72 m. at Aigina. This triviality is even more evident if we compare the intercolumnar dimensions, deducting from the axial spacing the diameter in order to obtain the clear interval, from which the diameter is again deducted to obtain the excess of interval over diameter:

proportion in the later parts of the Parthenon (6.113 diameters in the pronaos), both suggest that the lower columns should have the greater height.

[50] Hill, *op. cit.*, pp. 205, 208.

[51] Stevens, *op. cit.*, figs. 3, 4.

[52] In the upper tier of the Hephaisteion, Hill's scheme would give 4.330 diameters, which seems rather stunted for work in marble at this date, while that of Stevens would give 4.725 diameters (the lower diameter being 0.472 m.), a better proportion but clearly impossible because of the dimensions. My calculation would give 4.814 diameters without or 4.607 diameters with the thickening.

A1	2.344 —0.734 = 1.610 m.; and 1.610 —0.734 = 0.876 m.	(Dinsmoor, all sides)
B4	1.553 —0.63 = 0.923 m.; and 0.923 —0.63 = 0.293 m.	(Hill, flanks)
	or 1.524 —0.63 = 0.894 m.; and 0.894 —0.63 = 0.264 m.	(" all sides)
	or 1.51 —0.63 = 0.88 m.; and 0.88 —0.63 = 0.25 m.	(" rear)
B5	1.553 —0.63 = 0.923 m.; and 0.923 —0.63 = 0.293 m.	(Stevens, all sides)

I feel that this matter of the excess of interval over diameter is very important. Normally, in external Doric porticoes of the Periclean age, the excess is fairly constant, lying between 0.43 and 0.55 m., with a serious effort to maintain it close to 0.49 m. (1 1/2 Doric feet, the normal width of a man across the shoulders) as a means of keeping the design in scale. Smaller excesses than this are found in the west wings of the Propylaia at Athens (0.358 m.), the "Basilica" at Thorikos (0.3495 m. on the fronts, 0.369 m. on the sides), and in the Athenian temple at Delos (0.204 m.); but all three of these are exceptional and out of scale, the first repeating the ratio of 3:4 which was designed for the central building (though the dimensions are reduced to nine-thirteenths), the second almost the same, and the third employing the ratio 4:5 which was designed for the Parthenon (though the dimensions are reduced to three-sevenths). Similarly the porch fronts of the Hephaisteion and the temples at Sounion and Rhamnous keep the excess within the limits 0.452 and 0.510 m. In the Parthenon porches, however, the excess is increased to 0.7525 m. in the opisthodomos because of the use of the second-hand diameter 1.714 m. inherited from the Older Parthenon, and to 0.898 m. in the pronaos where the diameter was reduced still more. On the other hand, the internal colonnades of the Parthenon show an excess of only 0.314 m., because the second-hand column diameter 1.115 m. inherited from the Older Parthenon would otherwise have yielded a tremendous excess of 1.447 m. if the number of column spacings across the back of the cella had been reduced from four to three. In any case, the slight excess of only 0.25/0.293 m. suggested for the Hephaisteion in schemes B4-5 would have been out of scale without any discernible reason. We may preferably accept the excess of 0.876 m. resulting from scheme A1, which agrees with the fact that internal colonnades should theoretically have more open proportions because of their smaller scale and also to permit more commodious circulation.

More tangible, perhaps, is the relation of the flank colonnades to the edges of the flank stylobates, 3.810 m. apart (3.803 m., Stevens). In schemes B4-5 the axial rectangle would have exceeded the stylobate interval by 0.360 or 0.381 m. (B4) or by 0.428 m. (B5) on each side, so that, with the maximum column diameter of 0.63 m., the stylobate projection beyond the circumference would have been 0.045 or 0.066 m. (B4) or even 0.110 or 0.113 m. (B5). It is evident that such great projections as 0.110 or 0.113 m. would have been contrary to normal practice; Stevens attempted to account for such great projections on the assumption of possible moulded bases under the columns,[53] which would be a desperate explanation of a condition which resulted merely from the use of an inadequate axial spacing. Hill's alternative projections of 0.045 or 0.066 m. would be satisfactory in themselves, but they were attained only by the doubtful expedient of reducing the spacing across the rear to

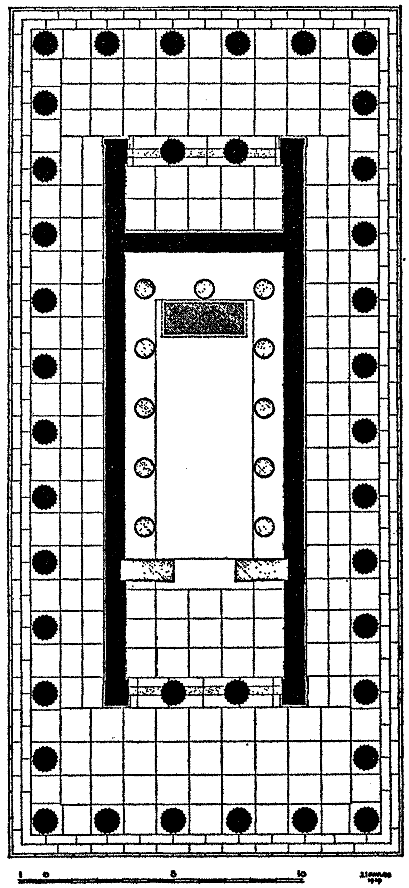

Fig. 4. Plan of the Hephaisteion (Restored by W. B. Dinsmoor, 1941)

1.524 or even 1.51 m. In the Periclean age the stylobate projection seems to have been definitely established in the case of Doric external stylobates between 0.0335 and 0.054 m., regardless of scale.[54] Likewise in the internal colonnade of the Parthenon it is 0.0535 m., and in the porches of the Parthenon it is 0.042 m. in the opisthodomos

[53] Stevens, *op. cit.*, pp. 147-149, figs. 3, 6.

