SOME REMARKS UPON THE INTERIOR OF THE HEPHAISTEION[1]

INTRODUCTION

DURING the restoration of the eastern portion of the Hephaisteion by Professor Anastasios K. Orlandos in 1936 and 1937,[2] and also during the thorough excavation of the interior of the temple in 1939 by the American School of Classical Studies at Athens,[3] important new discoveries were made. And, still more recently, Professor W. B. Dinsmoor,[4] Professor Oscar Broneer,[5] and Mr. B. H. Hill[6] have published articles which add greatly to our knowledge of the interior. Thus, he who would like to know what the interior originally looked like has a good deal of recent material to consult.

In Professor T. L. Shear's report of 1939 upon the activities of the American School in the Agora of ancient Athens—the report is published in *Hesperia* of 1940—he reproduces a plan of the whole Agora, in which the Hephaisteion is indicated with four columns at the west end of the cella and with seven columns along both the north and south sides of the cella.[7] Also, the pedestal for the cult statues in the cella is drawn in what seems to the writer to be its correct position. Further, Messrs. Dinsmoor, Broneer, and Hill are agreed that within the cella there was a double order of Doric columns, one above the other. There is some discrepancy among these scholars, however, as to the axial unit of the colonnades, as to the location of the cult statues, as to the interpretation of the remains of stucco upon the walls of the interior of the

[1] The writer wishes to express his sincere thanks both to Professor Homer A. Thompson and to Professor Oscar Broneer, not only for their many valuable suggestions as this study progressed, but also for their careful reading of the manuscript. It is fair to these scholars, however, to say that their views do not entirely coincide with the writer's, notably in regard to the stucco on the walls of the interior of the cella.

Mr. Bert H. Hill, too, was most helpful. It is an important asset for the American School that he should be living in Athens.

[2] A. K. Orlandos: Ἀρχεῖον τῶν Βυζαντινῶν Μνημείων τῆς Ἑλλάδος, Τόμος Β', 1936, pp. 207-216.

[3] The excavations were supervised by Mrs. Dorothy Burr Thompson.

[4] W. B. Dinsmoor: Observations on the Hephaisteion, *Hesperia*, Supplement V (1940).

[5] O. Broneer: *Hesperia*, XIV, 1945, pp. 246-258.

[6] *Hesperia*, Supplement VIII, pp. 190-208.

[7] *Hesperia*, Vol. IX, 1940, Pl. I. The plan was drawn by Mr. John Travlos, Architect of the Excavations of the American School.

cella, and as to some other matters of less importance. In the present article the writer will try to add a little to what is already known about the interior of the Hephaisteion.

The chief new discoveries of the scholars mentioned in the last paragraph, which help in an architectural restoration of the interior, are, briefly stated, as follows:

1) Poros foundations suitable for the support of columns at the west end of the cella and also along the north and south sides of the cella. The foundations show that the columns at the west were some little distance from the west wall, while the columns along the north and south sides were comparatively near the walls behind them. (That the foundations did not bond into the foundations of the temple itself does not necessarily mean that the foundations which supported the columns and the columns themselves were both an after-thought. For foundations of interior walls, even in the best periods, were as a rule not bonded into the foundations of the exterior walls; as, for example, the foundation of the east cross wall of the Erechtheum; cf. Paton and Stevens, *Erechtheum*, Text, pp. 147-148.)

2) A vertical scratch on the vertical face of the marble course beneath the north orthostate. The scratch gives the north-south axis of the row of columns at the west end of the cella. The distance from the orthostates of the west wall to the scratch is 1.464 m. (cf. Fig. 4).

3) An architrave block of the upper order. The block tells us that the orders were probably Doric; that the axial unit of the double order was 1.553 m.; that the upper diameter of the upper columns approximated 0.40 m.; that there was a course of marble above the architrave. Further, as the architrave block is of Pentelic marble, we may infer that the columns were also of Pentelic marble. The position of the architrave block in relation to the bottom of the orthostate was determinable, thanks to the remarkable preservation of the temple, which is the best preserved of all Greek temples. (The writer's study of the architrave block brought out the fact that the block had not only a fascia along the top of the side toward the wall, but also either a fascia or a set of moldings along the top of the side toward the interior of the cella).

4) Two blocks of dark Eleusinian limestone of the die of the pedestal which supported the cult statues.

The above data, together with information derived from inscriptions and ancient writers, are amply sufficient to make a drawing which will give a very good idea of the original interior of the cella [8] (cf. Fig. 1).

[8] No architrave block over the lower columns has as yet been found. In Fig. 1 the architrave was restored with a molding along the top. It is possible that instead of a molding there was a fascia with guttae below, like the usual treatment of a Doric architrave. But, as there is no evidence for guttae on the architrave block of the upper order, it is possible that the architrave over the lower order had no guttae.

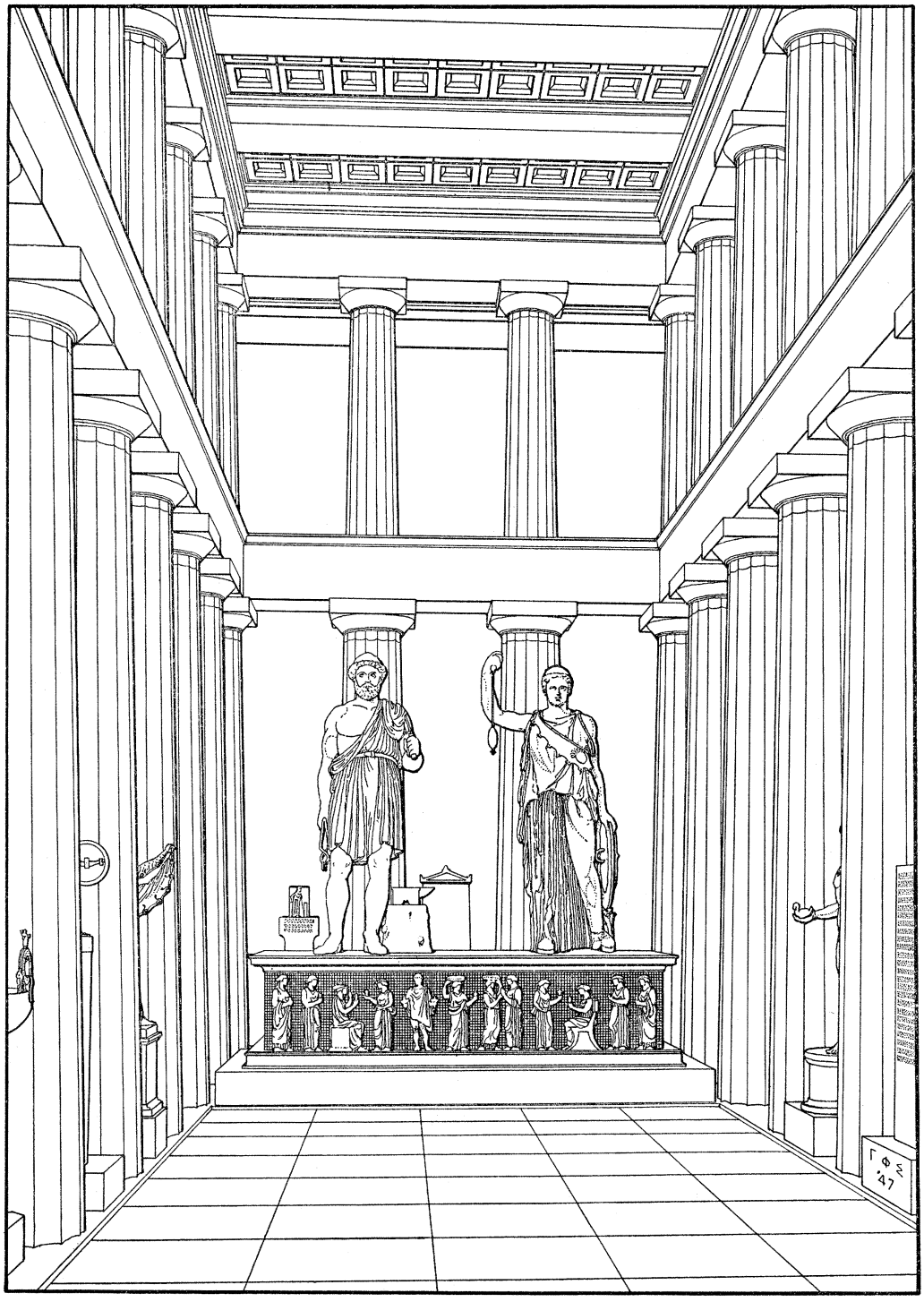

Fig. 1. Perspective of the Interior of the Hephaisteion : Restoration

An excellent way to study an ancient building is to draw restored plans, elevations and sections of it at fairly large scale, as valuable information is sure to escape the notice of the restorer who does not thus carefully go into his problem. Below are some of the most important features which came to light as the drawings needed for Fig. 1 progressed.

