

# HALAI

## THE 1992–1994 FIELD SEASONS

This is the second preliminary report on excavations at Halai in Lokris, which are being carried out by a team from Cornell University. Our first two excavation seasons were summarized in the first preliminary report along with earlier work at the site and its environs, including that of an expedition of Goldman and Walker (Kosmopoulos) from 1911 to 1935.<sup>1</sup> A third season of excavations was carried out at Halai in the summer of 1992. Nearly fifty archaeologists and archaeologists-in-training from North America and Europe took part.<sup>2</sup> Digging took place on the acropolis in

1. Coleman 1992a. Since the earlier report, all survey and architectural plans have been digitized by means of the Autocad program (Release 12). The architectural drawings illustrating the current report were printed from these electronic records with a LaserJet 4m printer. Figure 1 gives an impression of the present state of the overall digitized architectural records. The data files include much more information than can be displayed in black and white or at a scale appropriate here. The digitized plans available at the project's World Wide Web site (<http://halai.fac.cornell.edu>) show the remains of each period in a different color.

2. Work took place from June 22 to July 31. Thirteen local workers (including three pot-washers) were employed. In addition to Coleman, Director, full-time staff members included Mary Eliot, Associate Director and Area F supervisor; Jason H. Coleman, Peter Danner, Curtis L. Ellett, Kerill O'Neill, Melanie Pomeroy, Demetrios E. Sagias, Julia L. Shear, Greg Smith, and Patricia S. Wren, trench supervisors; Jackie Ettlinger, Denise McCoskey, Ann

Merriman, Michèle Miller, Helen Papademetriou, Edmund Pedersen, Tina Petrihou, Alison Sandman, and Sonya Wolff, field archaeologists; Christina Contis, architect; Paul R. Stremple, architectural recording; Devin Cheema, registrar; Eric A. Nordgren, object conservation; Julia F. Rounds, pottery sorting; Mark Bock, photographer; Peter De Staebler and Matthew Drake, balloon photography; Julie K. Near, palaeobotanist; Wendy Yielding, zooarchaeologist; and Valerie Woelfel, draftsman. Lois Berkowitz, Damian Carr, and Karen E. Carr were also present for part of the season. The following student trainees also participated (from Cornell University except as indicated): Vanessa Avery (McGill Univ.), Christi Baker, Karen F. Byrne, Treska M. Cole (Brown Univ.), Michelle Maxine Ensey (Central Washington Univ.), Celina L. Gray (Vassar College), Megan Katz (Princeton High School), Laura Kellogg (Univ. of Rhode Island), Todd Reed, Carrie A. Shea (Mount Holyoke College), Jeannette L. Stach (Oakland Univ.), and Jeremy Yielding. Johanna Eliot was camp manager. As in

former seasons, Eleni Zachou oversaw the excavations on behalf of the Greek Archaeological Service. The excavations were carried out under the general auspices of the American School of Classical Studies at Athens and the Cornell Halai and East Lokris Project (CHELP), and they were supported in part by grants from the National Endowment for the Humanities, the Townsend Fund of the Department of Classics at Cornell University, and the Institute for Aegean Prehistory as well as by private donations.

Preliminary notices and abstracts of oral papers on the current excavations include the following: 1990 season: *AJA* 95 (1991), p. 327; *BCH* 115 (1991), pp. 885–886; *AR* 1990–1991, p. 45; *ArchDelt* 45 (1990), Chron., pp. 184–185; 1991 season: *AJA* 96 (1992), p. 346; *BCH* 116 (1992), p. 885; *AR* 1991–1992, p. 40; *ArchDelt* 46 (1991), Chron., pp. 198–199; 1992 and subsequent study seasons: *AJA* 98 (1994), p. 287; *BCH* 117 (1993), pp. 824, 826; *AR* 1992–1993, pp. 49–50; *AR* 1993–1994, p. 49. For a summary of the current excavations, see also Papademetriou 1994.

Areas A, C, F, G, and H (Figs. 1, 2). Architecture, stratigraphy, and finds were further studied in the summers of 1993 and 1994 in anticipation of renewed excavation in 1996.<sup>3</sup>

The current excavations at Halai are a key part of the Cornell Halai and East Lokris Project (CHELP), an interdisciplinary project of survey and excavation initiated in 1986.<sup>4</sup> The survey area, roughly 185 km<sup>2</sup>, was chosen to include the maximum area that could conceivably have belonged to the Graeco-Roman town of Halai.<sup>5</sup> The overall aim of the project is to record and study the archaeological and environmental evidence for human activity within this area from the beginning of the Neolithic period until Byzantine times. The project is essentially scientific and does not rely on any particular theoretical approach.<sup>6</sup> Surface survey activities of 1988 and 1989 produced evidence that the probable maximum extent of the town of Halai itself was about 15 ha and suggested that in the Hellenistic period there may have been an outer ring of fortifications, now almost completely lost, in addition to those of the acropolis.<sup>7</sup> The 280 tombs of Archaic through Roman date excavated by Goldman and Walker and other recently excavated tombs<sup>8</sup> seem to have been grouped in cemeteries around the periphery of the town.

Starting in 1990, CHELP has focused on excavations on the acropolis of Halai. The aims of the excavations are to extend our knowledge of Halai and to set the results of the earlier expedition of Goldman and Walker into a more precise chronological and cultural context. Eventually, when surface survey is resumed, the results of our excavations will also be brought to bear on broader questions about the town's geographical situation, political boundaries, and economic life.

As in earlier years the system of balloon photography developed by Andrew Heafitz for the use of our expedition<sup>9</sup> continued to be of great

3. Study in 1993 took place from June 21 to July 30. Twenty-one people took part on a long-term basis. They included, in addition to Coleman and Eliot, Vanessa Avery, drafts person; Jacquelyn Collins-Clinton, Hellenistic and Roman pottery; M. Miller, Neolithic beads; J. K. Near, palaeobotanist; E. A. Nordgren, object conservation; W. Yielding, zooarchaeologist; V. Woelfel, drafts person; J. Yielding, chipped stone tools; C. Baker, J. H. Coleman, Veronique E. Dupont, C. L. Ellett, K. O'Neill, H. Papademetriou, T. Petrihou, Kathleen M. Quinn, J. F. Rounds, M. Pomeroy, D. E. Sagias, and P. S. Wren. Diane le Berrurier (Carleton Univ.), Late Roman levels and finds, was present for a shorter time.

Study in 1994 took place from June 27 to August 8. Fourteen people took part on a long-term basis, including (in addition to Coleman and Eliot) Susan

E. Allen, photography, Neolithic pottery; D. le Berrurier, Late Roman levels and finds; Megan Battey, inventory; Max Kallhammer, Autocad, drawing; Scott J. McDonough, Autocad, dBase; E. A. Nordgren, object conservation; K. O'Neill (Colby College), chipped stone tools; W. Yielding, zooarchaeologist; J. F. Rounds, Hellenistic levels and pottery; Emmanuelle Van Rutten, Autocad; Bryan Williams, architectural and stratigraphic recording; and P. S. Wren, Archaic levels and pottery. Present for a shorter time were J. K. Near, palaeobotanist, and Nicholas Nicastro, video photography. The study seasons were supported in part by the Townsend Fund of the Department of Classics at Cornell University and the Institute for Aegean Prehistory as well as by private donations. The excavations of 1996, the subject of a future report, concentrated on Neolithic levels.

4. We express our heartfelt thanks to the 14th Ephoreia of Prehistoric and Classical Antiquities at Lamia and particularly to Phanouria Dakoronia and Pantos Pantos for much help and advice during and since the third campaign of excavation. For their advice and kindness on many occasions, we also thank Eleni Zachou and Sonia Demaki, archaeologists of the 14th Ephoreia; conservator Christos Vapourakis; former *archaio-phylakas* Nikos Psarras; and the many other friends of the project in Malesina, too numerous to mention here by name.

5. Coleman 1992a, fig. 1.

6. The word "scientific" is of course somewhat problematic; for a brief discussion, see J. E. Coleman, in Coleman et al. 1996, pp. vi–vii.

7. Coleman 1992a, p. 268 and fig. 2.

8. For the location of one group of tombs see Coleman 1992a, fig. 2 at G.

9. Heafitz 1992.

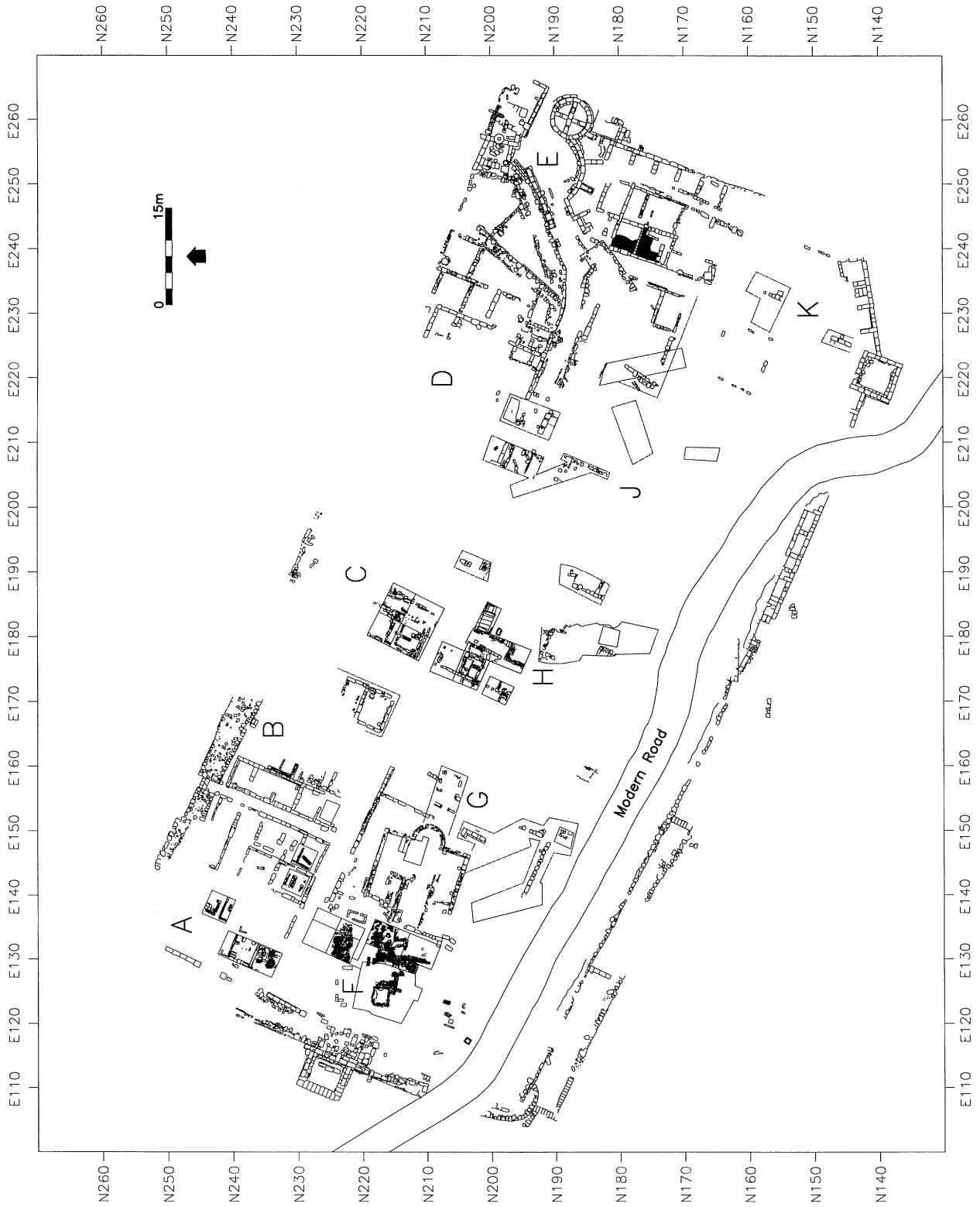


Figure 1. Plan of the acropolis of Halai showing the present state of computer records

