

EARLY STONEMWORKING IN THE CORINTHIA

(PLATE 32)

AN ASPECT of the earliest use of cut stone in the Corinthia that needs further consideration¹ is the manner in which the local poros limestone was worked.² One of the earliest Iron Age examples of the working of poros can be seen at Corinth in an 8th-century well in the area of the Roman Southeast Building, at the east end of the Roman Upper Forum.³ For most of its depth the well is dug in hardpan. This portion of the shaft is very smoothly finished, and so there are few traces of tooling. The lowest portion of the shaft is dug in poros bedrock; tooling marks are clearly preserved here. Deep diagonal grooves, some of which are nearly vertical, were left by tools with flat-ended blades *ca.* 0.04–0.05 m. wide. The curved section of these grooves indicates that the blades were convex, facilitating the removal of large pieces of stone with each stroke. That this was the initial tool used in the digging of the well is indicated by the fact that these grooves appear not only on the vertical walls of the shaft but also on the rock that curves in from the walls of the shaft to its unfinished bottom. Thus, the tool was used not only for the smoothing of the shaft but for the actual roughing out of the well cylinder. In this case, the tool which left these traces must have been a long-handled adze rather than a chisel.

Further evidence for the working of poros in 8th-century Corinth is found in two small, crudely faceted, roughly finished blocks (A-72-31 and A-72-32) which were discovered in sealed context in well 1972-2 of the Late Geometric period (Pl. 32:a, b). In the recent publication of these pieces,⁴ traces of various chisels and droves of differing widths were identified. If, however, the mason had been using such a large and sophisticated collection,

¹ This problem was treated earlier in *Hesperia* by Alan C. Brookes; see abbreviations below. I am grateful to Charles K. Williams, II, Frederick Cooper, and Kenneth Sams for their guidance and encouragement in my continuing study of Corinthian poros architecture.

Works frequently cited are abbreviated as follows:

Brookes = A. C. Brookes, "Stoneworking in the Geometric Period at Corinth," *Hesperia* 50, 1981, pp. 285–290
Robinson = H. S. Robinson, "Excavations at Corinth: Temple Hill, 1968–72," *Hesperia* 45, 1976, pp. 203–239

² A soft limestone called "poros" has been quarried extensively in the northeast Peloponnesos since antiquity. In Corinthian masonry structures of the Greek period, this type of stone was used almost exclusively. When first exposed in the quarry, Corinthian poros is so soft that it can be cut easily with a knife, but after some exposure to the air a hard gray patina, caused by the precipitation of salts through capillary action, begins to form on the surface. It is owing to these qualities of the local building stone, at least in part, that the Corinthian masonry tradition was able to develop so early and so quickly.

Corinthian poros is often distinguishable from other types of Greek limestone, but because its appearance varies greatly depending upon the weathering conditions to which it has been exposed, and because its unweathered appearance can vary even within the same quarry, it is impossible, on the basis of appearance, to assign accurately one poros block to one building, one to another.

I would like to thank geologists Norman Herz of the University of Georgia and George Koukis of the Institute of Geology and Mineral Exploration (IGME), Athens for discussing poros limestone with me. Descriptions of Corinthian poros appear in Henry S. Washington, "Excavations at Phlius in 1892. Appendix: 'Poros Stone,'" *AJA* 27, 1923, pp. 445–446 and Robinson, p. 225.

³ Well 1978-4.

⁴ Brookes.

he would presumably have employed the tools in succession, and the result would not have been so crude. It is often difficult to distinguish between the length and width of a chisel stroke, and the stated lengths of these strokes (up to 0.17 m.)⁵ suggest that the two have been confused.