I. COLONNADES

The north-south axis of the colonnade in the western part of the cella is known from the vertical scratch (already referred to) on the north wall of the cella. It is obvious that where the axis given by the scratch crosses the axis of the temple we must place either a column or an intercolumniation (cf. Fig. 2, A). If we place a column on the axis of the temple and then space out the columns to the north and south, using 1.553 m. for the axial unit, the foundations along the north and south sides of the cella are meaningless. But, if we place an intercolumniation on the axis of the temple, the foundations along the north and south sides of the cella are almost exactly what we should expect to find if the corners of the colonnades are turned with a column (or perhaps with a square pier with a side about equal to the diameter of a column; cf. Fig. 6). Fig. 3 shows the relation of the north and south colonnades to their foundations. Proceeding eastward from the corner columns (or piers if preferred) and again using the axial unit of 1.553 m., we find that seven columns can be spaced out (cf. Fig. 2). As a result of such a spacing, the distance between the axes of the most easterly columns and the west face of the east cross wall becomes 1.36 m. (cf. Fig. 4). If pilasters projected 0.07 m. from the east cross wall, then the free space between the easterly columns and their pilasters is equal to the free space between the columns themselves, provided we use for the calculations the column diameters which are halfway between the bottom of the orthostates and the bottom of that architrave which is immediately beneath the ceiling (cf. Fig. 4). Pilasters occur in the cella of the Parthenon,[9] and also in the cella of the temple of Neptune at Paestum.[10]

A-B, Fig. 3, projects about 0.113 m. beyond the face of the column, a projection which in the case of the Doric order is commonly only 0.05 m. to 0.06 m. Perhaps the anomaly can be explained in one of the three following ways:

1) Running along the outside of the cella is a vigorous molding below the orthostates. The molding is carried around the four antae of the temple—that is the antae have bases, an unusual feature for the Greek Doric order, but not unique.[11] If the pilasters in the cella also had bases, the projection of the line A-B, Fig. 3,

[9] Penrose: *Principles of Athenian Architecture,* Plate 4.
[10] Koldewey und Puchstein: *Die Griechischen Tempel in Unter-Italien und Sicilien,* Taf. 4.
[11] A. K. Orlandos: Ἀρχ. Ἐφ., 1917, pp. 213 and 222.

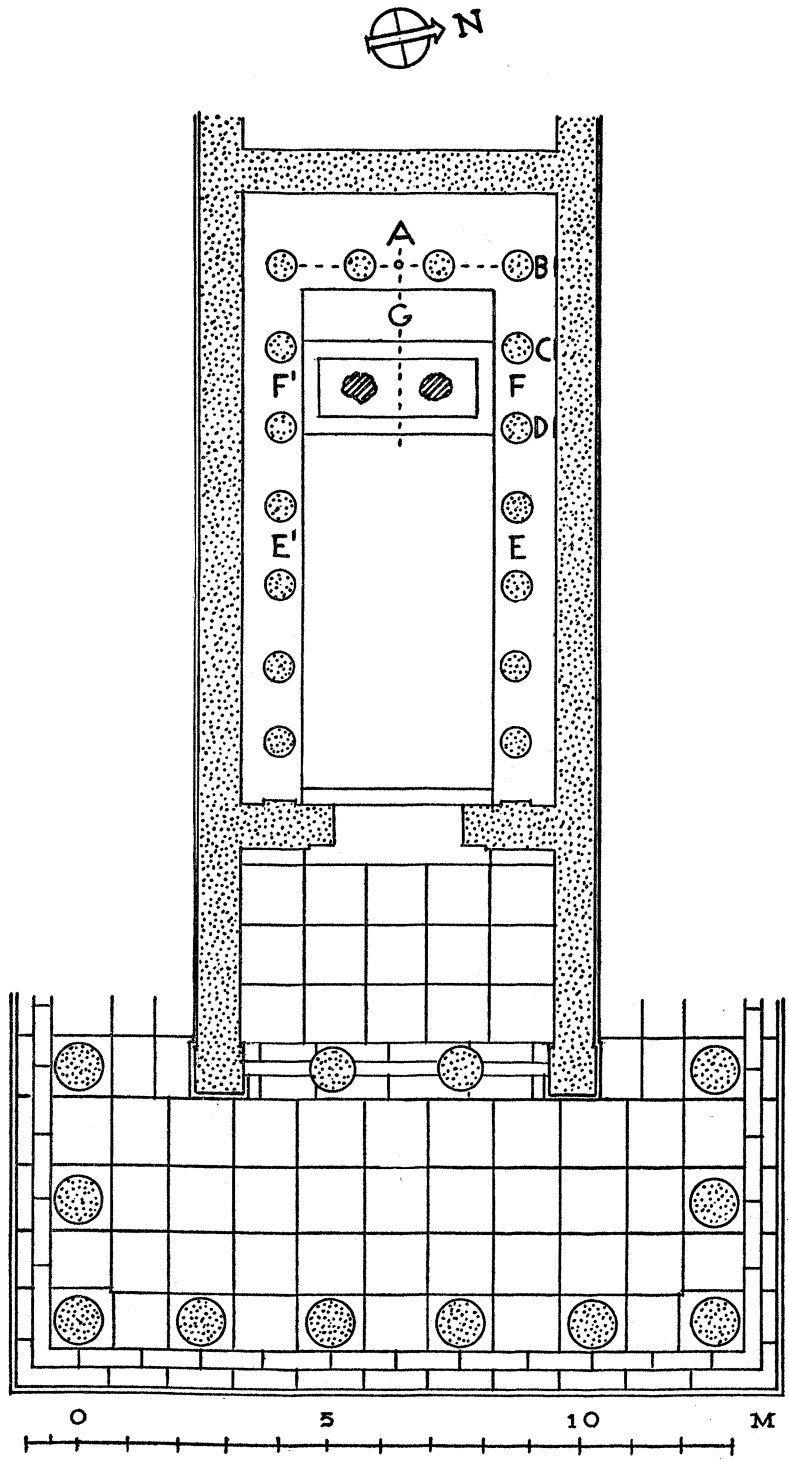

Fig. 2. Plan of the Interior of the Hephaisteion : Restored

becomes understandable—A-B must project far enough beyond the side face of the pilaster to carry the base of the pilaster properly. A suggestion for such a base is indicated with dotted lines in Fig. 3, on the right. (The pilasters in the cella of the Parthenon had no molded bases, but neither did the outside wall of the cella.)