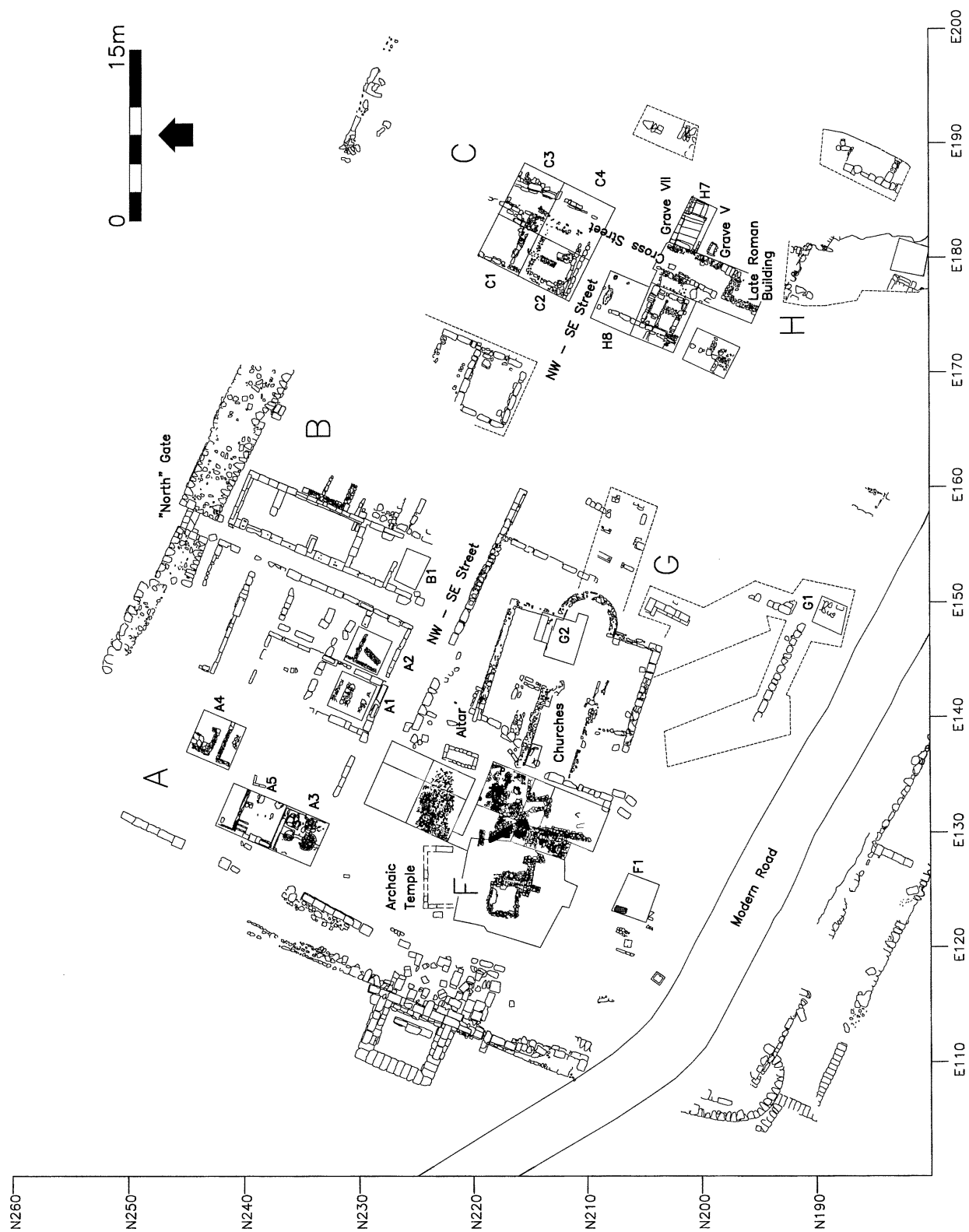


Figure 2. Plan of the northwest end of the acropolis

value in recording architecture and horizontal exposures of finds. Balloon photographs also proved useful for photogrammetric purposes.<sup>10</sup>

The remains on the acropolis at Halai fall into four main periods: Neolithic, Archaic, Hellenistic, and Late Roman. Each period is summarized below; Coleman is responsible for the sections on Neolithic and Hellenistic Halai, and conservation; Wren for the Archaic period;<sup>11</sup> and Quinn for the discussion of Late Roman and Byzantine remains. Catalogue entries for at least a few examples of stratified finds are given. Some of these finds were handed over to the Greek Archaeological Service for permanent storage and display in the new museum in the *Kastro* at Lamia, which opened in September 1994.

## NEOLITHIC PERIOD

At the time of its initial settlement in the Neolithic period, the acropolis of Halai was probably a low hill a few hundred meters from the seashore. Since then sea level has risen considerably and the sea now laps up against the foot of the original hill. We hope eventually to pursue studies to determine with greater accuracy the position of the seashore, the contours of the original hill, and the level of the alluvial deposits surrounding it at the various periods that Halai was occupied. As mentioned in the previous preliminary report, the Neolithic occupation probably extended at least 60 m northwest–southeast by 40 m northeast–southwest.<sup>12</sup>

The Neolithic deposits are most accessible in Area F, the “temple area” of the earlier excavations. Five new trenches were excavated in Area F in 1992 (F7–F11; see Figs. 3–5). Trenches F5–F8 were subsequently combined and designated F101. One trench, F9, comprised the reexcavation of a large trench first excavated by the Goldman/Walker expedition in 1931.<sup>13</sup> This was cleared of the debris that had accumulated since then and new soundings were made. The results generally confirmed the findings of the earlier expedition, as recorded in the notebook of Virginia Grace.<sup>14</sup> By the end of the season all trenches in Area F except F1 were linked to one another, giving a total area of Neolithic exposure of more than 200 m<sup>2</sup>.

Our excavations have now produced a reasonably complete sampling of the Neolithic sequence as it survives at Halai. The earliest levels were reached in trench F2 (at the eastern side of the Neolithic exposure just to the southwest of the later Archaic altar; Fig. 6), trench F3, and probably Room 11 of trench F9 (Fig. 3). In trenches F2 and F3 these levels occurred immediately above “stereo,” a yellow hardpan undisturbed by human activity, which was encountered about +0.70 masl. Since the top of the uppermost Neolithic levels preserved in trenches F2 and F3 is at about +2.70 masl, the depth of the Neolithic deposits is roughly 2.0 m. These deposits represent episodes of building and other human activity that suggest a more or less continuous occupation dating to ca. 5900–5300 B.C. (see below) and encompassing part of the Early Neolithic period, the Middle Neolithic period, and the first phase of Late Neolithic I as they are known generally in the Aegean.<sup>15</sup>

The architectural remains were summarized in the previous prelimi-

10. Especially as processed with the Photocad program; Contis 1993 describes our initial uses of photogrammetry.

11. Wren died on January 13, 1997, before her section of this article was finalized. Coleman rearranged her text slightly and added material from her M.A. thesis (Wren 1996); the substance of the work in this part, however, is hers. Coleman was much aided during final editing by the comments of an anonymous *Hesperia* reviewer.

12. Coleman 1992a, p. 273.

13. The outlines of this old trench are indicated in Coleman 1992a, fig. 5.

14. For the records of the earlier expedition see Coleman 1992a, p. 265, note 9; Quinn 1996.

15. For discussions of the general sequence in Greece see Coleman 1992b and Demoule and Perlès 1993.

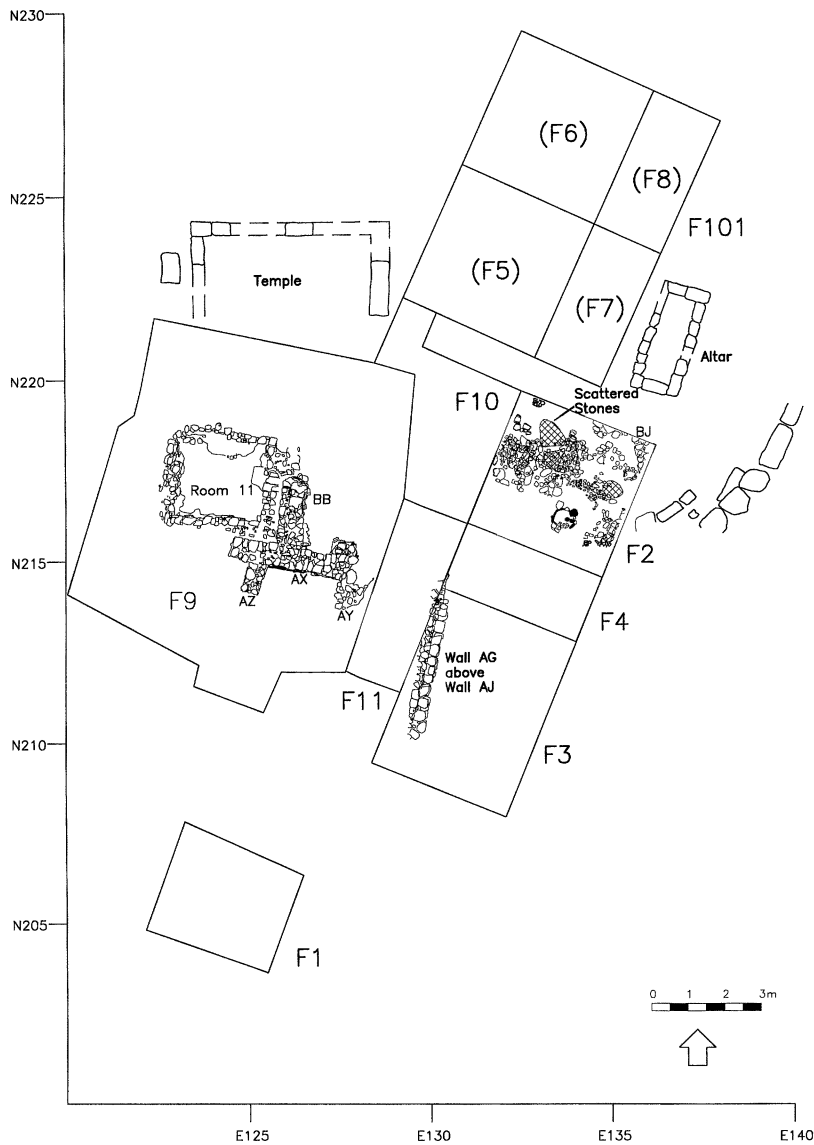


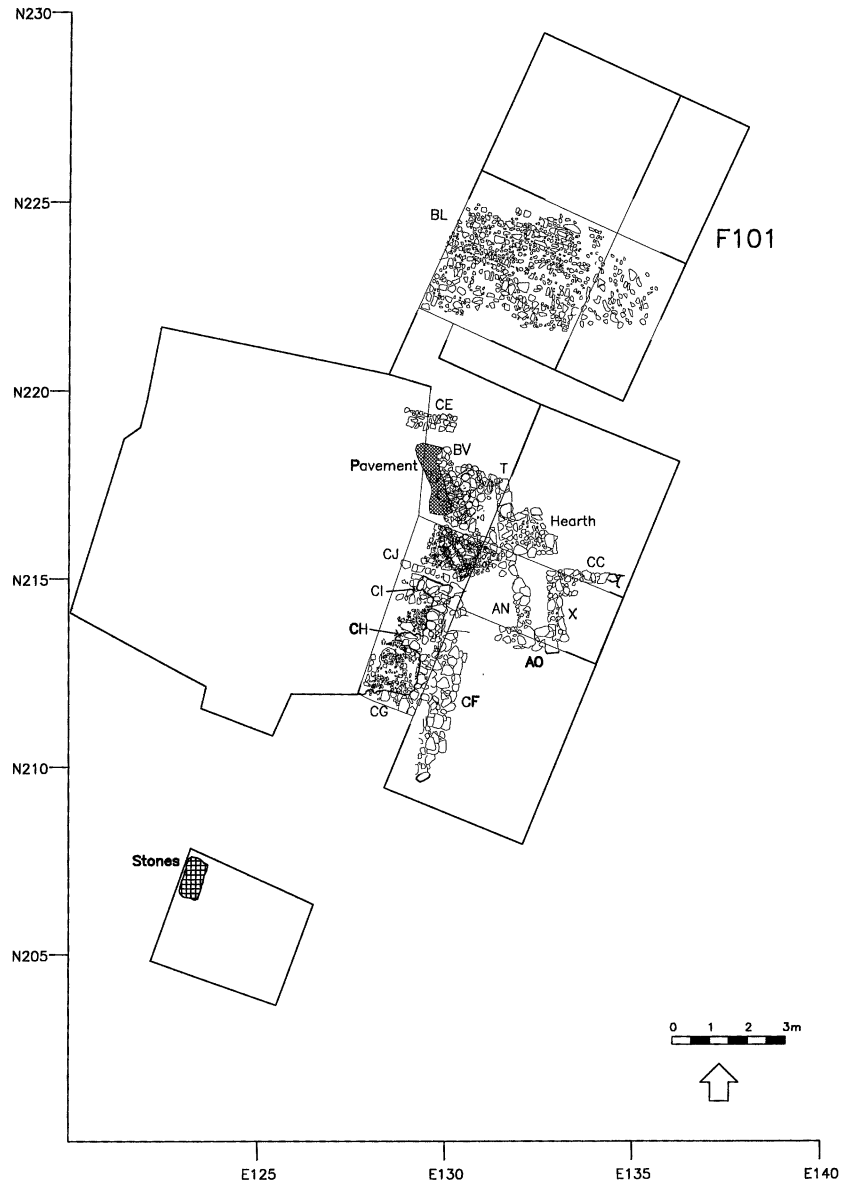
Figure 3. Plan of Area F showing the remains of all periods except Late Neolithic

nary report for *Hesperia*.<sup>16</sup> It is clear, despite the generally fragmentary condition of the architecture, that standard Aegean building methods were employed (mudbrick superstructures on socles built of small and medium-sized stones).<sup>17</sup> Some stone walls still stand to heights of 1 m or so. House plans are generally rectilinear (see Figs. 3, 4), although the overall plans are difficult to reconstruct because of the frequency of renovations and the gradual rise of ground level. The best-preserved room is Room 11, near the middle of trench F9, which was initially excavated in 1931 by Grace (Figs. 3, 5). It is roughly square in plan and ca. 2.5 m on a side. Most of the structures shown in schematic form in Figures 3 and 4 are parts of similar rectangular rooms and houses. Some rooms, particularly those of the latest architectural phases (Fig. 4), had pavings or platforms of small stones, and hearths were built of stones and clay. White mud-plaster floors also occur. The area represented by trench F2 was an unroofed courtyard and con-

16. Coleman 1992a, pp. 273–274.

17. Cf. Demoule and Perlès 1993, pp. 370, 375.

Figure 4. Plan of Area F showing Late Neolithic remains



tained a long sequence of hearths and pits (Figs. 5–7). Almost all the useful radiocarbon samples (see below) came from this sequence.