[54] Thus we find 0.0335 m. (Thorikos), 0.04 m. (Argive Heraion), 0.041 m. (Delos, Athenian temple), 0.046 m. (Parthenon), 0.0465 m. (Sounion), 0.048 m. (Hephaisteion and Rhamnous), and 0.054 m. (Propylaia throughout).

(only 0.035 m. on the north side) and 0.067 m. in the pronaos (enlarged in partial compensation for the reduced column diameter here employed). Thus the stylobate projection of 0.439 —0.367 = 0.072 m. inside the Hephaisteion (scheme A1) would be in accord with general practice.

For all these reasons I feel that scheme B with three by seven intervals, with sixteen columns, must be definitely eliminated. This carries with it not only the presently accepted restorations by Hill or Stevens,[55] but also their approval by Hugh Plommer, Herbert Koch, Mme. Semni Korouzou, John Travlos (in the plans of the American excavations in the Agora drawn since 1950), and, last but not least, Gottfried Gruben.[56] There remains only scheme A1 (Fig. 4), that which I had originally suggested, with two by five intervals and with eleven columns.

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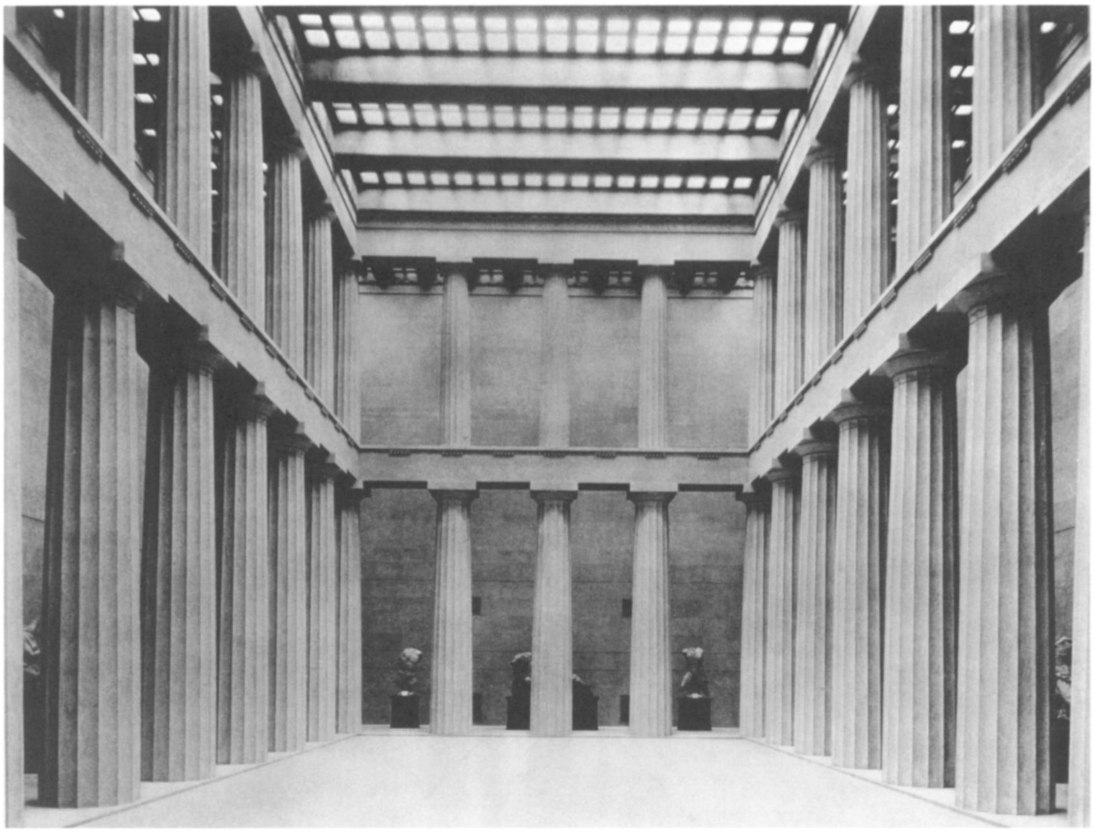
[55] My own reaction was from the beginning to dismiss scheme B as giving inadequate axial spacings and inadequate amounts for the excess of interval over diameter (*Hephaisteion*, p. 89). In connection with this subjective impression, I may recall the laconic exclamation of Professor Orlandos upon his first sight of the preliminary form of the plan as drawn in accordance with scheme B1: "What? So many columns?"

[56] Hugh Plommer, *B.S.A.*, XLV, 1950, pp. 77-78, pl. VII; Herbert Koch, *Studien zum Theseustempel in Athen*, 1955, pp. 59-60; Semni Karouzou, "Alkamenes und das Hephaisteion," *Ath. Mitt.*, LXIX/LXX, 1954/55, pp. 67-94; Gottfried Gruben, *Tempel der Griechen*, 1966, pp. 202-203.



The Parthenon at Nashville, Tennessee looking West (Restored by W. B. Dinsmoor, 1927)

WILLIAM BELL DINSMOOR: THE INTERNAL COLONNADE OF THE HEPHAISTEION

†EDWIN J. DOYLE: A LATIN EPITAPH FROM ATHENS

BORIMIR JORDAN: A GRAVE STELE FROM ATTICA