2) The unusually large projection of A-B, Fig. 3, beyond the face of the columns may also mean that the columns themselves had bases. There is a well-known Doric column with a molded base in the portico of the temple at Cori.[21] The suggestion for

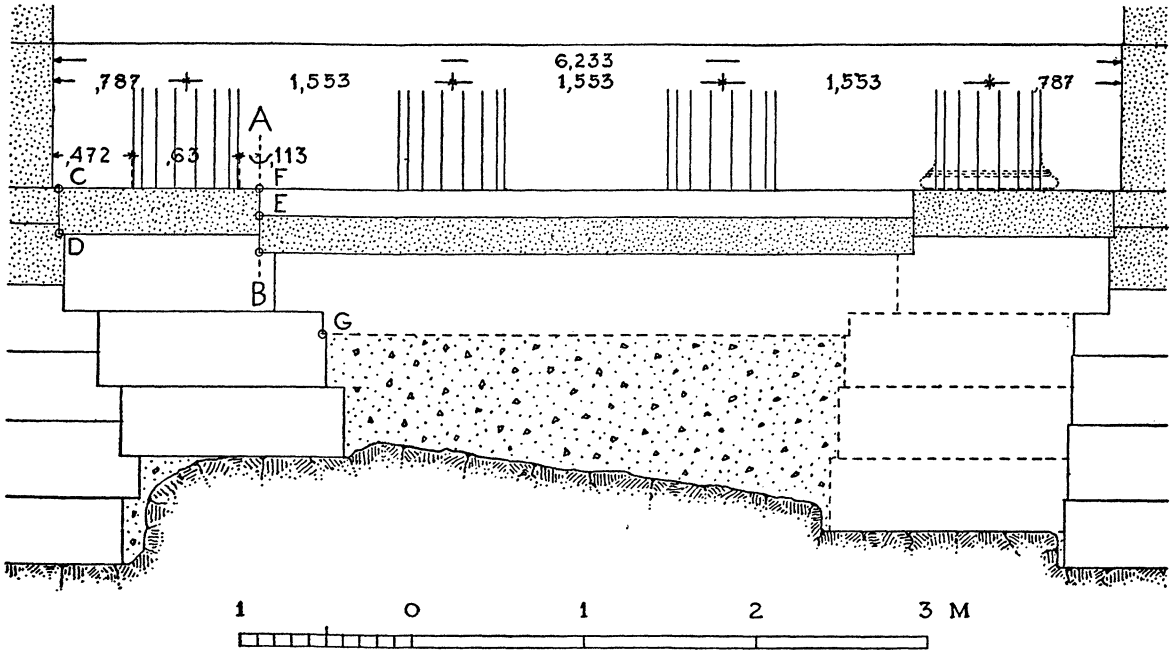

Fig. 3. Section through the Lower Part of the Cella of the Hephaisteion, Looking West : Restored

a pilaster base in the Hephaisteion as shown in Fig. 3, on the right, may also serve as a suggestion for a column base, for the bottom width of the pilaster nearly equalled the bottom diameter of the column if we follow what was done in the Parthenon.

3) If the lower columns of the interior of the Hephaisteion had bases, as suggested in the last paragraph, there is a possibility that the columns were not of the Doric order, but of the Ionic order or even of the Corinthian order. Further, the height of the fascia (possibly a set of moldings) along the top of the only preserved architrave block of the interior—the fascia toward the interior of the temple—may indicate that the upper columns of the interior were also not of the Doric order, for the fascia is too broad for the fascia of a Doric architrave of the height of the pre-

[12] *Fragments d'Architecture Antique*, Vol. I, Pl. 35.

served architrave block—the height of the fascia (0.097 m.) is about one fourth the height of the preserved architrave block (0.409 m.) instead of about one eleventh, the usual proportion for a Greek Doric architrave. And there are no traces of guttae beneath the fascia of either side of the preserved architrave block of the Hephaisteion to tell us positively that the accompanying capitals were of the Doric order. As a rule, a plane architrave is a good indication of a Doric order. But the fact that the Hephaisteion architrave had no fasciae does not necessarily mean that there were Doric capitals beneath that architrave. Did not the Ionic order of the interior of the temple at Bassae have a plane architrave (Anderson, Spiers, Dinsmoor, *Architecture of Ancient Greece*, Pl. XXXII)? For the above reasons it is possible that the upper columns were not of the Doric order. Moreover, could they have been piers, not columns? There is a feature not shown in Fig. 4, which gives us a little information about the capital beneath the preserved architrave block; the feature is an unpolished bearing surface on the under side of the architrave at its east end—this unpolished surface indicates that the abacus of the capital of the support below the architrave block was probably square in plan, with a side of *ca.* 0.57 m., which is quite in keeping for the upper Doric columns shown in figure 4. And from that same figure it will be observed that two Doric orders, one over the other, go very well together. But, if the lower order was Ionic or Corinthian, upper supports of Doric columns would hardly be permissible. Moreover, the trace of the abacus on the under side of the preserved architrave block tells us that the abacus is too big for either Ionic or Corinthian upper columns. With a little study, however, we find that upper supports which were square in plan can be made to fulfil the necessary conditions. Such piers might have been plane or panelled, or decorated with 1) ornament, 2) lightly projecting pilasters of the Ionic or Corinthian order (facing the cella), 3) sculptural figures, as in the well known case of the " Incantada " at Salonica (cf. Stuart and Revett, *The Antiquities of Athens*, Vol. III, chap. IX). In this connection we may point out that both Ionic and Corinthian columns are to be found in the interior of Doric temples: the temple at Bassae, which was fairly contemporary with the Hephaisteion, is an example of the former; the Tholos at Epidaurus, which was erected about a hundred years after the Hephaisteion was built, is an example of the latter.

At the moment, the chances favor an all Doric interior (cf. Figs. 1 and 4). But there is still a great deal of excavating to be done in the ancient Agora of Athens. Perhaps fragments will some day be found which will solve the difficulties of the interior of the Hephaisteion.

II. PEDESTAL OF THE CULT STATUES

Where was the level of the floor upon which the pedestal of the cult statues rested? We know the distance C-D, Fig. 3; it is 0.265 m. And we know the position

of B (Fig. 3). Make B-E equal to the thickness of the pavement in the peristyle, namely, 0.21 m.—in the Parthenon the thickness of the pavement in the peristyle is the same as that of the pavement in the cella. We thus have a thicker course beneath the interior columns of the Hephaisteion (where a thick course is needed on account of the superincumbent weight) than we have for the pavement in the cella—this again is what was done in the Parthenon. E-F becomes 0.16 m., considerably higher than in the case of the Parthenon, where the step is 0.04 m. high. But the two interiors were different. In the Parthenon the distance between the columns and the side walls was so great that large numbers of people must have circulated in the aisles; and to reach the aisles they must have passed over the low step which marked off the nave from the aisles. A step with a height of 0.04 m. really amounted to no step. People would have tripped over a step as high as 0.16 m., especially when we remember that the interior of the Parthenon was none too well lighted. In the case of the Hephaisteion, on the other hand, there was no need for a very low step, as large numbers of people were not expected to pass behind the columns, as we shall see a little further on in this article. Moreover, the above figures make the pavement of the cella of the Hephaisteion 0.04 m. above the pavement of the pronaos—this is almost similar to the difference between the corresponding levels in the Parthenon (cf. Fig. 4).

The thickness of the poros course below the pavement in front of the cult statues is determined by the cutting at G, Fig. 3.

The writer believes that the pavement behind the cult statues (cf. Fig. 2, G, and Fig. 4), was raised somewhat, so that the step became a low one, like that of the Parthenon. The area G is so small that to sink it 0.16 m. would make it look like a hole in the pavement.

Beneath the pavement at G, Fig. 2, and also under the pedestal of the cult statues a thin poros course was probably laid, as was done elsewhere in the temple in places of small extent (cf. Dinsmoor's " Observations, etc.," Fig. 11, sections A-A and C-C).