A massive band of stones on the southwestern side of trench F101 (designated Wall BL: Figs. 4, 5) is difficult to interpret. It dates to the latest period of Neolithic occupation of the site, in the Late Neolithic I phase, and we are suggesting as a working hypothesis that it represents a boundary wall for at least a part of the settlement. It is about 3.5 m wide and has a height from top to bottom of at least 0.70 m. It is not yet clear whether the existing remains originally projected above the surface of the ground or whether they are foundations. If the hypothesis of a boundary wall is correct, the town would probably have covered a significantly smaller area in the Late Neolithic I phase than in earlier periods, since remains of earlier date beneath the wall extend on either side. The circuit is unlikely to have extended westward beyond the line of the later Archaic/Hellenis-



Figure 5. Balloon view of part of Area F (1992), north–northwest at top

tic fortifications, to judge by the stratigraphy in trench F9, and, since the pottery associated with the Neolithic wall reported earlier in Area H<sup>18</sup> is exclusively Middle Neolithic, it is also probable that the Late Neolithic town did not extend as far eastward as Area H. Late Neolithic sherds have been found in soundings in Area A (trenches A2 and A4; Fig. 2), but they tend to be worn and may have reached their final position after Neolithic Halai was abandoned.

A child's skeleton, partly disturbed, was found in Middle Neolithic levels near and partly within the southeast scarp of trench F2 (Fig. 6; position marked by arrow); only part of the skeleton was retrieved because of the danger that the scarp would collapse. The remains recovered include fragments of the cranium (including many teeth) and a few postcranial bones.<sup>19</sup>

18. Coleman 1992a, p. 274 and pl. 73:b.

19. Egon Reuer and Susanne Fabrizii-Reuer were kind enough to carry out an initial study of this find.



Almost all soil from Neolithic deposits has been water-sieved throughout the three seasons of excavation, in the last two seasons under the supervision of Julie Near. The process, which was primarily designed to recover botanical remains from among the material that rises to the surface of the water, is described in Appendix 3. The heavy fraction from water-sieving was also retained in pieces of plastic fly screen, and it has yielded many small bones and artifacts such as beads and pieces of obsidian.

Study of the chipped stone tools continues. Kerill O'Neill has conducted an initial morphological analysis (Appendix 1), and Jeremy Yielding carried out a trial, low-power, microscopic use-wear analysis in 1993. In general, obsidian is by far the most frequent material used; cherts, of several colors and almost certainly imported, are less common. The inhabitants of Neolithic Halai clearly had access to obsidian in abundance and they worked it extensively at the site. Michèle Miller studied the Neolithic

Figure 6. Trench F2 from northwest. Child's skeleton is marked by arrow.

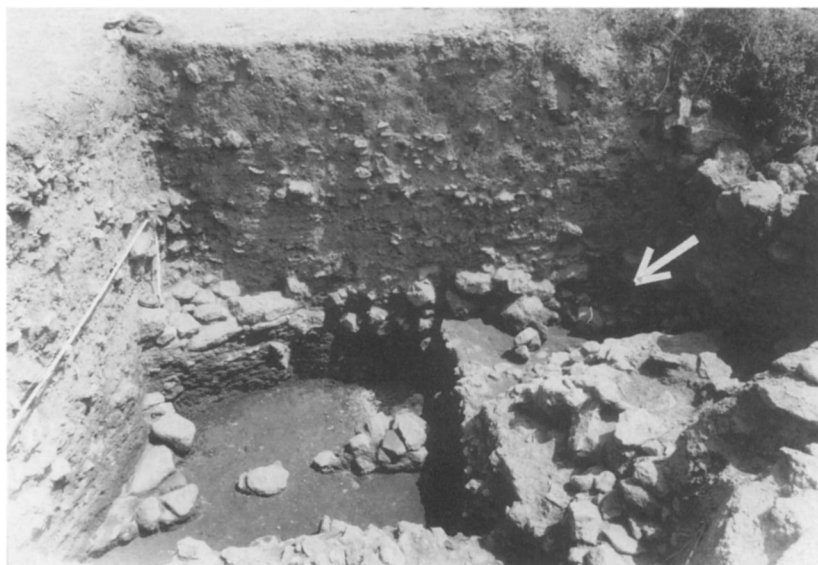
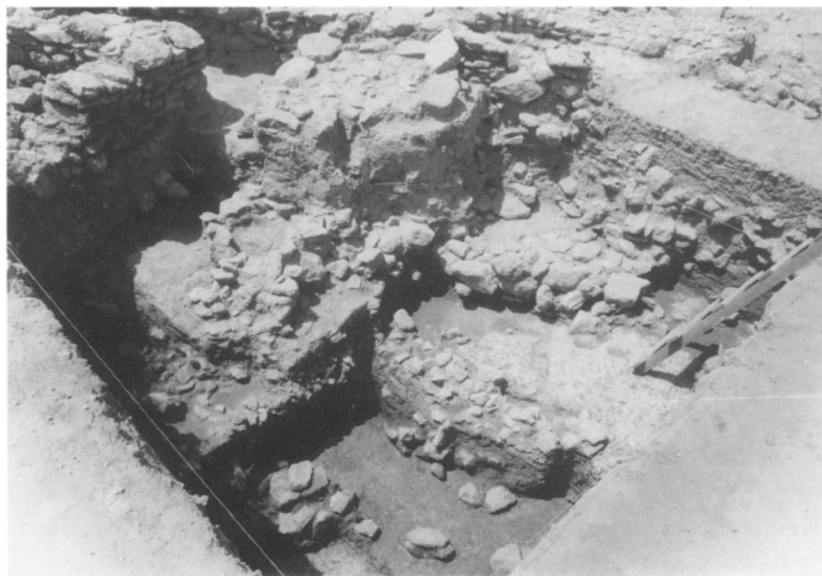


Figure 7. Trench F2 from northeast



beads for ten days or so in the summer of 1993 as part of her doctoral dissertation.<sup>20</sup>

Specialized studies on palaeozoology and palaeoethnobotany are in progress. Wendy Yielding (Appendix 2) has identified the bones of sheep, goats, pig, cattle, bird, and fish. So far she has concentrated on detailed study and analysis of the bones from trench F2, particularly the sheep/goats. The numerous seashells that have been recovered from the Neolithic deposits suggest that marine resources were also an important part of the diet. Near (Appendix 3) has identified among the food and possible food remains several varieties of wheat, barley, lentils, and other pulses; pistachio, fig, and grape were being gathered. In general, the evidence suggests that the animals and plants exploited by the Neolithic inhabitants were similar to those exploited at contemporary sites throughout Greece.

Preliminary studies of the Neolithic pottery have been completed. The pottery was provisionally subdivided for initial sorting into eleven categories ("wares") based in the first instance on the appearance of the exterior surface: PL (Plain); LS (Light Slip); DS (Dark Slip); RB (Red Burnished); BB (Black Burnished); PB (Pattern Burnished); OB (Other Burnished); RW (Red-on-White); DW (Dark-on-White); DB (Dark-on-Buff); and DR (Dark-on-Red). Subsequently, scientific analyses were initiated that may provide more objective criteria by which wares may be distinguished;<sup>21</sup> petrographic analysis and neutron activation analysis have so far been employed.<sup>22</sup>

Detailed phasing of the Neolithic deposits in terms of relative and absolute chronology has yet to be completed. A relative sequence of architectural phases is gradually emerging for the whole of Area F and the sequence of deposits in trenches F2 and F4 has been tentatively assigned by Mary Eliot to three "strata." The strata, which are numbered from earliest (stratum 1) to latest (stratum 3), have so far been useful for the initial studies of the chipped stone assemblage (Appendix 1). This stratigraphic division cannot yet be extended to the whole of Area F, however, and must be regarded as preliminary. The summary of the Neolithic sequence and chronology that follows relies on tentative comparisons of the Halai pottery sequence with the general Neolithic sequence in Greece rather than detailed stratigraphic analysis.

The earliest finds probably belong to an advanced stage of the Early Neolithic. Pottery with painted decoration is present, along with Black Burnished and Mottled Monochrome ("Variegated") wares, in most of the lowest deposits yet tested. The radiocarbon determinations (see below) suggest that the site was first occupied no later than a century or two after 6000 B.C. The Early Neolithic levels are followed by extensive deposits of Middle Neolithic, although the transition between Early and Middle Neolithic cannot be closely fixed until the pottery and stratigraphy have been further analyzed. There is much Red-on-White painted pottery in the Middle Neolithic deposits reminiscent of that found at Orchomenos, in the Valomenou mound at Chaironeia, and at Elateia.<sup>23</sup> Some Red-on-White pieces also resemble pottery of the Middle Neolithic sequence in Thessaly. Late Neolithic I levels represent the latest stage of occupation.

20. Miller 1997, pp. 188–190.

21. Such as those set out by Vitelli in *Franchthi* 8, pp. 3–12.

22. One hundred and seven representative sherds were exported in 1992, thanks to the kind cooperation of the Greek Archaeological Service. Analyses are being carried out at Cornell University: the preparation of thin sections at the Department of Geology and neutron activation analysis at the Ward Laboratory for Nuclear Studies. Timothy O'Donnell carried out the first steps of these preliminary analyses in the spring of 1994 with a selection of twelve sherds. Twelve more were analyzed in the fall of 1994 by Rebecca Edmonds. Tyler Kendall is currently continuing the analyses. We would like to acknowledge our gratitude for the help of Alexander Bentley and Cornell University staff members, especially Tim Z. Hossain of the Ward Laboratory.

23. Orchomenos: *Orchomenos* II; Chaironeia: Soteriades 1912; Elateia: Weinberg 1962.



**Figure 8. Neolithic small stone objects (1–6)**

24. Global sea level may have risen as much as 20 m since 5000 B.C. according to van Andel and Sutton, *Franchthi 2*, p. 33, fig. 9.

25. Cf. Demoule and Perlès 1993, pp. 368, 370.

26. Cf. Kardulias and Runnels 1995, pp. 104–108, who argue for such a system of distribution in EH II and possibly also in the Neolithic. Excavations at Halai, however, do not support the view of Kardulias and Runnels (pp. 97–103 and references) that chipped stone artifacts were important in Graeco-Roman times, since few pieces are found in levels later than the Neolithic and none in significant contexts; cf. Coleman 1986, p. 16, where contextual analysis at Elean Pylos suggested that the chipped stone artifacts that originated in Middle Helladic activity at the site and that were found in Classical levels were fortuitous rather than reused.

27. The initial identification number following the catalogue number in this report is the object's excavation field number; when a second number is given it is that in a secondary inventory system, which was discontinued for more recent finds. The field numbers start with a designation of area, trench, and year (a=1990, b=1991, etc.). All dimensions are in meters.

Initial study of the latest pottery suggests that the site was abandoned during the first stage ("Tsangli-Larissa") of Late Neolithic I, ca. 5300 B.C. No Neolithic pottery has been found anywhere on the acropolis or its environs that can be dated later than that stage.

In general, the finds suggest considerable continuity of material culture throughout the Neolithic occupation of Halai. There are no sharp breaks before the final abandonment that might indicate the arrival of new people or earlier episodes of abandonment. An abundance of sea-shells and imported obsidian throughout the Neolithic levels suggests that the sea was important as a source of food and for procurement of resources lacking in the immediate region of the site. Since sea level was rising continuously with respect to the land during the period of Neolithic occupation,<sup>24</sup> the loss of arable land was probably a major factor in the eventual abandonment of the site. In any case, there is no evidence to suggest that the abandonment was a result of hostile action or an immediate natural disaster.

In the earlier periods of the Neolithic era, settlements are usually located some distance from the sea and only a few permanent coastal settlements are known on the Greek mainland.<sup>25</sup> The livelihood of the inhabitants of Halai, as represented by the animal and plant remains, is therefore of great interest. The abundant obsidian also suggests that we consider the possibility that Halai was a place to which material was brought by sea and subsequently distributed to the hinterland.<sup>26</sup>

Six small Neolithic stone objects are catalogued below.<sup>27</sup>

1	Stone pendant	Fig. 8	2	Stone pendant	Fig. 8
<p>F5b(12)41a (H91-464). Intact; slightly chipped. L. 0.01, H. 0.008, Th. 0.005. Turquoise-green stone interleaved with white bands. Triangular in outline; thicker at bottom, narrowing toward apex. Hole near apex, D. 0.001. Two narrow grooves, W. 0.001, across the bottom.</p>			<p>F5b(12)41a (H91-389). Intact. L. 0.013, H. 0.01, Th. 0.004. Stone mottled light and dark green. Somewhat irregular in outline with polished surfaces. Hole near center, D. 0.003.</p>		

- |   |   |
|---|---|
| <p>3 Stone pendant                      Fig. 8</p> <p>F2a(1)3 (H90-22). Coleman 1992a, pl. 70:d. Intact except for slight chipping. L. 0.025, W. 0.018, Th. 0.002. Dark green, polished stone. Trapezoidal in outline. Tiny hole, D. 0.001, near narrower end of trapezoid.</p>   | <p>5 Stone pendant                      Fig. 8</p> <p>F2c(121)264. Intact except that the holes are broken away at outer edge. D. 0.033, Th. 0.01. Pink marble with white and dark striations. Circular in outline; flattened on one side, convex on the other side. Two pierced holes, D. 0.003, about 0.006 apart. Traces of two other smaller holes, D. 0.002, one at either side of the pair of larger holes.</p> |
| <p>4 Stone pendant                      Fig. 8</p> <p>F2b(60)316 (H91-533). Intact except outer edge of hole broken away. L. 0.021, W. 0.008, Th. 0.006. Polished, black stone. Elongated in outline; rounded at edges. Hole near broader end, D. 0.002; small vertical groove at narrower end, extending ca. 0.003 up each side.</p> | <p>6 Stone celt                              Fig. 8</p> <p>F2c(126)259 (H92-713). Intact except for small chips at blade. L. 0.046, W. 0.03, Th. 0.016. Compact, black stone. Surface well polished, somewhat shiny.</p>  |

## RADIOCARBON DETERMINATIONS

Thirteen radiocarbon determinations have been carried out on samples of carbonized material from various points in the Neolithic sequence by the Laboratory of Isotope Geochemistry of the University of Arizona and two further determinations were carried out by Beta Analytic Inc. The material from which the samples were taken was generally small in mass (<20 gm) and not well consolidated because of the dampness of the soil. It was therefore impossible in most cases to identify the original organic material or even to tell whether it was short- or long-lived. The eleven determinations listed in Table 1 present a reasonably consistent chronological picture and they correspond fairly well with the stratigraphic order of the samples in that they generally give increasingly later datings for stratigraphically later deposits. I have chosen to leave out of consideration the four determinations listed in Table 2. These are much earlier than the other dates in the Halai sequence and do not conform with our general picture of Greek Neolithic chronology; the samples may represent or have been contaminated by older organic material. The case of one apparently single body of carbonized material is particularly interesting. It was divided into three samples, two of which were run by Arizona (A-7272, A-7622) and one by Beta Analytic Inc. (Beta-66803). Two of the resulting determinations (A-7622 and Beta-66803) have 2-sigma ranges with considerable overlap, and they are consistent with the other dates from the site. The third (A-7272), however, is much earlier than the other two and should be disregarded. The discrepancy, for which the archaeological context does not provide any clue, points up the need for excavators to analyze as many radiocarbon samples from their sites as possible, in order to obtain a reliable sequence.