In the fall of 1981, Kostas Zogas, a stonecutter in Zeugolatio, Corinthia, graciously allowed me to spend a day observing him work poros. The widest chisel he used measured *ca.* 0.05 m., but he informed me that in Athens it was possible to find flat chisels up to 0.10 m. wide. His chisel strokes were never longer than 0.03–0.04 m., and it was obvious from watching him work that a stroke much over 0.05 m. long would be impossible with such tools. He would drive his chisel in four or five consecutive strokes, then lift it and start again. A slight ridge marked the end of each chisel stroke, while the width of a chisel stroke was clearly defined by neat vertical edges. These edges were, of course, often obliterated by subsequent overlapping chisel strokes.

Now, in distinguishing between the width and length of a chisel stroke, I look for these neat vertical edges. If I find one, I can be fairly sure that it represents the side of a chisel groove, not the end of a stroke; if I find two, I can be certain of the width of the chisel. The ancient Greeks often employed extremely broad chisels in the finishing of poros, some of which appear to have been as wide as 0.13 m., but the length of a flat-chisel stroke never approaches that dimension. Examples of this broad-chisel tooling are widespread, especially in the 4th century, and one of the clearest examples of it can be seen in the stadium tunnel at Nemea.⁶ An actual chisel of this sort was discovered at Morgantina.⁷

Of the marks which can without question be associated with the finishing of the pair of faceted Corinthian blocks, I was unable to find any two which could not have been made by the same instrument. That instrument appears to have had a flat blade *ca.* 0.08 m. wide which was hit continuously in strokes up to 0.03 m. long. The short, continuous strokes suggest that the tool employed was not an adze but a broad, flat chisel. An interesting note in connection with A-72-32 is that in the finishing process a layer of stone at least 0.02 m. thick was removed: near the edge of this fragment an unfinished surface remains which projects *ca.* 0.02 m. above the finished surface.⁸

A series of small, rounded depressions on another poros piece from Corinth seems to prove that the pointed chisel was also employed in Geometric Corinth,⁹ but it appears in

⁵ Brookes, p. 287.

⁶ Stephen G. Miller, "Excavations at Nemea, 1978," *Hesperia* 48, 1979 (pp. 73–103), pl. 38:a. Miller (p. 98) recognized the larger dimension of the chisel grooves (0.13 m.) as representing the width of the blade.

⁷ The blade is *ca.* 0.10 m. wide. It is on display in the Syracuse museum.

⁸ At Temple FS at Selinous, the foundation blocks were brought to the site with a protective skin at least 0.04–0.05 m. thick. This is clear from the partially finished surfaces of the foundation blocks and the strata of working chips recently exposed in a trench in the cella of the temple. That these actually are chips from the final working of the temple blocks is indicated by the chisel marks that appear on one side of each chip and by the fact that the thickness of these chips coincides with the depth of the chisel strokes. Apparently, in the final working of these blocks two layers (each *ca.* 0.02–0.03 m. thick) of stone were removed. The stone of these foundations is of a consistency similar to that of Corinthian poros.

⁹ Brookes, p. 289, note 19, pl. 75:e (MF-72-27). An actual example of an iron point was identified by Charles Morgan in a Middle Geometric grave near the Bema (Grave D): MF 6309.

this case that it was used not as a part of a regular succession of tools but to render a design on the top of the slab. The shallow, rounded holes which appear on the faceted blocks, however, need not have been left by such a tool.¹⁰ It is possible that they were left by burrowing insects or roots that riddle the poros of Corinth.

Additional information about the ability and desire of Geometric Corinthians to work stone comes from a poros sarcophagus discovered immediately to the southwest of the Roman Bema.¹¹ Unlike the well shaft and the faceted blocks, the sarcophagus was given a neat, regular finish. Tool marks are everywhere visible, but they are not the great gouged channels seen in the lower portion of the well shaft. These tool marks are particularly difficult to analyze, but they appear to have been left by a flat chisel, *ca.* 0.08–0.09 m. wide and hit in continuous strokes *ca.* 0.005–0.02 m. long. The strokes are not neatly parallel, nor are they arranged in decorative patterns;¹² they overlap and change directions, showing that the same surface was worked more than once with the same tool in an attempt to smooth it. The sarcophagus may have been roughed out with an adze of the sort used in the well shaft, but no traces of it remain.¹³