In passing, we may remark that the sill of the entrance door projected an unusual amount into the pronaos (cf. Fig. 4),—an indication that the door may have been given an architectural treatment which stood out vigorously from the wall behind it.

From the two preserved blocks of the die of the pedestal of the cult statues Professor Dinsmoor works out a length of 3.086 m. and a width of 1.303 m. for the die as a whole, figures which are undoubtedly very accurate. The pedestal together with its base moldings was thus so wide that the ancient Greek who wanted to go around the pedestal was obliged to pass back of the columns on either the north side or the south side of the pedestal (cf. Figs. 1, 2, and 6). The distance between the columns and the orthostates behind them is, at the top of the orthostates, *ca.* 0.48 m. (cf. Fig. 3). The space is sufficient for persons to pass, but, in doing so, most of them would rub against the upper part of the orthostates (which are finished as exposed faces), for the top of the orthostates is 0.845 m., or about the height of a man's hips, above

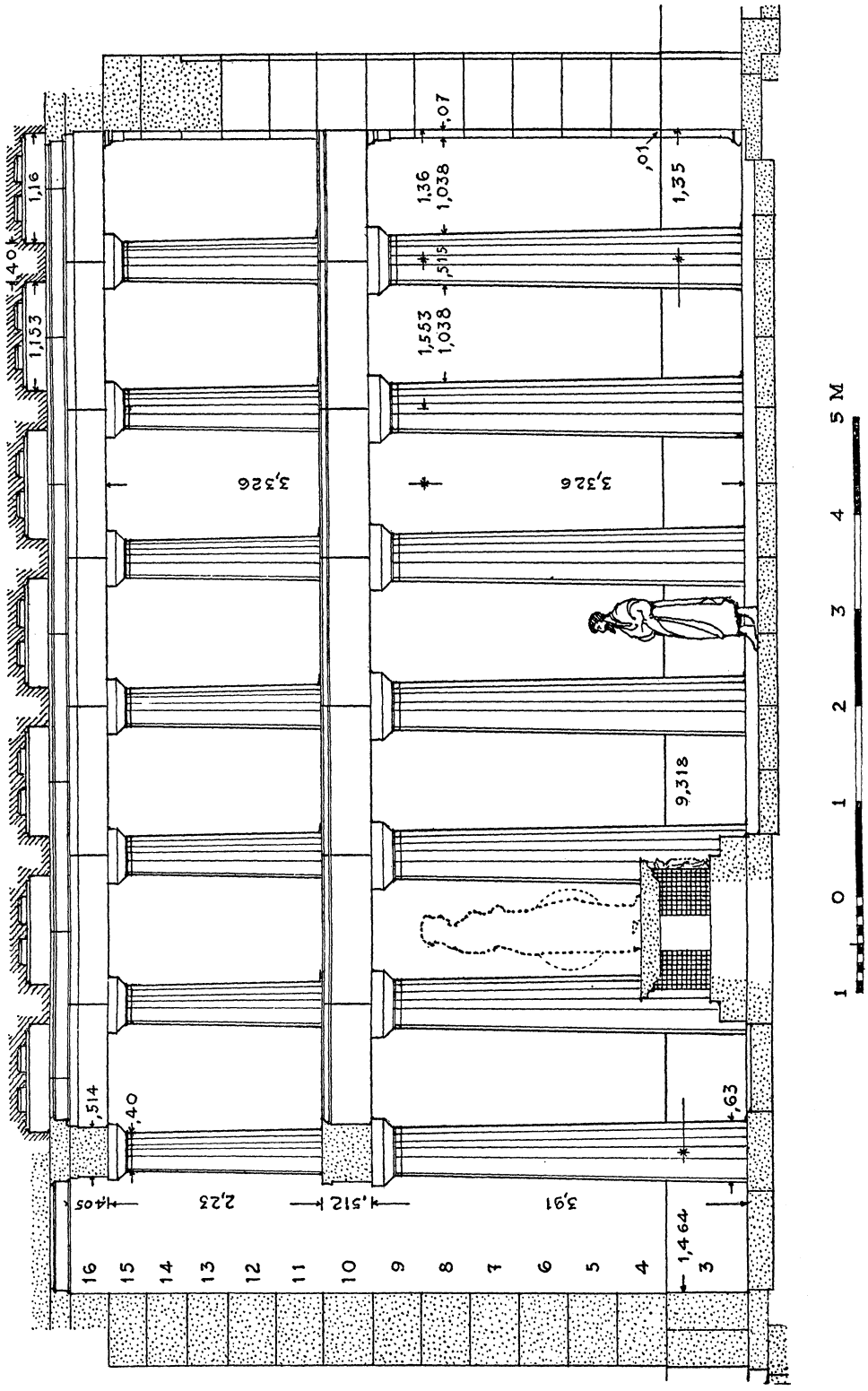

Fig. 4. Section through the Cella of the Hephaisteion, Looking North: Restored

the base of the wall. We might hope that even today the upper part of the orthostates would be particularly well polished behind those columns back of which the public circulated; and, indeed, this is so at B, C, and D, Fig. 2. (The corresponding places on the south wall of the cella are not in a good state of preservation, but portions of well polished surfaces are visible there, also.) If we had no architrave block to give us the axial unit of the colonnades, the polished surfaces at B, C, and D would tell us the axial unit fairly accurately.

The spaces E and E′ between the columns (cf. Fig. 2) and the similar spaces eastward were excellent niches for votive monuments. We would not expect to find that the public circulated behind the columns in this part of the cella, for at least some of the votive monuments must have practically filled the niches in which they stood and thus have prevented circulation behind the columns. And nowhere behind these columns is the upper part of the orthostates in so highly a polished condition as at B, C, and D.

Professor Dinsmoor has shown from the five dowel cuttings in the exposed vertical face of the block from the east face of the die of the pedestal of the cult statues that objects of some kind, probably twelve in number, were doweled to that face, and, further, from the lack of dowel cuttings in the exposed vertical face of the die block from the rear of the pedestal that objects were not attached to the back of the pedestal (cf. Fig. 6). In *I. G.*, I², 371 mention is made of twelve forked dowels for the pedestal (cf. Fig. 5). The forked dowels are in addition to the ordinary dowels needed for the bottom of the blocks of the pedestal. Some sort of forked dowel was necessary to prevent the objects attached to the exposed face of the die from being pulled off. The dowel cuttings for the forked dowels have a larger area at the bottom of the dowel cuttings than at the face of the die. Thus, after the dowel was leaded, both it and its lead were well anchored. Twelve objects were attached to the front by the twelve forked dowels of the inscription, no objects to the back—quite clearly there were no objects attached to the sides of the die (the blocks of the sides are missing): in other words, only the front of the pedestal was decorated.

A very probable supposition as to the material of the attached objects is that they were of white marble, as no other material would stand out so well against a dark Eleusinian background. It is more than likely that the applied objects were figures, and that, taken collectively, they formed a frieze representing some festival of the craftsmen of Athens, for both Hephaistos and Athena, whose statues were supported by the pedestal, were the patrons of craftsmen. A frieze of small figures of white marble, attached to a background of dark Eleusinian limestone, at once reminds us of the well-known friezes of the Erechtheum.[13] That one frieze influenced the other

[13] If originally there were no marble figures attached to the frieze under the west gable of the Erechtheum, as seems possible (cf. Paton and Stevens, *The Erechtheum*, Text, p. 240), then we have a further slight resemblance between the frieze of the pedestal in the Hephaisteion and the frieze of the Erechtheum.

frieze is impossible to say, for the pedestal in the Hephaisteion, dated to 421-15 B. C. by inscription *I. G.*, I², 370/371, is about contemporary with the friezes of the Erechtheum. (The Erechtheum building inscription would make the Erechtheum friezes *ca.* five years later than the frieze in the Hephaisteion).