Two determinations from near the beginning of the Neolithic sequence (dated EN in Table 1) come from early deposits in trench F2 (below the level of Wall BJ). They suggest that the site was occupied by about 5900–

TABLE 1. SELECTED RADIOCARBON DETERMINATIONS

<i>Lab. No.</i>	<i>Exc. Field No.</i>	<i>Sample</i>	<i>Uncal. B.P. Date</i>	<i>Cal., 1-sigma</i>	<i>Cal., 2-sigma</i>	<i>Period</i>
A-7271	F2c(168)580	wood	7325±160	6360–5980 B.C.	6460–5840 B.C.	EN
A-7268	F2c(127)275	wood	7530±200	6530–6170 B.C.	6760–5970 B.C.	EN
A-7267	F2c(124)250	charcoal	6905±90	5930–5630 B.C.	5960–5580 B.C.	MN
A-7264	F2c(118)216	wood	6980±170	6010–5630 B.C.	6190–5520 B.C.	MN
A-7266	F2c(121)263	charcoal	7285±145	6220–5970 B.C.	6410–5820 B.C.	MN
A-7622	F2c(173)581c	wood	7065±75	6005–5810 B.C.	6080–5710 B.C.	MN
Beta-66803	F2c(173)581b	wood	6850±70	5730–5600 B.C.	5930–5580 B.C.	MN
A-7270	F2c(148)426	wood	6935±170	5960–5600 B.C.	6140–5490 B.C.	MN
Beta-66802	F2c(139)400	soot	6750±60	5660–5580 B.C.	5700–5500 B.C.	MN
A-7265	F2c(119)222	soot	7070±165	6100–5710 B.C.	6270–5590 B.C.	MN
A-7273	F10c(16)87	wood	6615±75	5580–5440 B.C.	5600–5350 B.C.	LN

Samples are listed in rough stratigraphic order. The material in the sample column is as estimated at the time of excavation. All samples were collected in 1992 and analyzed during 1993 except A-7622, which was analyzed in 1994. Dates in the "Uncal. B.P. Date" column are given on the basis of the conventional 5568 half-life of radiocarbon. Calibrations are according to the computer program CALIB (Radiocarbon Calibration Program, 1993, Rev. 3.0.3c; to be used in conjunction with Stuiver and Reimer 1993) and are rounded off to the nearest decade. They are given with 1-sigma and 2-sigma ranges. Determinations with uncalibrated dates earlier than ca. 7200 B.P. are calibrated with the bidecadral data set; the rest are calibrated with the decadal data set.

TABLE 2. RADIOCARBON DETERMINATIONS JUDGED INACCURATE

<i>Lab. No.</i>	<i>Exc. Field No.</i>	<i>Sample</i>	<i>Uncal. B.P. Date</i>	<i>Cal., 1-sigma</i>	<i>Cal., 2-sigma</i>
A-7269	F2c(139)361	soot	8560±200	7890–7430 B.C.	8020–7050 B.C.
A-7272	F2c(173)581a	wood	7785±180	6990–6420 B.C.	7130–6210 B.C.
A-7274	F10c(25)121	charcoal	12870±380	13880–12660 B.C.	14400–12150 B.C.
A-7275	F101c(19)83	charcoal	9805±310	9800–8530 B.C.	10400–8100 B.C.

5800 B.C., if not earlier. Eight determinations are associated with a sequence of hearths and deposits in higher levels in trench F2 that fall within the Middle Neolithic period, to judge by the associated pottery. The determinations are consistent with such an assignment; taken together, they suggest that the Middle Neolithic began no later than 5700 B.C., which is consistent with the chronology I have elsewhere proposed.<sup>28</sup> Where a division between the Early and Middle Neolithic deposits at Halai may conveniently fall is not yet clear from the stratigraphy and pottery. The final determination listed in Table 1 (A-7273) is from a Late Neolithic deposit, near the end of the period of Neolithic occupation. As it is the only determination yet obtained from Late Neolithic levels, it must be regarded with caution. Nevertheless, it provides a hint that the Late Neolithic occupation did not extend later than 5400–5300 B.C.

In general, the radiocarbon determinations for Halai are reasonably consistent with those from other sites, although they suggest that it may be more accurate to date the beginning of the Middle Neolithic a little earlier than is customary.

28. Coleman 1992b.

## ARCHAIC PERIOD

Halai was founded anew in the Archaic period, probably in the late 7th century B.C.<sup>29</sup> Its seaside location is significant and its foundation is likely to be connected with increases in trade and communication by sea at that time as a result of Greek colonization in the northern Aegean and the Black Sea area (see below). The acropolis was laid out in a regular way with its long axis aligned west/northwest to east/southeast (Fig. 1). The fortifications, gates, and streets of the Archaic acropolis must have been built in accordance with an overall plan, to judge by their general adherence to rectangular lines and spaces, and the interior buildings may also have been carefully planned. The line of the main street leading from the southeast end of the acropolis to the temple area near its northwest end was maintained until the abandonment of the town in the Late Roman period, and the location of the two perpendicular streets so far identified, one near the north corner giving access to the "North" Gate and the other passing through Areas C and H (Fig. 9), probably also originated in the Archaic plan. The lines of most of the fortifications were also maintained, although the fortifications were expanded toward the southeast on several occasions and the walls themselves were renovated and strengthened.<sup>30</sup> The northwest end of the acropolis was probably the religious center (temple area) from the beginning (Fig. 9). The long axis of the altar to the east of the temple is almost perpendicular to the northwest-southeast alignment of the acropolis. The earliest temple, by contrast, is aligned differently and, since its long axis is almost exactly east-west, it is likely that religious custom was more important in determining its layout than conformity to the town plan.

Excavations have reached Archaic levels chiefly in Area F (the temple area) and in Area A, immediately to the north. Since we have not yet physically connected the two areas with trenches, the stratigraphy and chronology cannot yet be closely coordinated. In 1992 work on Archaic levels took place chiefly in Area A.

A new trench, A5, immediately adjacent to the northeast side of A3 (Figs. 10, 11), revealed all but the southeastern side of a rectangular room (Room 19), ca. 3.4 m northeast-southwest by at least 3.5 m northwest-southeast. At least ten courses of mudbricks still remain in place above the stone socle of its northwestern wall (AV) at the west corner of the room. This extraordinary state of preservation probably can be attributed to continued use of Room 19 while the floor/use level gradually rose, perhaps as much as 0.50 m. In the uppermost levels near the north corner, three slabs of stone are set on edge to create two receptacles (Figs. 10, 12). The slabs are ca. 0.85–0.90 m long and 0.50 m in height. An intact, round-bottomed jug (chytra) was found, apparently in place, in the southeastern receptacle.<sup>31</sup> The depositional history of the room and the adjacent area to the southwest in trench A3 is highly complex; Room 19 had two horizontal, gray (burned?) lenses in the northwest half, and regular, horizontal, variously colored layers of claylike material in the south corner.<sup>32</sup> The depositional history and purpose of these lenses and layers are as yet uncertain and will become clear only with further excavation.

29. For more extensive discussion of Archaic Halai see Wren 1996. I have profited greatly from Curtis L. Ellett's M.A. thesis (Ellett 1995) and from unpublished work by Denise McCoskey. For the date of founding, see Wren 1996, pp. 54–58.

30. Goldman 1940, pp. 381–397.

31. The chytra strongly resembles *Agora* XII, no. 1922, pl. 93, dated to the second quarter of the 6th century, but of a type that changed little between then and the end of the 4th century.

32. Described in detail in Ellett 1995, pp. 27–44; cf. Wren 1996, pp. 49–53.

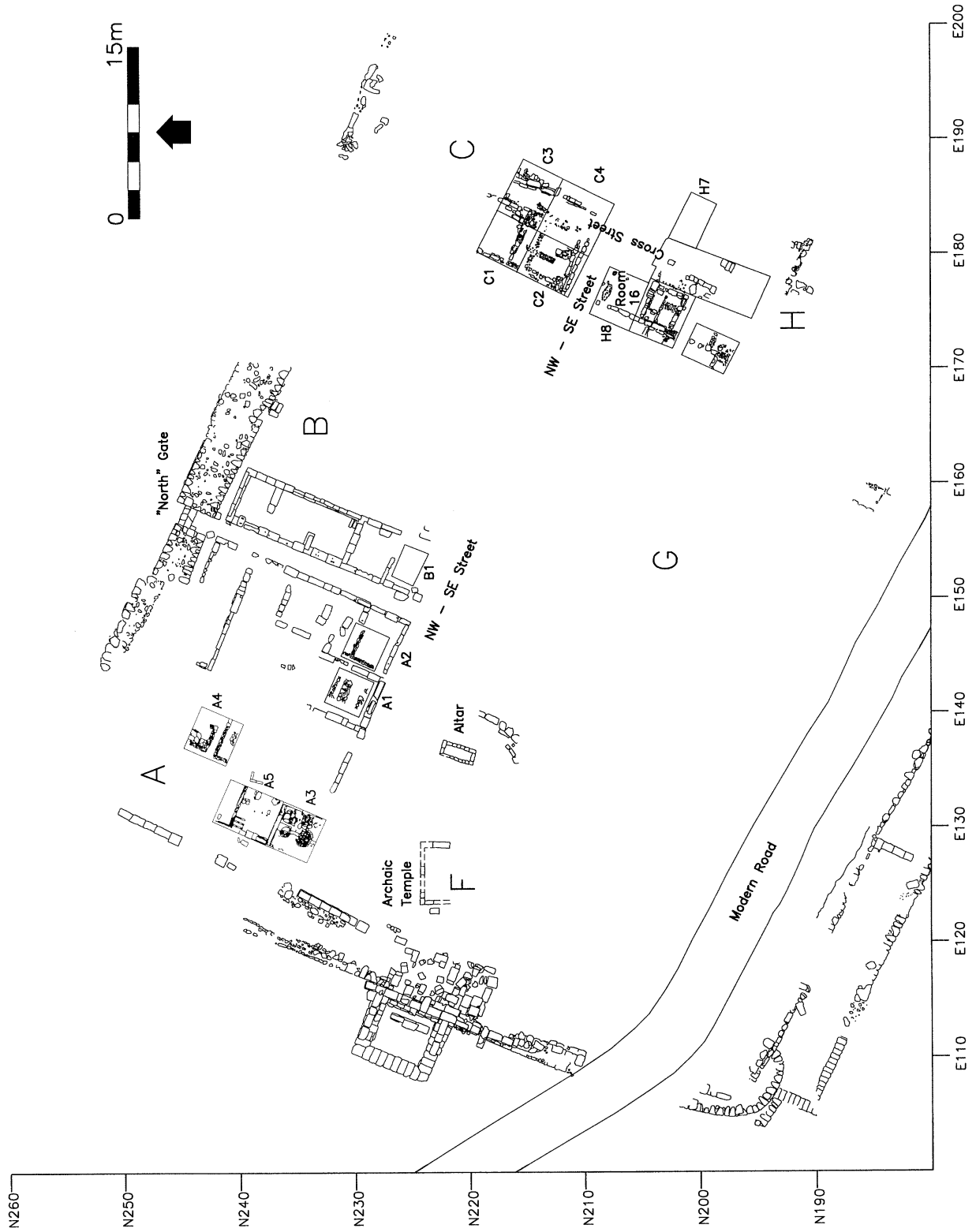


Figure 9. Plan of the northwest end of the acropolis showing Archaic and Hellenistic remains