Where visible traces of tooling are preserved on the isolated poros blocks in the cut-stone or rubble foundations of 8th- and 7th-century Corinth, they appear to have been left by similar broad, flat chisels. On several blocks in the buildings to the north of the Temple Hill roadway and in the retaining wall on the south side of that roadway, the chisel marks are occasionally grouped in rough chevron patterns.¹⁴ Also, near the east end of the retaining wall some blocks appear to preserve a different kind of tooling (Pl. 32:c). The surface of these blocks is rough and uneven and carries long diagonal grooves measuring from *ca.* 0.03–0.04 m. up to 0.10 m. These are probably the traces of a hammer or adze used,

¹⁰ I assume that these are the marks Brookes (pp. 287–288) is associating with the pointed chisel.

¹¹ Grave H: C. H. Morgan, II, "Excavations at Corinth, 1936–37," *AJA* 41, 1937 (pp. 539–552), pp. 543–544, pl. 13:1 and 2; Brookes, p. 286, pl. 75:b and c.

¹² Decorative tooling is found in later buildings in the Corinthia, especially during the 4th century. The surface treatment of the walls of the Nemea stadium tunnel is an example (see footnote 6 above).

¹³ Brookes (p. 286) finds traces of a round chisel (W. 0.017 m.) and a pointed chisel in the tool marks of the sarcophagus. Again, what I interpret as the length of the chisel stroke, he interprets as the width of the blade. His interpretation thus leads to the conclusion that the length of the strokes was *ca.* 0.085 m.

The problem in analyzing these particular tool marks is that there are no clear vertical edges defining the width of the chisel blade and that the grooves left by the tool are slightly curved across their short section. This could indicate that a narrow, slightly convex adze was used to finish the inside of the sarcophagus, instead of a flat chisel, and that the strokes of the adze were over 0.08 m. long.

¹⁴ The surfaces on which they appear would not have been visible, and so this does not represent decorative tooling. It simply represents systematic work.

Extensive excavations on Temple Hill have recently been carried out by Professor Henry S. Robinson. (For a preliminary report, see Robinson.) During these excavations the roadway was uncovered for most of its length, walls were discovered bordering it on north and south, and parts of several buildings were discovered to the north of the roadway. These buildings are the most recent of the discoveries and appear in none of the reports. The road was apparently laid down *ca.* 625 B.C. (Robinson, p. 212) and the walls were presumably built at the same time (p. 215). The complex to the north of the roadway also appears to have been constructed in the 7th century (Robinson, personal communication). I am grateful to Professor Robinson for the time he spent with me on Temple Hill explaining the new excavations and for allowing me to include the early architecture on Temple Hill in my study of Corinthian poros architecture.

perhaps in the quarry, for roughing the blocks into shape. The larger dimension of the grooves probably represents the width of the blade.

Most of the blocks from the early temples at Isthmia and Corinth preserve clear tooling on their ends and undersurface.¹⁵ This tooling has been effected by flat chisels, usually *ca.* 0.08 m. broad and hit in strokes up to 0.03 m. long (Pl. 32:d). The strokes are not arranged in patterns but go in all directions and cut deeply into the surface of the stone, giving it a “spatulaed” appearance¹⁶ not unlike that of the faceted blocks. This tooling is easily distinguishable from that found on the joint faces of the blocks from the 6th-century Temple of Apollo on Temple Hill in Corinth (Pl. 32:e) and should, perhaps, be seen as characteristic only of the very earliest cut-stone architecture in the Corinthia.¹⁷ The faces and upper surface of the blocks from the early temples at Corinth and Isthmia are considerably smoother but appear to have been finished with the same chisels hit in shallower and shorter strokes.