Professor Dinsmoor remarks (cf. "Observations, etc.," p. 108), that, on the analogy of bases with dark dies and dark upper members in the Temple of Zeus at Olympia, in the Tholos at Delphi, and in the Temple of the Athenians on Delos, the

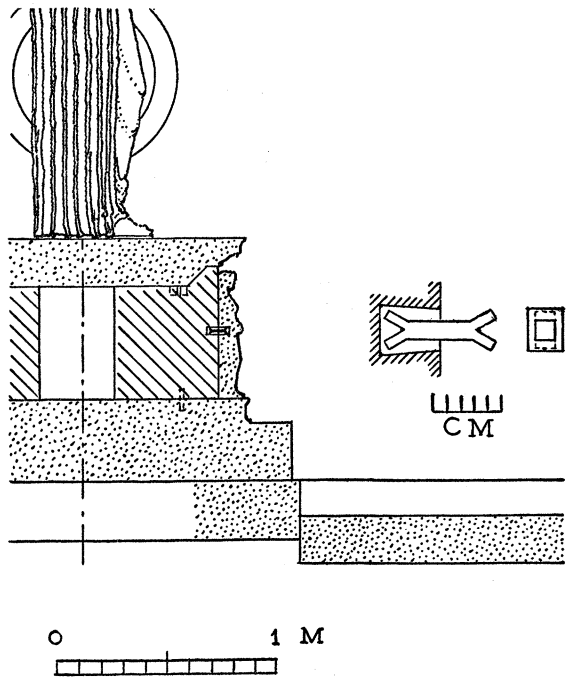

Fig. 5. Section through the Pedestal of the Cult Statues, Looking North : Restored. Detail of Forked Dowel (Restored) for Attachment of Marble Figure

member above our dark die was probably dark. But he goes on to say that the members below the dark dies at the above quoted places were dark in the two first cases, light in the last case. That is, the color for the members was not rigidly adhered to. It was probably selected to harmonize with the color scheme of the interior of the temples, with the decoration, if any, of the pedestals, and also with the color of the statues supported by the bases, for the statues might be of wood (painted, gilded, or draped), of various colored marbles, of bronze (sometimes gilded), of gold and ivory. In the case of the Hephaisteion we favor white members (probably of Pentelic marble) both above and below the dark die, for the moldings of these members should be fine in scale to go with the delicate carving of the small

figures attached to the face of the die, and fine scale moldings cannot be cut satisfactorily in Eleusinian stone: the moldings should also be light in color to go with the white marble figures attached to the die. That only a portion of the thickness of the crowning member of the pedestal was visible is clearly evident, for the top of the die is cut with a rabbet, as shown in Figure 5. In this way the crowning member was strong enough to carry the heavy cult statues, and yet but a portion of its thickness was visible. If the whole thickness of the top member had been visible, it would have seemed too clumsy for the delicate figures of the frieze. On similar grounds, a plea may be advanced for a fine scale treatment of a white member immediately below the die (cf. Figs. 1 and 5). We may add that there was a delicate treatment of Pentelic marble directly above and below the frieze figures of the Erechtheum.

III. CULT STATUES

Pausanias tells us that in the temple were two statues standing side by side: one of Hephaistos, the other of Athena.[14] From another source we seem to learn that the statues were of bronze.[15] Bronze is an appropriate material in this case, for the temple stood in the district of the foundries. The bits of castings and the fragments of molds found in 1939 within the peribolos of the Hephaisteion are almost certainly to be connected with the cult statues (cf. Dinsmoor, " Observations, etc.," p. 109). The casters of the district would have been likely to vote, rather strenuously, against an attempt to make the statues in marble.

The large size of the pedestal and the thickness of the member upon which the cult statues rested indicate that the statues were large—undoubtedly larger than life, to give them dignity. The Themis of Rhamnus, which is 2.25 m. high, is a fairly good parallel. Let us make our Athena higher, say 2.35 m., because the cella of the Hephaisteion is larger and loftier than the cella in which the Themis stood. And, if we give to Hephaistos a somewhat greater height than to Athena, say 2.45 m., we shall be probably near the truth. But the statues may have been bigger—certainly not smaller. When the fragments of the molds mentioned above, numbering about one hundred and fifty, are eventually put together, it may be possible to determine the heights more accurately.

A group of two figures standing on a common pedestal may be considered as two separate statues with their bases brought into contact with each other. Let us suppose that the die of the pedestal is cut into two equal blocks, and that each block supports a statue, the center of gravity of each statue being vertically over the center of its corresponding block (Fig. 6). The distance from the axis of the temple to the center of gravity of either statue becomes 0.772 m., which is almost exactly the distance

[14] Pausanias, I, 14, 6.

[15] J. G. Frazer, *Pausanias's Description of Greece*, Vol. II, p. 127.