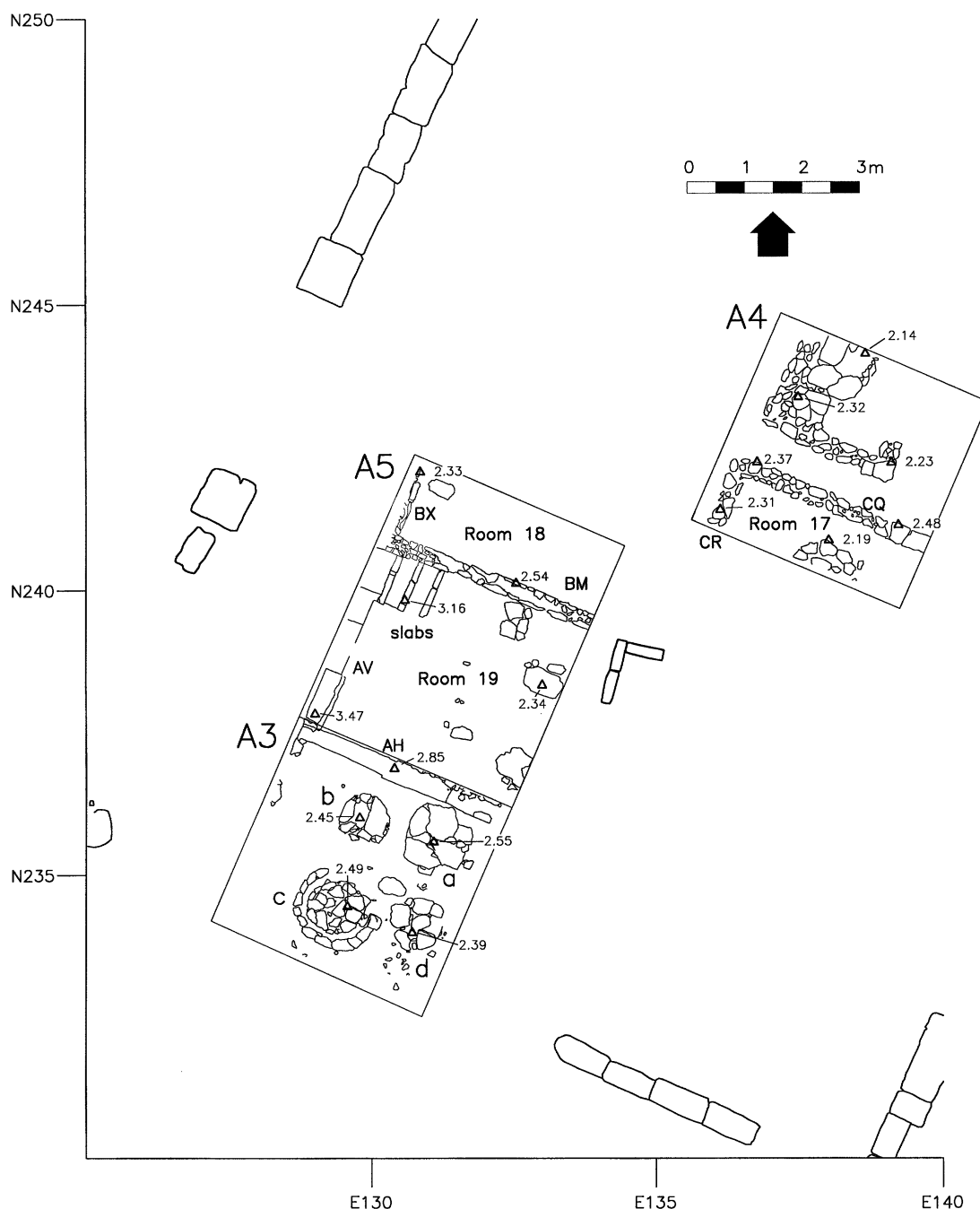


Figure 10. Plan of trenches A3 and A5

In room 18, adjacent to the northeast side of Room 19 (i.e., northeast of Wall BM; see Fig. 13), a group of pottery was found consisting of at least four oinochoai and five amphoras, apparently fallen together with their lids.<sup>33</sup> The group is to be dated to the late 6th and early 5th centuries B.C. While this situation suggests a mishap at the end of the Archaic period, more excavation is needed to determine whether the destruction was widespread and whether it was caused by natural or human means.<sup>34</sup> In any case, the Archaic buildings excavated in trench A5 probably remained in use thereafter.

33. Ellett 1995, p. 43; Wren 1996, pp. 53–54, 97–101.

34. For discussion of the possibilities that Halai suffered a destructive earthquake in Late Archaic times or was damaged by the Persian fleet as it passed through the North Euboean gulf on the way to Salamis in 480 B.C. (Hdt. 8.66), see Wren 1996, pp. 27–59.



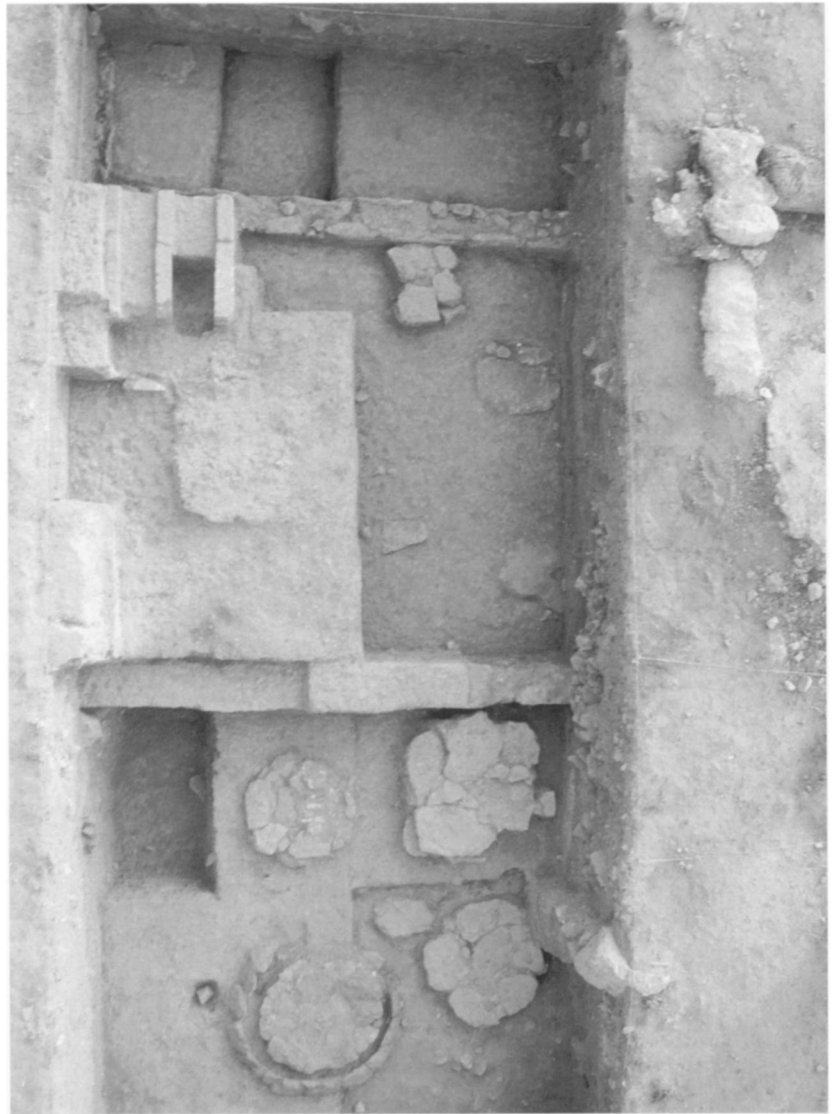


Figure 11. Balloon view of trenches A3 and A5 (1992), north-northeast at top

Figure 12. Trench A5 from northeast



## ROOM 18 (DESTRUCTION LEVEL)

## 7 Amphora Fig. 14

H93-930. Wren 1996, p. 98, no. B1. Many fragments; possibly making a complete vessel. Rim, neck, partial shoulder, and one handle glued. H. est. 0.72, D. of rim 0.175, H. of neck (with rim) 0.125, H. of toe 0.043, D. of toe 0.074. Coarse fabric tempered with jagged bits of probable mudstone (strong reddish brown), tiny pebbles, and limelike flecks; elongated voids suggest organic temper; fired gray at the core. Oatmeal-colored and -textured exterior, Munsell 5YR 7/4; interior Munsell 7.5YR 7/4. Horizontal, overhanging rim with flat surfaces, outer edge angled slightly outward. Cylindrical neck, flattened shoulder, spherical body, and cylindrical toe. Round handles, pinched at top, oval where handles touch rim, with AP inscribed after firing near top of one handle.

Corinthian A-style transport amphora, ca. 500–480 B.C. Corinthian A amphoras are distinguished by a consistently globular body (while the trend elsewhere is to narrow, elongated forms) and a hard orange clay, often fired gray at the core, with a sizeable amount of temper, primarily mudstone. The

temper in 7 closely resembles mudstone included in the fabric of Corinthian A amphoras (made of clay from Neogene sediments that do not naturally contain mudstone; Whitbread 1986, pp. 97, 99), suggesting that it was added as temper. The initials inscribed on the handle may be those of a distributor, since the potter is likely to have inscribed his own before firing.

See Grace 1961, fig. 35, left, for parallel fractional amphora identical in all other respects but for a vertical edge to the rim. This smaller version comes from a well in the Athenian Agora containing Persian destruction debris. See also Shear 1993, p. 451 and fig. 8.

## 8 Amphora Fig. 14

H93-931. Wren 1996, p. 99, no. B2. Fragments of neck, rim, one handle (though both are present), and part of shoulder glued. D. of rim 0.180, H. of neck (with rim) 0.11. Medium-coarse, pink fabric (Munsell 5YR 7/4), with heavy pink lime incrustation (Munsell 7.5YR 7/4) on exterior, part of interior, and some breaks. Molded rim; concave neck; short, cylindrical, sloping, oval handles with thumb impressions



Figure 13. Trench A5, showing deposit northeast of Wall BM (1992), north-northeast at top

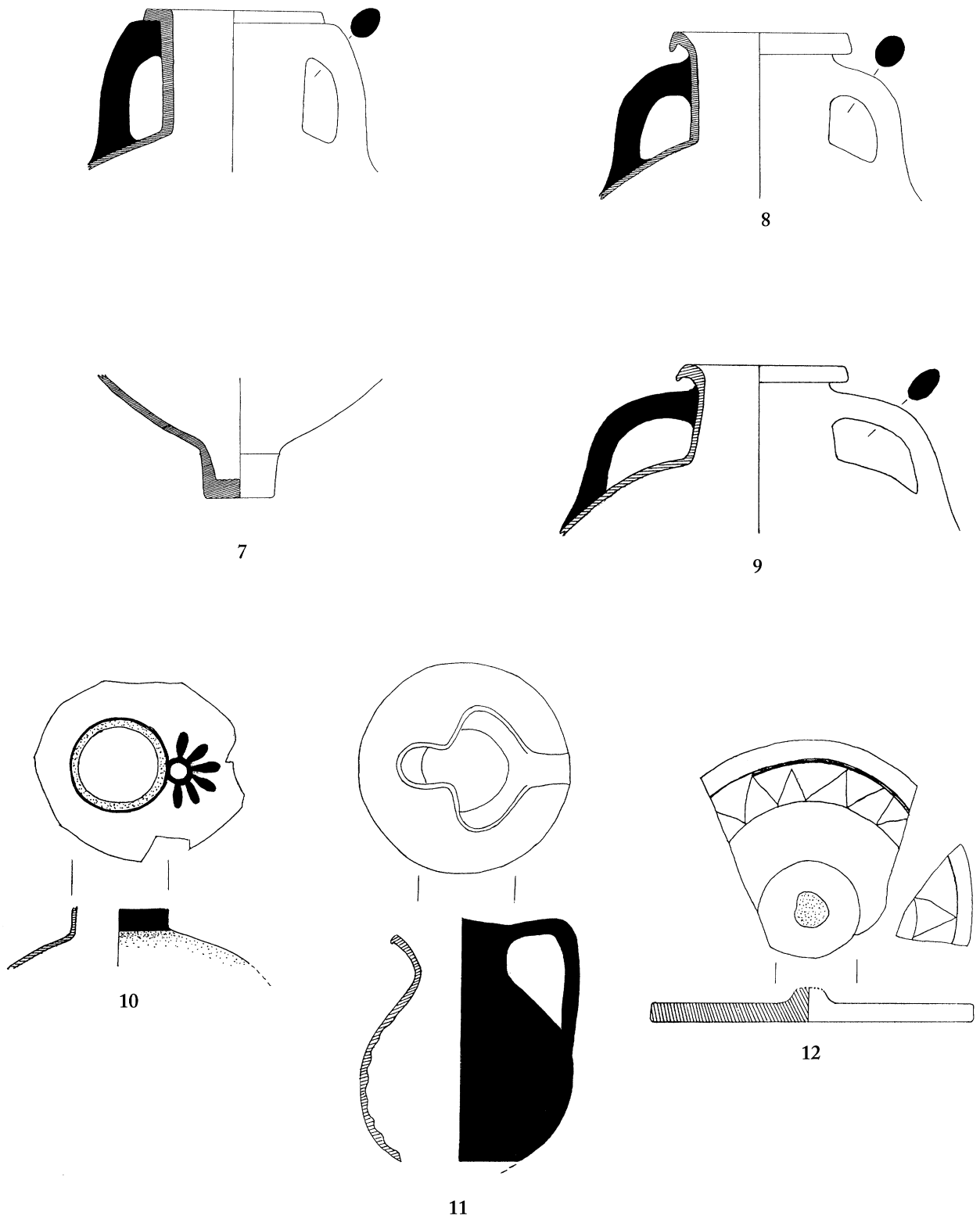


Figure 14. Archaic pottery from trench A5, Room 18, destruction level. Scales 1:6 (7–9) and 1:3 (10–12)

where handles join neck and shoulder; curving shoulder; apparently spherical body.