This spatula tooling also appears on some early Archaic blocks from the Sanctuary of Zeus at Nemea¹⁸ and on the blocks from the Archaic temple at Mycenae.¹⁹ The chisels used on these blocks were of similar width to those used on the blocks from the early temples at Corinth and Isthmia.

The repertory of tools employed by Corinthian masons of the 8th through the early 6th centuries B.C. appears to have been a small one. It included the adze, probably the quarry hammer, and, rarely, the pointed chisel.²⁰ But the most widely used tool, for both rough and smooth finishes, was the broad, flat chisel. Little else was necessary for the working of the soft poros stone.

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¹⁵ The latest report on the early temple at Corinth is included in Robinson, pp. 244–250. The early temple at Isthmia was published by Oscar Broneer (*Isthmia, I, Temple of Poseidon*, Princeton 1971).

I would like to express my gratitude to Professor Broneer for the encouragement he has given me and for allowing me to examine and include in my study of Corinthian poros architecture the remains of the early temple at Isthmia.

¹⁶ This is Professor Robinson’s apt description.

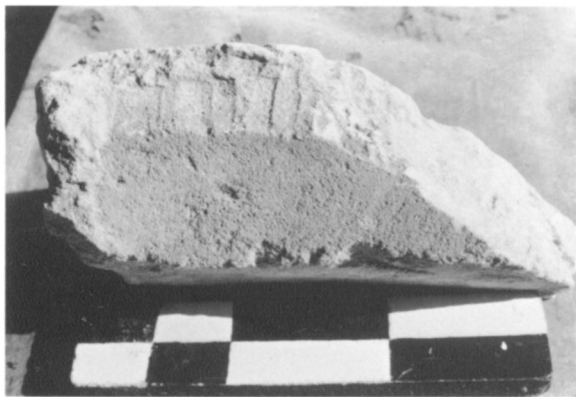
¹⁷ The tooling of the blocks from the Temple of Apollo is much neater and more systematic.

¹⁸ The fragments of this early building are described by Miller (footnote 6 above), pp. 81–82; “Excavations at Nemea, 1979,” *Hesperia* 49, 1980 (pp. 178–205), pp. 183–187; “Excavations at Nemea, 1980,” *Hesperia* 50, 1981 (pp. 45–67), pp. 51–55.

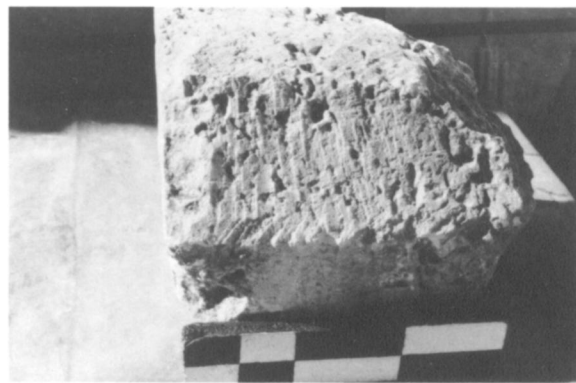
¹⁹ For a description of the temple, see A. J. B. Wace, *Mycenae. An Archaeological History and Guide*, New York 1964, pp. 84–86.

²⁰ In describing Grave E, apparently Protocorinthian, also near the Bema, Charles Morgan (Corinth Notebook No. 162, p. 48) writes that the “cutting of the stereo was accomplished, at least in part, by a four-tined fork, points *ca.* 0.09 m. apart and *ca.* 0.01 m. in diameter.” This grave is no longer visible, and so its tooling cannot be rechecked. I have, however, seen no other examples of any type of multiple-point tooling in the Corinthia before the 4th century B.C. and perhaps not before Roman times.

PLATE 32



a. Geometric faceted fragment A-72-32



b. Geometric faceted fragment A-72-31



c. Retaining wall on south side of 7th-century Temple Hill roadway



d. Block from the early Temple of Apollo



e. Temple of Apollo (6th century), foundation of north colonnade from the west