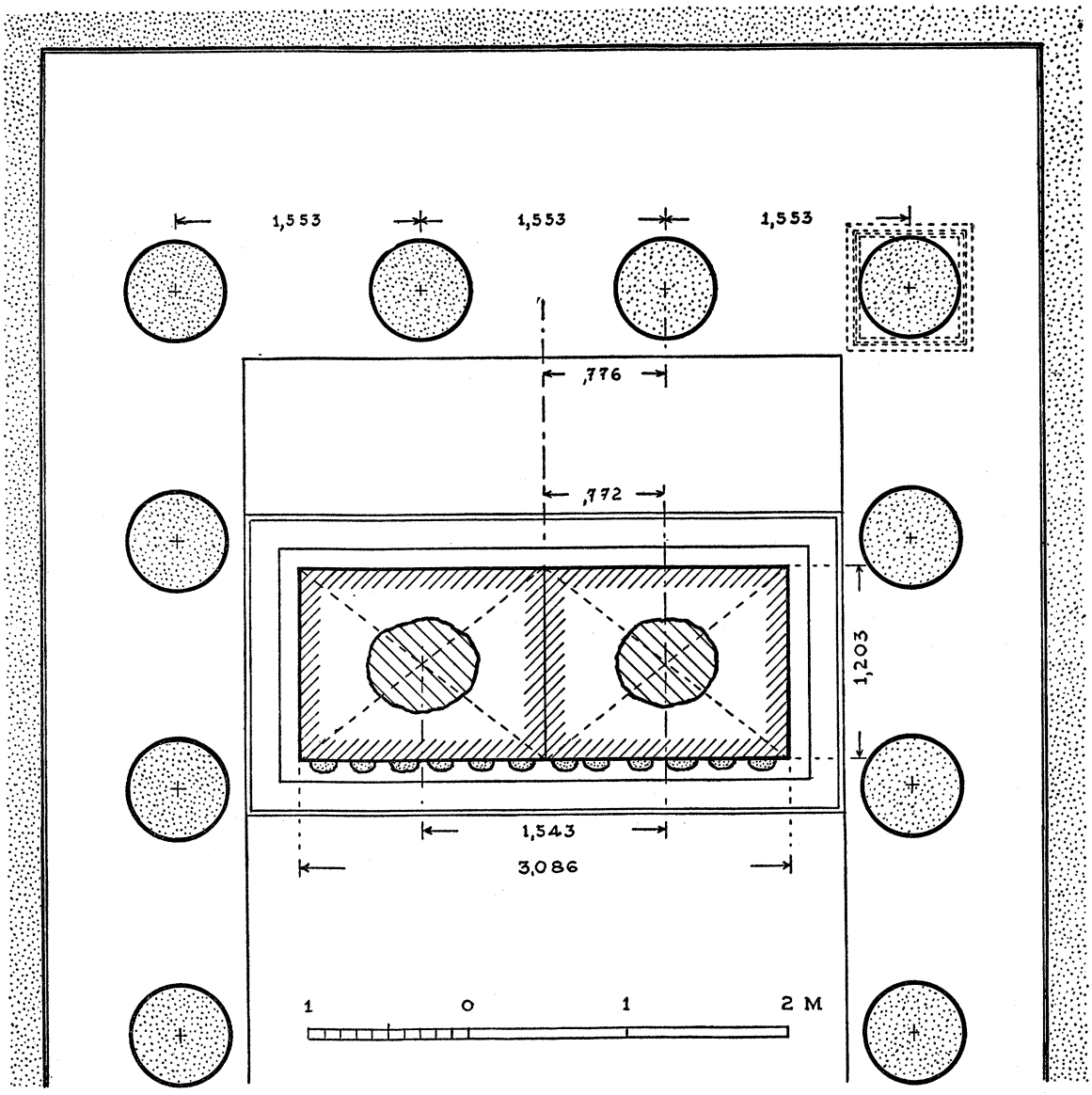

Fig. 6. Plan of the Pedestal of the Cult Statues : Restored

from the axis of the temple to the axes of the nearest columns—there is only 0.004 m. difference (cf. Fig. 6). In other words, the statues were, for all intents and purposes, placed on the axes of the columns behind them. Statues and columns thus had an orderly arrangement in regard to each other. This orderly arrangement, please note, is an indication that 1.553 m. is the correct axial unit for the colonnade behind the statues. It is not likely that the statues would be placed close to the columns behind

them, for then the backs of the statues could not be properly seen. There can be little doubt but that the sculptor of the statues would have preferred to have the statues placed as shown in Fig. 2, where there is ample space for a large number of people to admire the statues from the front, and where the north and south sides of the group could be seen from positions F and F′ (Fig. 2) and the backs of the statues from position G (Fig. 2). The chryselephantine statue of Athena in the Parthenon was similarly placed in its cella.[16]

Hephaistos is often represented in ancient art with a conical cap on his head, bearded, dressed in a simple tunic falling to his knees, and wearing the belt of a workman. He usually carries a staff because of his lameness. His attributes are the anvil, the hammer, and the tongs. A. Furtwängler believed that a marble torso in Cassel and a head in the Vatican were copied from our Hephaistos.[17] And his suppositions seem plausible.

We are somewhat better off for an idea of what the Athena looked like. There are five copies of an Athena, which on stylistic grounds point to a Greek original of the late fifth century B. C. The very fact that there are five copies is indicative of the importance of the original. E. Reisch suggests, with a good deal of probability, that the original of the five copies was the Athena in the Hephaisteion.[18] The five copies which he reproduced differ somewhat from each other, as we should expect to find in the case of copies. Three are represented with no shield, and among these three is by far the best executed of the copies—the Athena of the Chiaramonte Museum (see Reisch's publication, plate III). One copy (cf. Reisch's figure 33)—in the museum at Cherchell—has an acanthus plant at the side of the left foot; and the plant supported a shield, for there is a bit of marble projecting from the left side of the left leg just above the knee, which is, certainly, part of the strap near the center of the inside of the shield—the strap through which the person who carries the shield would thrust his arm. This copy combines all the data given in *I. G.*, I², 371, the inscription which deals with the cult statues at some length. (The inscription mentions a shield with a

[16] To the features in the cella of the Hephaisteion, whose counterparts are to be found in the Parthenon — the double order of Doric columns, the possible pilasters, and the probable position of the pedestal of the cult statues — may be added those of the grilles of the pronaos and the opisthodomus of the Hephaisteion. Indeed, in both temples there are clear indications of wooden lintels just under the capitals of the columns; of wooden jambs; of bumpers to prevent the valves of the grilles from flapping about in the wind; of the fact that only the lower portions of the grilles opened; of marble sills, slightly wedge shaped, slipped into place from the rear after the columns were up. Part of the base moldings of the antae of the Hephaisteion had to be cut off flush with the face of the antae before the adjacent sill could be slipped into place — a difficulty not encountered in the Parthenon, because the antae had no base moldings.

[17] A. Furtwängler: *Meisterwerke der Griechischen Plastik*, Fig. 22, p. 120.

[18] E. Reisch: *Jahreshefte*, I, 1898, pp. 55-93. The writer is grateful to Professor Homer A. Thompson for this reference. Compare, also, B. Sauer: *Das Sogenannte Theseion*, Chap. V.

flowering acanthus beneath it; it says nothing about the serpent which is often represented between the shield and the statue of Athena—cf. Fig. 1).

Which statue occupied the place of honor on the pedestal, the place of honor being to the observer's left? Perhaps the question is answered by the bas-relief of a metope depicting Hephaistos and Athena, in which Hephaistos has the place of honor.[19] The bas-relief does not give a conclusive answer to the question, however, for the figures of the metope are facing each other, while the cult statues faced the entrance of the cella (see below). But there is a good presumption that the location of the statues as shown in Fig. 1 is correct.

There is an aesthetic reason which helps to confirm the two following suppositions: first, that the Hephaistos and the Athena represented in Fig. 1 were the statues which actually stood in the cella and, second, that Hephaistos occupied the place of honor. The torso of Hephaistos in Cassel has the weight of its body more on the left leg than on the right leg. The five copies of the Athena have, on the other hand, the weight of the body thrown on the right foot. Put this Hephaistos and this Athena side by side (cf. Fig. 1), and we have a stable, pyramidal, composition as seen from the front, the main point of view. If the weights of the bodies were thrown on the other feet, the statues would appear to tip outward—a particularly disagreeable composition for a group (cf. *Hesperia*, XV, 1946, p. 102, Fig. 19).

Athena and Hephaistos were closely related to each other both by blood and by common interests. Why, then, are they shown standing side by side in Fig. 1? Why do they display no interest in each other? The writer believes that they were principally concerned with the people who came into the temple to worship them. When a king and queen of today hold a reception, do they not look at their guests rather than at each other?

IV. CEILING OVER THE CELLA

From analogy with many other Greek temples there was, unquestionably, a flat wooden ceiling over the nave. The beams must have been heavy, for they carried not only the wooden construction between the beams (i. e., either wooden coffers or plain boarding), but also half the jack rafters and half the marble tiles above the nave. Further, with such a load the beams would, for good construction, be placed directly over the columns of the cella.

As already noted, the distance from the axes of the eastern-most columns to the face of the east cross wall was 1.36 m. (cf. Fig. 4). Using this measurement, the most easterly compartment of the ceiling becomes the same as all the other compartments of the ceiling—an additional argument that the axial distance from column to column is correct (the figures for the computation are indicated in Fig. 4).

Paint undoubtedly added to the effectiveness of the ceiling.

[19] E. Reisch: *op. cit.*, Fig. 37.

V. WALLS BACK OF THE COLONNADES

The face of the orthostates was everywhere carefully finished, a sure indication that the face was intended to be seen. But the walls above the orthostates, although of solid marble, were at first intended to be stuccoed; for one can see that the exposed faces of the wall blocks had a treatment which would help to make stucco adhere to the wall. The treatment was obtained as follows: the exposed faces of the ordinary wall blocks were prepared before the blocks were put into the wall—the exposed faces were given a finely stippled surface (made with the point) surrounded by a narrow well-finished border. Then, after the blocks were in place, the finished borders were almost entirely removed by stippling.

Also before the wall blocks were set in place, their bottoms were dressed along the edges of the exposed faces, so that no pressure came near the face of the blocks—this was to prevent chipping of the exposed faces, not only when the blocks were being set, but also in the case of earthquakes rocking the temple after the latter was finished (cf. Fig. 7). Precaution against earthquakes was important, for the first damage caused by an undulatory movement of the earth would be to chip the horizontal edges of the exposed faces of the wall blocks, *if the pressure were not relieved.* The chipping would take place both in the cella and in the peristyle; the chipping in the cella would damage the stucco.