Transport amphora, probably late 6th or early 5th century. C. Koehler, who kindly viewed drawings and slides of 8 and 9, was unable to identify either amphora, except to venture that 8 is probably not Corinthian. She also indicated that thumb impressions on Corinthian vessels occur only on 8th-century examples.

9 Amphora Fig. 14

H93-932. Wren 1996, p. 99, no. B3. Fragmentary; rim, neck, partial shoulder, and handles glued. D. of rim 0.165, H. of neck (including rim) 0.096. Fairly fine reddish yellow fabric (Munsell 5YR 7/6) with light-pink incrustation (Munsell 5YR 7/4); tempered with same probable mudstone as 7, tiny pebbles, and limelike flecks; elongated voids suggest burned organic inclusions. Depressions at shoulder on interior smeared with additional clay before firing. Molded rim (flaring slightly more than that on 8); convex neck; long, oval, broadly curving handles with finger depressions where handles join shoulder; curving shoulder; apparently spherical body.

Transport amphora, possibly Corinthian, probably late 6th, early 5th century. Since the later trend in amphoras is away from the bulging spheres of the late 6th and early 5th centuries (cf. Koehler 1978, pls. 15-16, and Lawall 1995, figs. 9-103), it is safe to suggest that neither 8 nor 9 postdates 7. The apparent mudstone inclusions in 9 suggest a Corinthian provenience.

10 Oinochoe Fig. 14

H92-898. Wren 1996, p. 100, no. B4. Neck and shoulder fragments, glued. D. 0.080, Th. 0.008. Fine, light reddish brown fabric (Munsell 5YR 6/4) with gray/black-glazed neck (Munsell 7.5YR 3/0); semi-glossy light red body (Munsell 2.5YR 6/6). Vertical neck; flattened shoulder. Gray/black (turning to blue) pattern of leaves (or perhaps a flower) arranged around a circlet on shoulder just below neck.

Round-mouthed oinochoe, ca. 550-480 B.C.; cf. *Agora* XII, nos. 145-149, pl. 8.

11 Oinochoe Fig. 14

H93-926. Wren 1996, p. 100, no. B5. Nearly three-quarters complete (base missing). H. est. 0.14. Fine, reddish yellow fabric (Munsell 5YR 6/6) with black-glazed body fired to streaky red and brown; reserve band at bottom. Interior glazed only inside neck (black faded to red). Trefoil rim; narrow neck; low strap handle; oval body.

Chous-shaped oinochoe, probably no later than 480 B.C. For similar oinochoai, see *Agora* XII, nos. 109 and 112, pl. 6.

12 Lid Fig. 14

H92-738. Wren 1996, p. 101, no. B6. About three-fifths complete. H. (with broken knob) 0.015, D. 0.150, Th. 0.008. Somewhat coarse pink fabric (Munsell 5YR 7/4), with tiny, smooth pebble inclusions. Flat lid with broken knob at center. Band of incised triangles between grooves and a single groove near base of handle.

Date uncertain, but probably late 6th or early 5th century.

Further digging in trench A3 revealed details of the circular stone platforms mentioned in the previous report (Fig. 10). The platforms are roughly 1 m in diameter and 0.20 m deep, and one of them, Structure b, was covered with a layer of pieces of large, flat, triangular shells (Fig. 15), carefully embedded, shiny side up, in clay.<sup>35</sup> The shallow channel partly surrounding Structure c (Fig. 16) may have been intended to provide for the runoff of a liquid, or perhaps to support other material placed on the platform. Differences in level—nearly 0.30 m between the two extremes—

35. The shells are of the family Pinnidae and probably of the species *Pinna nobilis*, as was kindly suggested by Lilian Karali. See Coleman 1992a, p. 275, pl. 71:a for earlier reference to the platforms.

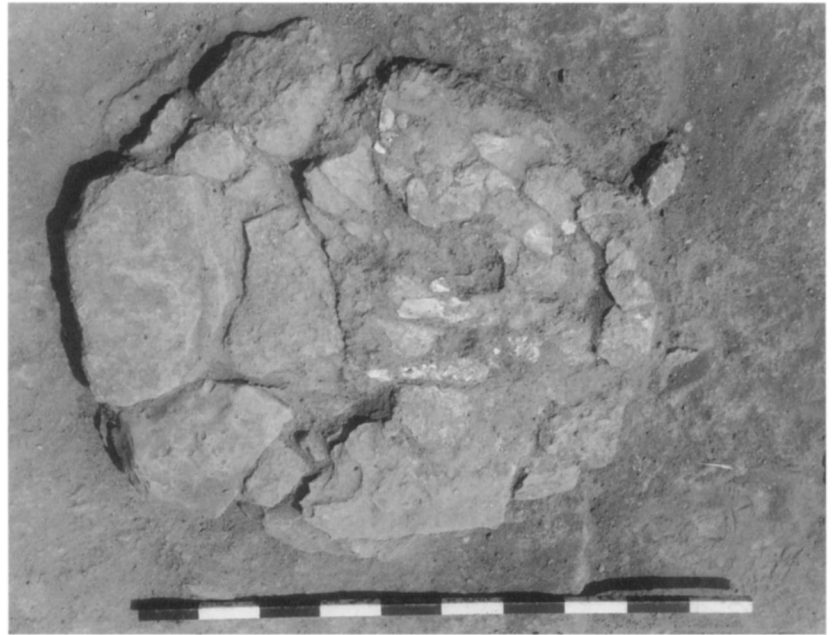


Figure 15. Structure b in trench A3 from southeast

Figure 16. Trench A3 from south



36. Cf. Hägg 1983, pp. 190–193; Antonaccio 1995, pp. 199–207 and references there cited. The suggestion in Coleman 1992a, p. 275 that the platforms might be bases for granaries, based on comparison with circular Geometric structures at Lefkandi (*Lefkandi I*, pp. 24–25 and pls. 5, 6:c, 7, 8:b), now seems improbable; in fact, it seems more likely that the Lefkandi structures also had a ritual purpose (cf. Wren 1996, pp. 66–70).

37. Wren 1996, pp. 73–78. Archaic Greeks tended to utilize heroes in order to strengthen their claims to land, sometimes repatriating the bones of local heroes or even inventing worthy ancestors when none existed (Snodgrass 1980, pp. 38, 41–42). Since Halai was a new foundation (a colony of Opous?), it may have stood in need of such a hero; cf. Antonaccio 1995 on heroized city founders. Snodgrass (1980, p. 42) argues that although platforms like those at Halai were found in different contexts, they nevertheless suggest ancestor cults.

suggest that not all platforms were in use at the same time. Fragments of a skyphos, a krater, another very large column krater, a miniature skyphos, and possibly an oinochoe were found scattered among the platforms and presumably date to their latest period of use. A relative scarcity of fragments of roof tiles suggests the A3 platforms were outdoors.

The form of the platforms and their association with drinking vessels suggest that they had a ritual function. They are less than 10 m from the Archaic temple and dining and/or drinking is associated with similar stone platforms found at Asine, Miletus, Nichoria, and possibly at Troy, which are also thought to have been used in ritual.<sup>36</sup> The ritual at Halai might have been in connection with a hero or heroized city founder.<sup>37</sup>

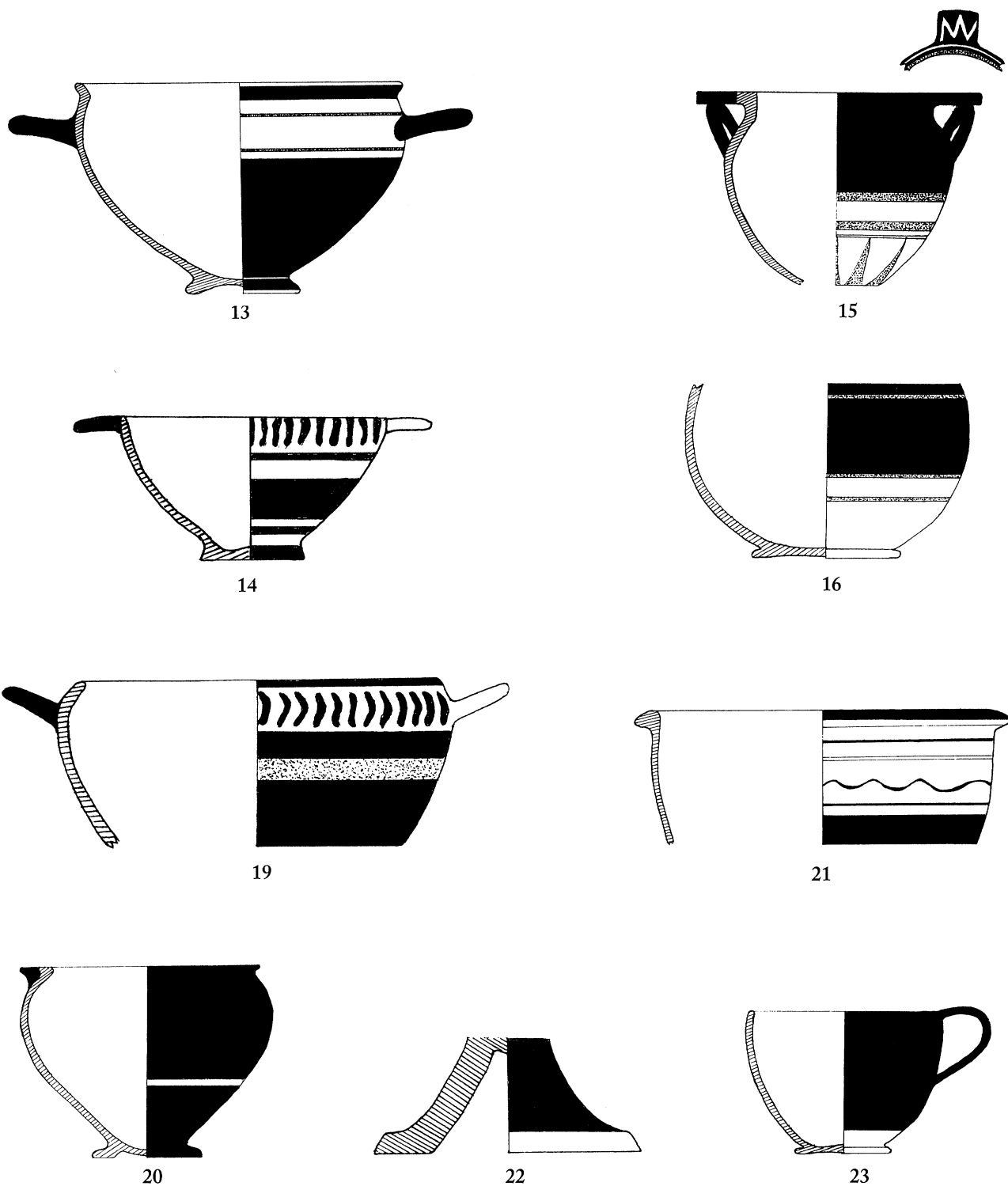


Figure 17. Archaic pottery from trench A3, around the circular platforms (13–16), and trench F6 (19–23). Scales 2:3 (14), 1:3 (13, 16, 19, 22, 23), 1:6 (15, 20, 21)

TRENCH A<sub>3</sub>: AREA AROUND CIRCULAR PLATFORMS

- 13 Skyphos Fig. 17  
H93-921. Wren 1996, p. 102, no. B7. About three-quarters complete. D. rim 0.150, H. 0.105, D. base 0.055, Th. 0.004. Fine, reddish yellow fabric; fabric and slip Munsell 5YR 6/6. Black glaze with metallic sheen. Narrow purple band on interior of everted rim. Black band on exterior of rim, with two narrow purple bands in reserve zone of handle area. Black handles have slight upward thrust. Deep bowl, curving in slightly at top. Black zone beneath handles; incision at top of low foot; narrow reserve band at base. Probably a central Greek product. General parallels from Corinth (e.g., *Corinth* VII, ii, An 176) and Attica (e.g., *Agora* XII, pp. 88–89, nos. 378 and 380, p. 262, pl. 18) suggest a date in the late 6th century B.C.
- 14 Miniature kotyle Fig. 17  
H93-925. Wren 1996, p. 102, no. B8. Nearly complete. D. rim 0.066, D. base 0.023, H. 0.035, Th. 0.0018. Black-glazed, deteriorating to red on upper half of body; very deteriorated black paint on interior. Handles drooping slightly. Hastily painted with vertical strokes beneath rim, three bands around body, one on low base. Black paint on underside of base, with reserve circle at center. Corinthian, votive kotyle, 6th century. Cf. *Corinth* XVIII, i, p. 174, no. 561, pl. 52.
- 15 Column krater Fig. 17  
H93-924. Wren 1996, p. 108, no. B9. About two-thirds complete; missing base and most of lower body. D. exterior rim 0.279, H. pres. 0.199. Fine light red fabric with crushed-shell temper, Munsell 2.5YR 6/6. Exterior somewhat incrustated. Black glaze deteriorating to red, particularly on rays near base; slip Munsell 5YR 7/4. Interior black, deteriorating to brown. Flat, black-glazed rim with narrow purple and white bands. Zigzag pattern painted in white on handle plate. Top portion of body black, with two purple bands, separated by reserve band, at lower center. Large, clumsily painted rays extend upward from (missing) base in bottom quarter. Corinthianizing, black-glazed column krater, probably late 6th century.
- 16 Oinochoe Fig. 17  
H93-922. Wren 1996, p. 108, no. B10. Lower half only. D. base 0.074, H. pres. 0.085, W. 0.140, Th. 0.005. Fairly fine textured, light red fabric, Munsell 2.5YR 6/8. Closed, black-glazed vessel faded to red, with three purple stripes, two flanking the black zone, one in reserve zone above flat base. Probably an imported oinochoe of the later 6th or early 5th century.

Study of pottery from trench F6, ca. 3 m northeast of the Archaic temple, suggests that the destruction of Goldman's "first temple" occurred ca. 480 B.C.<sup>38</sup> The catalogue below is of finds from debris probably associated with this destruction. It includes a small piece of sculpture (17) that is probably best described as folk art.

## TRENCH F6

- 17 Relief bust in stone Fig. 18  
F6b(15)66 (H91-483). Found in trench F6. Nearly complete; chipped on the back, on the front at left corner, at the top, and around the head. H. 0.16, L. at base 0.15, Th. at base 0.095, Th. at top of head 0.085. Limestone, mostly covered with brown deposit from soil. Smoothed on all surfaces. Front crudely carved,

38. Wren 1996, pp. 54, 90–91 and the catalogue on pp. 109–112.

with head and neck in relief. Probably female. Flowing hair divided into strands by vertical incisions extending to just below neck. Indented face with deep eye sockets and slash mouth, slightly askew. Tapering neck, unnaturally long.

Probably 6th century B.C., but reminiscent of the Daedalic style.

# 18 Skyphos Fig. 19

F6b(08)21 (H91-648). Coleman 1992a, p. 275 and pl. 72. Wren 1996, p. 109, no. B11. Broken into many fragments, missing about a third, including more than half of the base and one handle. D. rim 0.29, D. base 0.152, H. 0.165, Th. 0.005. Fine, light red fabric (Munsell 2.5YR 6/8) with brown or reddish brown glaze on beige slip. Solidly glazed inside. Vertical strokes in handle zone beneath band on concave rim; wide band above black-figured animal frieze. Crudely drawn animals in silhouette, from right: panther, dolphin, scorpion, dog, rabbit, snake, and cow. Crude volute lotus/thicket near head of snake. Hastily drawn crosses as sparse fillers. Simple, sparing incision. Added color (light gray-brown) on udder of cow and belly of dolphin. Inscription of potter (in retrograde): "Εποφελὲς ἐποίησ(ε)"; inscription of painter (reading forward): "Εὐφρα[ . . . ] ἔκραφσε," with "ἔγραψε" misspelled (cf. Coleman 1992a, p. 275, note 22). Above low base, short, stubby rays extending nearly to ground line.

A local Corinthianizing work of Archaic date.

# 19 Kotyle

Fig. 17

HA95-4. Wren 1996, p. 110, no. B12. Parts of rim and shoulder; one handle. D. 0.210, H. pres. 0.097, Th. 0.004. Black-glazed on exterior and interior, deteriorating to streaky red-brown. Black band on rim that follows inward curve of body above handle zone. Vertical strokes in handle zone; handles pitched slightly upward. Black zone, cut by red band, beneath handles. Corinthianizing, 6th century. Cf. *Corinth* VII, i, p. 36, no. 107, fig. 11.



Figure 18. Archaic relief bust (17)

# 20 Lekane

Fig. 17

H91-575. Wren 1996, p. 111, no. B13. Fragmentary; handles missing. H. est. 0.19, D. 0.25, Th. 0.007. Good dull red glaze (Munsell 10YR 5/6) on exterior and interior except for reserve band around probable center of body. High, curving shoulder, sloping sharply inward to flat base. Bridge-spouted. Probable import. Cf. Goldman 1940, no. 7, fig. 35 for shape, though that example, which Goldman dates to the first quarter of the 6th century, has a high foot.

Early 6th century B.C. The bridge-spouted lekane is far more common in the 7th century than the 6th, but early examples have a pronounced everted rim. The band is broad at the beginning, then narrows rapidly; cf. *Agora* XII, pp. 212, 359–360 and pl. 83 and, for similar narrowing of the bands on oinochoai, pl. 4.

Figure 19. Archaic skyphos (18)





## 21 Lekane Fig. 17

H91-629. Wren 1996, p. 111, no. B14. Part of rim (molded) and shoulder; one (nonjoining) handle. D. exterior rim 0.374, Th. 0.007–0.010. Fairly fine reddish yellow fabric (Munsell 5YR 6/6). Dull black glaze on exterior; black band at rim on interior. Narrow black stripe and two closely spaced incisions beneath outer rim. Wavy line and black stripe between incisions and black zone.

Probably Eretrian, ca. 490 B.C. The wavy line on Attic lekanai disappears after the early 6th century (though the motif continues elsewhere, particularly in East Greece) but the Attic version has a thicker, more tightly crimped line than the extended waves on this vessel. E. Vanderpool suggests that thin wavy lines are Eretrian, based on a lekane in the Eretria Museum that he dates to 490 B.C. because of its similarity to a jar from the Marathon tumulus; for discussion, see *Agora* XII, pp. 40 and 196, note 5. For the type of wavy line, see Boardman 1952, fig. BF, pl. 13.

## 22 Cup Fig. 17

H91-574. Wren 1996, p. 112, no. B15. Foot only. D. pres. 0.102, H. pres. 0.044. Very fine light red fabric (Munsell 2.5YR 6/6). Black glaze

somewhat thinly applied with metallic sheen; badly chipped. Reserve band at base; black band on underside of base; black-glaze interior. High conical foot with concave torus and sloping base.

Probable base of Attic vicup, ca. 480–475 B.C. Cf. *Agora* XII, no. 434, pl. 20, dated to 475 B.C. The vicup, distinguished by the concave outer face of its foot, was produced between 480 and 475 B.C., probably by just one workshop. Two fragments were found in Persian debris in Athens; cf. *Agora* XII, pp. 92–93.

## 23 Cup Fig. 17

H91-573. Wren 1996, p. 112, no. B16. About half complete. D. rim 0.095, D. base 0.044, H. 0.070, W. (with handle) 0.120. Black glaze on exterior and interior of teacup-shaped vessel, with narrow reserve band above base. Ribbon handle slightly off center. Groove above flat base.

Probable import, late 6th or early 5th century. No close parallel was found, though the apparently short-lived plain-walled variety was in its infancy in the late 6th and early 5th centuries and was rare in Attica. The type is conventionally kept with jugs, but could have been used as a dipper, drinking cup, measure, or taster; cf. *Agora* XII, p. 71.

Halai was probably typical in most ways of the smaller cities and towns of Classical times, some 750 of which are known in the Aegean region,<sup>39</sup> and it was not an important place in the sense that it played a key role in recorded history. Its archaeological value, on the other hand, is considerable. As a new foundation of the late 7th century B.C., Halai can tell us much about how the Greeks conceived of and organized their towns in Greece itself (as opposed to colonies abroad). Halai is one of only two towns on the Greek mainland that have produced evidence for a regular plan in the Archaic period.<sup>40</sup> Its seaside position also makes it an important source of evidence on maritime communication and trade, particularly as it is located on the principal sea route between the southern Greek mainland and the northern Aegean, which in all historic periods passed between Euboea and the mainland. Very little information is yet available concerning the smaller ports-of-call along this sea route.<sup>41</sup>

Further excavation is necessary, however, if the history and society of Archaic Halai are to be fully understood. The scarcity of finds clearly datable to the later 5th century B.C. either from trenches in Areas A and F or the excavations of Goldman and Walker below the “poros pavement” in

39. Ruschenbusch 1985, pp. 253–257.

40. The other is Halieis: Boyd and Jameson 1981.

41. For a preliminary discussion see Wren 1996, pp. 17–27.

the Temple Area suggests the possibility that Goldman erred in dating the destruction that resulted in the debris assigned to the “second temple area” to 426 B.C.<sup>42</sup> rather than earlier.<sup>43</sup>

## HELLENISTIC PERIOD

Almost no material from the 5th or 4th centuries B.C. has been recovered at Halai by our expedition, although the excavations of 1992 in Area C in and beside the main northwest–southeast road that subdivides the acropolis suggest that it continued in use during these centuries.<sup>44</sup> Settlement on the acropolis in the later Hellenistic period, on the other hand, was clearly very extensive, and much of the architecture now extant at the site probably belongs to that time. Goldman had already suggested that great changes occurred during the course of the 4th century B.C., including renovation of the fortification wall and its extension toward the southeast (her System II),<sup>45</sup> the construction of the North Gate Buildings,<sup>46</sup> a predecessor to the Northeast Gate Building,<sup>47</sup> and “the whole network of regularly laid out buildings” she encountered in trial trenches throughout the acropolis.<sup>48</sup> She dated the renewal of the fortifications to “the middle of the fourth century B.C., and not later than the end of the third quarter” on the style of the masonry and the strength of a sherd of Gnathia ware and a fragment of a terracotta figurine.<sup>49</sup> Although our expedition has as yet produced no new evidence for the date of these changes, they are likely to be truly “Hellenistic” in the sense that they are subsequent to and somehow connected with the Macedonian conquest of southern Greece. Perhaps Halai expanded and prospered in the Hellenistic period because it was a regular stopping point for Macedonian military shipping connecting the major Macedonian port at Demetrias on the Gulf of Pagasae with Chalcis and Corinth. The importance of these three ports, and the sea route they controlled, is emphasized by their designation from at least the time of Philip V (221–179 B.C.) as the “fettters of Greece” (Polyb. 18.11.4–7).

Our investigations of Hellenistic levels in 1992 took place mainly in Areas C and H (Figs. 1, 2, 9, 20). Evidence has now emerged for a cross-street bisecting the main axial northwest–southeast road that passes through both areas near their southeast sides (Fig. 9). The cross-street was about 2.5 m wide and bordered by stone curbs. In Late Roman times the stretch of cross-street in Area H was blocked by a building, Room 5, of which parts of two walls have been excavated, meeting at a right angle (Fig. 2, “Late Roman Building”; see below, “Late Roman Period”).

Trench C1 produced an extensive deposit of pottery and other household artifacts. Almost all of these appear to predate the destruction of the Hellenistic town by Sulla’s forces in 85 B.C., as attested by Plutarch (*Sulla* 26) and tentatively recognized by our expedition in 1990–1991.<sup>50</sup> In trench H8, on the other side of the main road, a newly excavated room (Room 16; Fig. 9) was filled with Hellenistic material dating to the time of its use and subsequent destruction; the walls of the room were encountered almost immediately beneath the modern surface and no significant traces of occupation in Roman times are evident.

42. Goldman 1940, p. 454.

43. Pace Ellett 1995, pp. 74–76.

44. Roadbeds datable to “the fifth and first half of the fourth century” were also found at the eastern corner of the acropolis near the Northeast Gate by Goldman (1940, p. 396). Finds from the cemetery (e.g., Goldman and Jones 1942) suggest that the town continued in use, even if there is little evidence of activity on the acropolis.

45. Goldman 1940, p. 396.

46. Goldman 1940, pp. 478–487.

47. Goldman 1940, p. 481.

48. Goldman 1940, p. 481.

49. Goldman 1940, p. 396.

50. Cf. Coleman 1992a, p. 276.

Figure 20. Areas C and H (1992),  
northeast at top



It is now clear that the cross-street and many of the buildings in Areas C and H were used primarily in the Hellenistic period and that significant reoccupation was long in coming after the destruction we provisionally assign to Sulla. No layers of Early and Middle Roman date have yet been distinguished and stray finds from those phases, although present,<sup>51</sup> are scanty. The Late Roman building just mentioned that blocks the cross-

51. Carr 1992, pp. 282–284.

street in Area H is the only substantial structure in Areas C and H, apart from tombs, that may so far be securely dated later than the time of Sulla.

Six movable objects representative of the finds from Hellenistic Halai are catalogued here: four loomweights, a lamp, and an amphoriskos. The stamps on loomweights 24–26 are of particular interest, since, as Yielding first observed, they were made by sheep or goat astragali.

**24 Terracotta loomweight** Fig. 21  
H5b(16)111 (H91-451).

Circular, flat, disklike. Intact. D. 0.104, Th. 0.025, Wt. 310 g. Two piercings, each D. 0.008, near edge. Stamped, approximately in center of one face, with the side of a sheep or goat astragalus (ankle bone), L. 0.041. Although stamps like the one on this loomweight are sometimes thought to represent dolphins (e.g., Goldman 1940, p. 513, no. 39; Coleman 1992a, p. 282, no. 1), Yielding observed in the summer of 1994 that they must come from sheep or goat astragali. Figure 21 includes an astragalus from Neolithic levels as a model for the stamp. Cf. 25–27.

**25 Terracotta loomweight**

F6b(03)7 (H91-534). Circular, flat, disklike. Intact except for a few small chips. D. 0.113, Th. 0.023, Wt. 375 g. Two piercings, each D. 0.006, near edge. Stamped, approximately in

center of one face, with the side of a sheep or goat astragalus, L. 0.027.

**26 Terracotta loomweight** Fig. 21

H5b(14)88. Circular, flat, disklike. D. 0.111, Th. 0.024, Wt. 350 g. Two piercings, each D. 0.008, near edge. Stamp impression from the dorsal surface of an astragalus; Figure 21 includes an astragalus from Neolithic levels as a model.

**27 Terracotta loomweight**

H3a(01)4a (H90-58). Circular, flat, disklike. Intact, chipped edge. D. 0.125, Th. 0.300, Wt. 570 g. One piercing, D. 0.012, near edge. Stamp impression of shell, W. 0.015, off center on one face.