The relieving of the pressure (amounting to about 0.001 m.) did not extend through the entire thickness of the wall—it was carried back from the face of the wall a sufficient distance 1) to supply an air vent for the pouring of the lead for the damp-proofing (see below), and 2) to prevent the corner of the blocks from being broken off (cf. Fig. 7). It is not logical to carry the relieving of the pressure through the entire wall. As a matter of fact there are two places, in addition to the case shown in Fig. 7, where we can clearly see that the pressure was not relieved in the middle of the wall (the south side of the western Christian door, in the fifth course above the orthostates; near the south end of the west cross wall, in the tenth course above the orthostates). The writer can find no example of where the pressure is relieved in the middle of the wall.

Further, the vertical joints back of the stucco were damp-proofed with lead, for an earthquake might open the vertical joints. But no damp-proofing was deemed necessary in the horizontal joints of the wall, for, in this case, the superincumbent weight of the wall ensured tight joints, earthquake or no earthquake.[20] The architect of the temple evidently feared that dampness, working through the vertical joints,

[20] The vertical joints of the orthostates are not damp-proofed. This is good evidence that 1) the walls above the orthostates were intended from the first to be stuccoed, and 2) the lead used for damp-proofing was not meant to act as an ordinary dowel, that is, to prevent the blocks from shifting at right angles to the direction of the wall.

would cause unsightly blotches on the face of the stucco; perhaps, even, that the dampness might make the stucco fall off.

Such unusual pains were taken to protect the stucco that there is little doubt but that mural paintings on the stucco were originally intended.

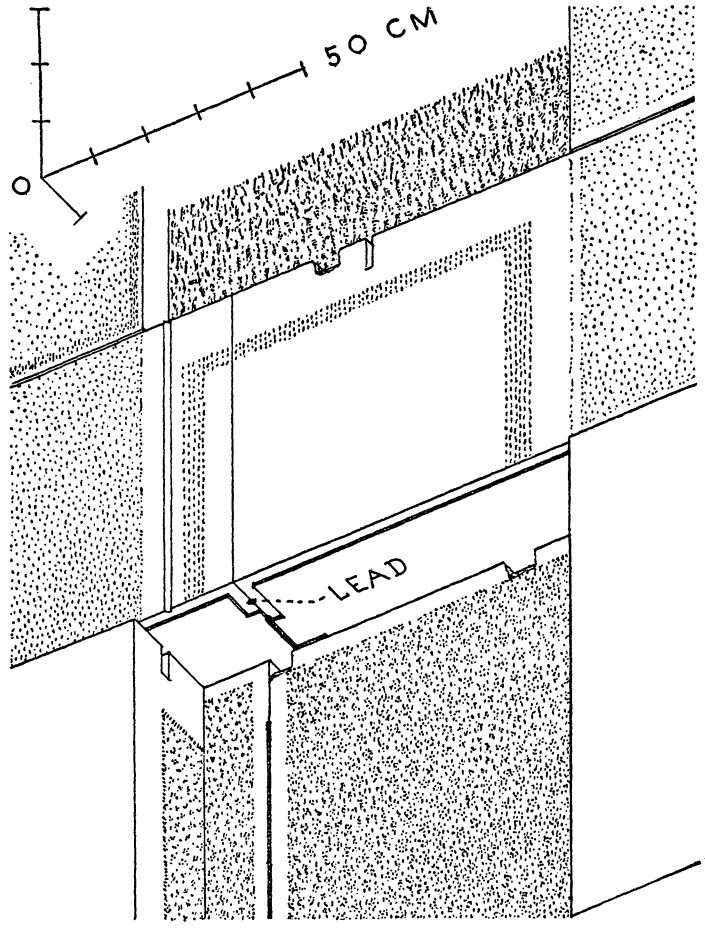

Fig. 7. Relieving of Pressure beneath the Wall Blocks; taken from the First Course above the Orthostates, at the Junction of the East Cross Wall with the North Wall

If mural paintings were at first meant to decorate the interior of the temple, they would not have been particularly well lighted by a door alone. Perhaps the original design for the east cross wall called for windows, as in the picture gallery of the Propylaea and in the east cella of the Erechtheum.

We have seen that the foundations of the colonnades in the cella did not bond with the walls of the cella, an indication of the possibility (though not an actual proof)

that columns were not originally intended for the cella. Why a change from mural paintings to columns? Perhaps because all the good mural painters were busy on other important works? Perhaps because the Committee in charge of the erection of the temple altered their minds about the kind of decoration they wanted in the cella? Whatever the difficulty, its solution may well have called for the substitution of colonnades for paintings. If so, windows in the east cross wall, less necessary with the new scheme, would perforce have had to be omitted, because the colonnades narrowed the nave so much that there would not have been room in the east cross wall for a dignified door and two windows (one on either side of the door).

The interior walls (with the exception of the orthostate) were covered with one coat of stucco consisting, the writer believes, of volcanic ash, lime, and fine sand, with cut straw as a binder (like the goat's hair we of today put into plaster). Excellent hard hydraulic mortars were well known in the fifth century B. C.,—they were used for lining cisterns long before the Hephaisteion was built. For such work the ancient Greeks had at least one abundant supply of volcanic ash, namely, that from the Island of Santorini (the same ash is used today). The ash is light in color. By itself it is inert. Like pozzolana, santorini must be mixed with slaked lime to give it its setting property. It sets under water as well as out of water. And, when set, it is harder than plaster. Either pulverized marble or sand, or both these, may be added to the mixture of santorini and lime to give the stucco the consistency desired for the work in hand. In the case of the Hephaisteion the writer believes the stucco is composed of crushed and screened santorini, of screened lime, and of very fine sand, with the addition of some straw. It is hard, thin (see below), and of a straw color. It is only fairly well smoothed, as though a second coat had been intended. The first six courses above the orthostate (that is, to the tops of the lower columns) are covered with stucco 0.002 m. to 0.003 m. thick; above the sixth course the stucco is generally as thin as a sheet of paper, but here and there, where the wall is somewhat irregular, the thickness reaches 0.003 m. That the very thin stucco existed above the sixth course is an important discovery of Mr. B. H. Hill.

The straw in both the thin and thicker stuccoes is finely cut and fairly uniform in size, averaging 0.005 m. in length and 0.0005 m. in diameter, with *ca.* twenty-five stems in an area of 50 sq. cm. of the stucco. (On the south wall, beginning at the southeast corner of the cella, in the first six courses above the orthostates, there are large patches of stucco in which a coarser straw was mixed with the stucco. This straw varies in length from 0.007 m. to 0.033 m., and in diameter from 0.001 to 0.002 m.; there are *ca.* eight stems in an area of 50 sq. cm. The plasterers may have started with the coarser straw and have found it too gross).

The stems in the stucco have long since rotted away, but their impressions are, in many places, beautifully preserved. The stems were straight. They were neatly cut to the desired lengths.

The stucco now shows little color on its exposed face, but pieces of the thicker stucco turn a reddish color when submerged in water. The same test applied to the thinner stucco reveals but a slight trace of red—perhaps here the color has faded on account of the extreme thinness of the stucco.[21] The color employed was a water color, for washing with water removes it to a considerable extent. The color did not sink into the stucco, showing that the color was applied after the stucco had set. We have, then, the same stucco used in the thin coat on the upper portion of the walls and in the thicker coat on the lower portion of the walls. The water color of both the upper and the lower portions of the walls was thus applied to a background made of the same stucco (differing only in thickness) : consequently the color would dry out everywhere a uniform tone (something which would not have happened if the materials of the backgrounds had differed).

If we mark on the north wall the axes of the three most westerly columns of the north colonnade of the cella, we find that the stucco is well finished in the first and second intercolumniations. But the stucco is somewhat wavy behind the columns, especially behind the second and third columns from the west. Evidently the plasterers found it difficult to do a good job back of the columns on account of the nearness of the columns to the wall. The waviness in the stucco behind the columns would, however, be fairly well concealed by the columns themselves. (Please note that the position of the wavy stucco is a further indication that 1.553 m. is the correct axial unit of the colonnades along the north and south walls). The stucco is, evidently, later than the columns. But how much later?

The demarcation between the thin and thick stuccoes, which occurs at the top of the lower columns (cf. Fig. 4), does not take place in a ship-shape straight line—here and there the thick stucco runs irregularly up into the thin stucco. The poor workmanship can again be explained on the ground that the plasterers had to work behind capitals and architraves which stood at no great distance from the wall (cf. Fig. 2). The irregular line, like the wavy stucco behind the columns, shows that the stucco was applied to the wall after the colonnades were in place.

The stucco is not carried into the reveals of the church door at the west, indicating that the stucco antedates the making of the door. But how much earlier is the stucco than the door?

Certainly the stucco of the Hephaisteion is much better than the Christian stucco used in the temple. For, if we examine the first layer of stucco applied to the soffit of the triumphal arch of the church (Prof. Orlandos removed the arch; portions of its soffit, because they were decorated with painted figures, are now preserved in the Agora Museum), we find that the plaster is entirely different from the stucco we have described. There are two varieties of the church plaster: 1) a plaster composed of

[21] Vitruvius: M. H. Morgan's translation, p. 207.

lime and straw, about 1 cm. thick and very soft (preserved in the Agora museum); 2) a plaster composed of lime and sand (no straw), about 1 cm. thick, and somewhat harder than the first kind of church plaster (this second kind of plaster is to be found on the soffits of the triumphal arch blocks lying to the south of the Hephaisteion). The much better quality of the stucco on the walls of the Hephaisteion than on the Christian triumphal arch is an additional indication that the Hephaisteion stucco antedates the church stucco.

Does the straw in the stucco of the Hephaisteion help us to date the stucco? Straw begins to appear in stucco of the Hellenistic period (example: in the Hellenistic house excavated by Miss Mabel L. Lang in 1948 in the Agora of Athens, near the southwest corner of the main area). But straw was used in mud bricks of the fifth and earlier centuries, and in the terracotta molds of the statues of Hephaistos and Athena (many pieces of molds are preserved in the museum of the Agora of Athens). The use of straw as a binder was, thus, known in the fifth century. If used in bricks and in terracotta molds of the fifth century, why not also in stucco of the same period? If the stucco of the Hephaisteion dates from the fifth century—the most plausible date for it because it is so thin and hard, and is made, as the writer believes, of carefully prepared santorini, lime, and sand—then we have the earliest known use of straw in stucco.

The red water color of the stucco of the Hephaisteion does not tell us much about the date of the stucco, for such a color might have been applied to the walls in almost any period. We may remark, however, that painted stucco of the fifth century seems to have required two coats of stucco—a first coat of santorini, lime, and sand; a second coat of santorini, lime, and pulverized marble. At least this, the writer believes, is the composition of the fifth century stucco of the Tholos in the Agora of Athens, which is a good example of painted fifth century stucco. The first time the walls of the Tholos were stuccoed, two coats were applied. The first coat was composed of santorini, lime, and a rather coarse sand (no straw): about 0.0015 m. thick, hard, and gray in color. The second coat was composed of santorini, lime, and pulverized marble (no straw): about 0.0015 m. thick, hard, and white in cross section. The second coat was painted red, but the color did not sink into the stucco. The use of coarse sand in the first coat may be explained on the ground that the stucco was applied to a wall of roughly dressed poros blocks, which require a coarse coat of stucco. The marble wall of the Hephaisteion did not require so coarse a coat—a coat of santorini, lime, fine sand, and straw sufficed.[22]

It seems probable that the coat of stucco in the Hephaisteion (with straw in it) was to be covered with a second coat of santorini, lime, and pulverized marble, like

[22] Samples of the stuccoes mentioned in this article have been filed in the Agora Museum, as have some samples of other ancient stuccoes examined in the course of the investigations.

the second coat of the Tholos as mentioned above. The second coat in the Hephaisteion was omitted—perhaps because the architect considered that the first coat of stucco, inconspicuous behind the columns and architraves, was good enough as a ground for a coat of paint (see below). He thus finished the building more quickly, and he saved money. Delivery and expense are factors which architects often encounter at the end of building operations—the money factor was especially urgent in Athens toward the close of the fifth century B. C.

The writer has consulted Prof. G. A. Soteriou, Prof. A. K. Orlandos, and Mr. J. Travlos in regard to the stucco of the Hephaisteion. These scholars are particularly competent to judge Christian plasters. They are unanimous in saying that they have never seen Christian plasters which even remotely resemble the stucco of the Hephaisteion. They are agreed that Christian plasters are much thicker than the Hephaisteion stucco; that the Christian plasters are made of lime with or without sand in it, and with or without straw in it. The writer is persuaded that Christian plasters are softer than earlier stuccoes chiefly because lime was employed in Christian times instead of the santorini and lime of the earlier periods. Moreover, Prof. Orlandos and Mr. Travlos, who are authorities on Greek and Roman stuccoes in addition to Christian plasters, believe, as the writer does, that the stucco of the Hephaisteion may well date from the latter part of the fifth century B. C., because thin stucco is characteristic of the fifth century B. C., while it is not so characteristic of the stuccoes of the Roman and Hellenistic periods.

The writer has also consulted Prof. Constantin J. Livadefs of the Polytechneion of Athens, Greece. He is continually testing cements, mortars, and concretes. The writer is grateful to him for his valuable advice.

The writer is further persuaded that, if the stucco was put on in the fifth century, it was painted soon afterward, as the cella would hardly be left with walls covered with raw stucco. Assuredly, red colored walls would make an excellent foil to the white Pentelic columns, for red would give an illusion of distance between the walls and the columns, and thus make the cella appear more roomy; let us remember that the columns, not in the original scheme, had a tendency to fill up the cella. We have only to look at the white marble columns of the Gennadius Library in Athens, Greece, with red plastered walls behind them, to understand how effective the interior of the Hephaisteion must have been.

To sum up the chief operations:

1: Walls prepared for mural paintings above the orthostates;

A. Walls made of blocks which had a stippled finish (with plain borders) on their exposed faces. (Plain borders were to be removed by stippling after the blocks were in the walls).

B. Under surfaces of wall blocks had the pressure relieved beneath their exposed faces, to prevent chipping.
C. Vertical wall joints damp-proofed with lead.

2: Colonnades substituted for mural paintings;

3: Application of a hard stucco composed of santorini, lime, fine sand, and straw, very thin in the upper portions of the walls, about 0.003 m. in the lower portions. Probably intended second coat of stucco, perhaps of santorini, lime, and pulverized marble, omitted;

4: Application of a water color paint to the stuccoed portions of the walls.

It seems likely that all these operations took place in the fifth century B. C.

VI. BONDING OF THE COLONNADES TO THE WALLS

The colonnades were probably tied to their surrounding walls by means of a marble ceiling at the level of the wooden ceiling over the nave. There is room in the soffit of the temple for such a bonding (a wise precaution against earthquakes).

* * *

The recent excavation of the Hephaisteion by the American School of Classical Studies revealed important features in addition to those alluded to in this article—one example, the existence in classical times of a formal garden around the temple.[23] Other ancient monuments in Athens—such as the Olympieion and the Asklepieion, to mention only two—would surely prove as profitable to excavate scientifically as did the Hephaisteion.

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[23] Dorothy Burr Thompson: *Hesperia*, VI, 1937, pp. 396-425.

EDITOR'S NOTE

A different arrangement of the cult statues in the light of recently discovered evidence will be suggested by Mrs. Semni Karouzou in a forthcoming article.