**28 Lamp**

Fig. 22

C3c(45)163 (H92-904). Broken, handle missing. L. 0.150, H. 0.031, D. 0.054. Grayish clay with black glaze, somewhat flaked. Molded with

**Figure 21. Hellenistic loomweights (24, 26), with inserts showing knucklebones**

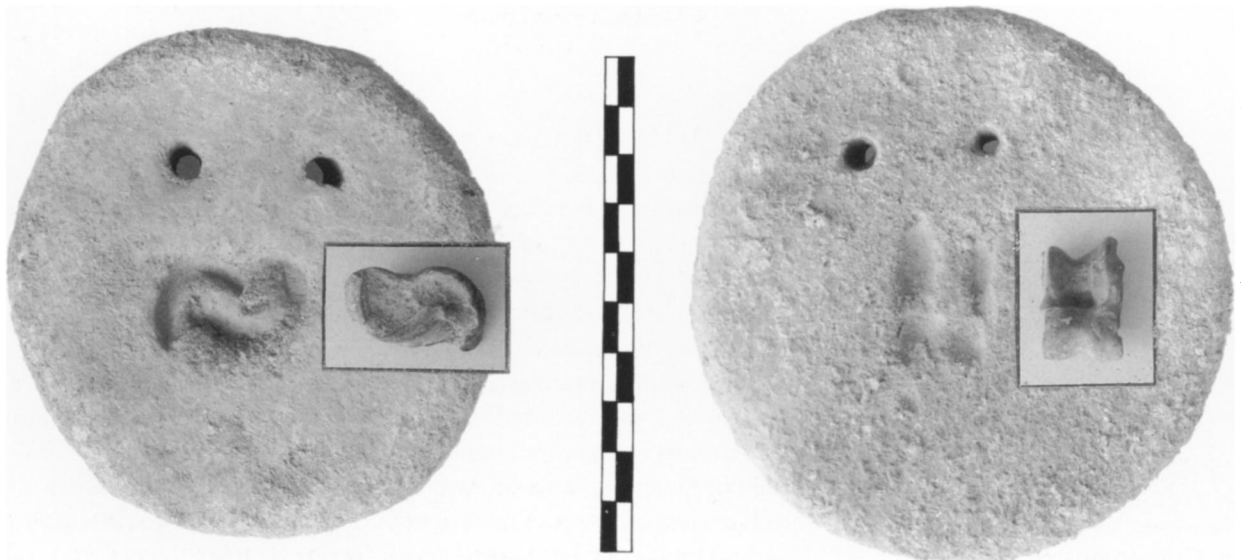




Figure 22 (*above*). Hellenistic lamp (28)



Figure 23 (*right*). Hellenistic amphoriskos (29)

flat bottom and rounded sides. Profile of deep rounded body, from the base of the rim to the flat bottom, measures H. 0.025, D. 0.054. Long pointed nozzle, L. 0.045, with large, oval wick hole. Cf. Coleman 1992a, p. 282, nos. 2–4 and pl. 74. Probably 1st century B.C.

#### 29 Amphoriskos Fig. 23

H7c(15)87. Nearly complete; missing one handle, mended from many pieces. H. 0.174, D. 0.13,

D. base 0.058, D. rim 0.07. Fine, nonmicaceous clay, light reddish brown in color (Munsell 5YR 6/3). Surface with lustrous brown (Munsell 7.5YR 5/4) slip, not very carefully applied toward the foot. Handles with two vertical grooves from base of rim to shoulder. Flaring rim with sharply profiled lip. Plum-shaped body with flowing curves. Two fine, raised ridges separate the neck from the body at height of shoulder. Raised spiraling flutes on body.

### LATE ROMAN PERIOD

52. For more extensive treatment see Quinn 1996, focusing both on the existing remains and information preserved in the excavation notes and photographs of the Goldman/Walker expedition. The Late Roman period is conventionally dated A.D. 350–650, e.g., Alcock 1993, p. 36.

53. The basilica is mentioned briefly in Walker and Goldman 1915, pp. 422, 433 and in Goldman 1940, p. 432, where it also appears on the plan of the site. Cf. Coleman 1992a, p. 277.

Recent attention has focused on the basilica church in Area G and the remains of the latest structures in Area H.<sup>52</sup> A test trench (G2) was excavated in 1992 near the eastern end of the basilica (Figs. 2, 24, 25).<sup>53</sup> A mosaic floor was uncovered in the bema approximately 0.30 m below the modern ground surface (Figs. 26, 27). The full dimensions of the mosaic are not yet known, but it continues farther west and south into the bema area and east into the apse beyond the limits of the trench; its northern boundary appears to be the stylobate for the northern colonnade wall (Wall BS/BW), as no continuation was found in the northern aisle.

The mosaic is made of small tesserae of natural stone, glass, and faience. It comprises at least four figured panels framed by an outer border of mul-

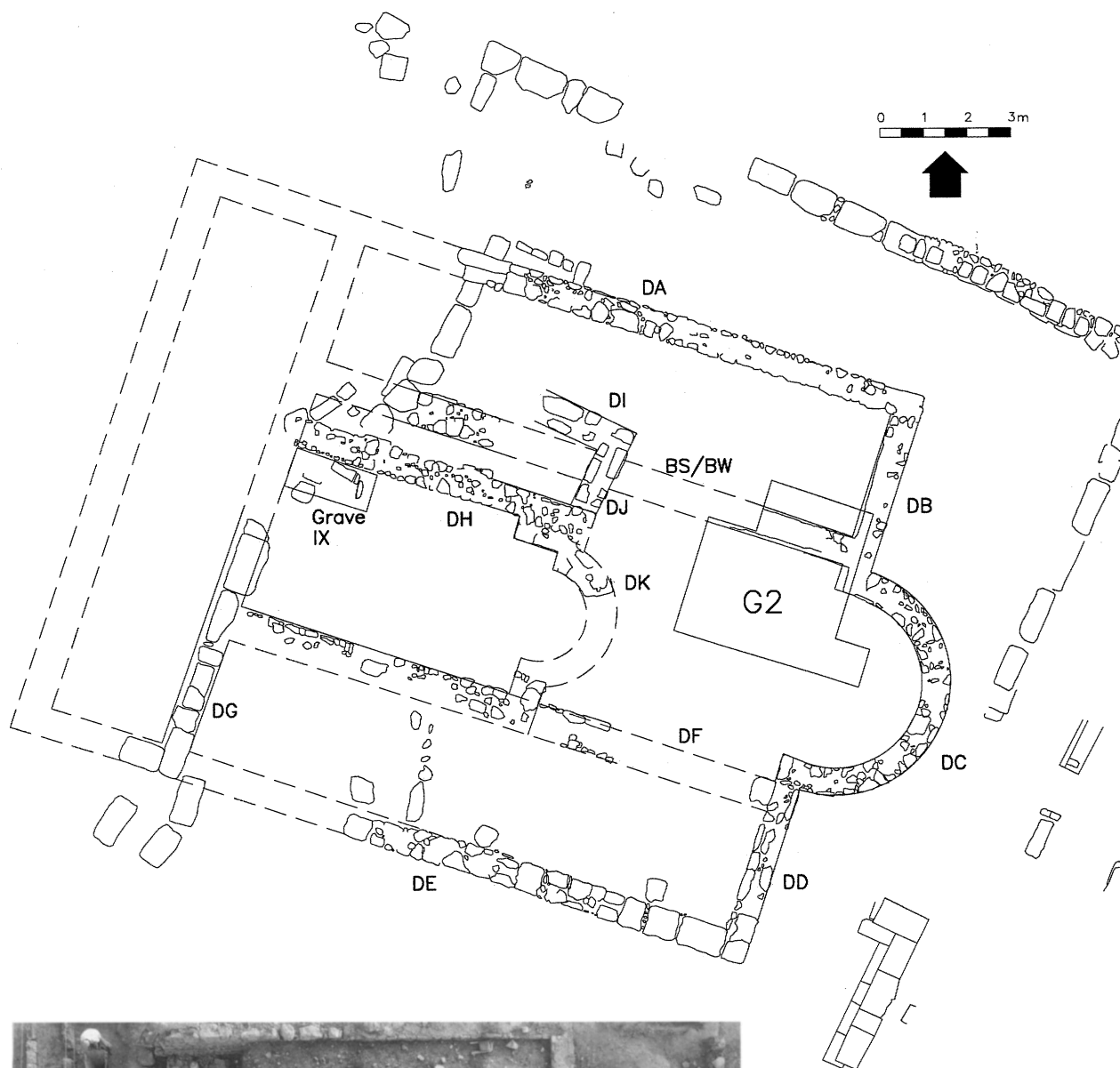
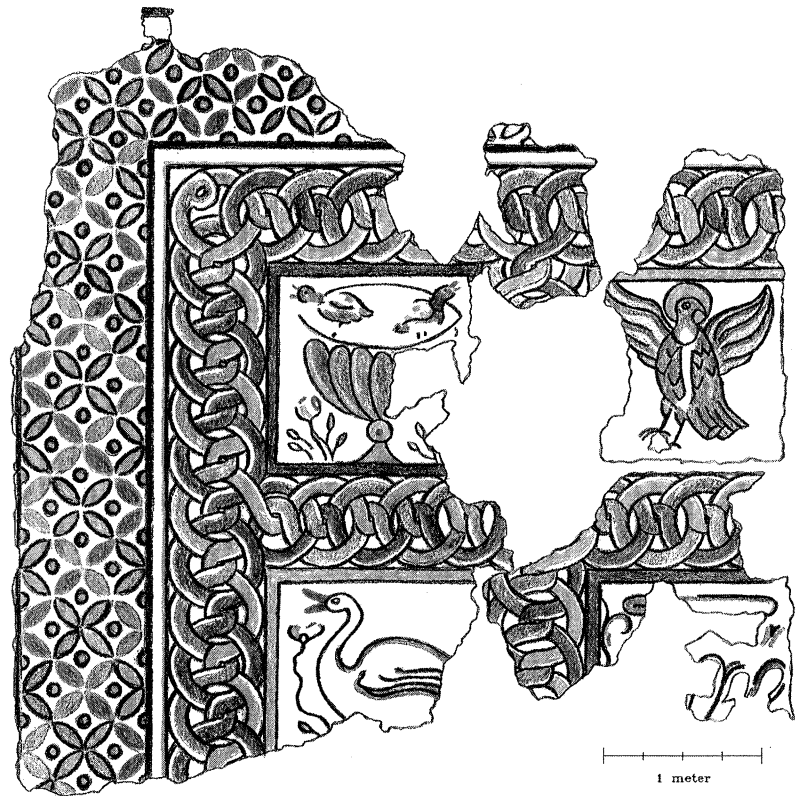


Figure 24. Plan of Area G showing churches



Figure 25. Area G showing churches (1992), north-northeast at top

Figure 26. Mosaic from the Late Roman church



54. For parallels, see the early-5th-century mosaics in the nave of Basilica Alpha at Demetrias (Spiro 1978, p. 393) and the basilica at Arkitsa (Spiro 1978, p. 267), and the mid-5th-century Medusa mosaic at Ephesos (*Ephesos* VIII, ii, p. 100).

55. Cf. parallels on late-5th- or early- 6th-century mosaics at Paleopyrga near the ancient theater of Argos (Spiro 1978, p. 125) and in the nave of the Late Roman basilica at Delphi (Spiro 1978, p. 239).

56. Spiro (1978, p. 61) notes that field designs with floral and faunal motifs do not appear in mosaics of mainland Greece until the mid-5th century A.C. Lifelike, three-dimensional figures are common in the mid-5th-century examples, while two-dimensional representations are more characteristic of the late 5th and early 6th centuries (Spiro 1978, p. 210). For initial parallels and dating of our mosaic we are indebted to Laura D. Steele (unpublished paper).

57. We are indebted to Helen Papademetriou and Tina Petrihou for preliminary architectural observations made in an unpublished field report (1993).

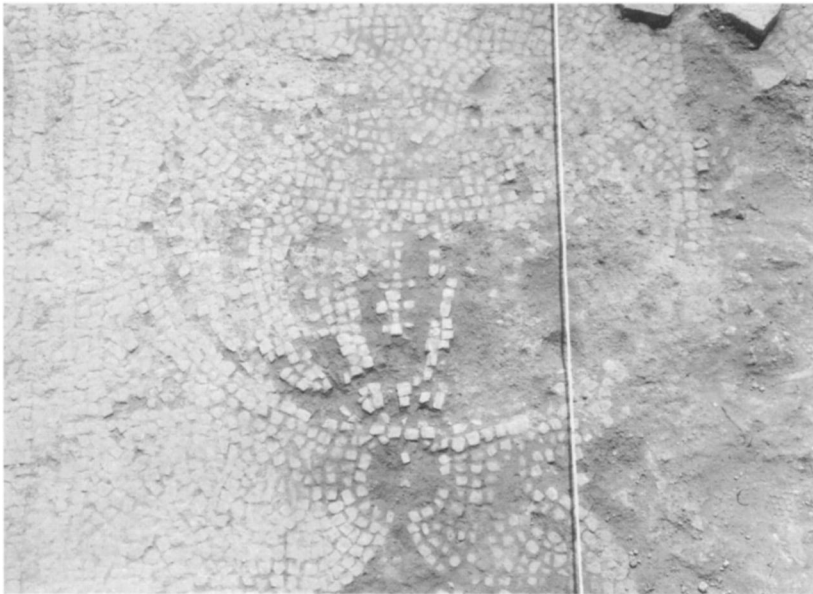
ticolored intersecting circles (light gray, red, and yellow) forming quatre-foils set on edge and inscribed with small yellow circles.<sup>54</sup> A black fillet border and a white band border follow this outer frame. In the central field of the mosaic the figured panels are separated from one another by a chain of interlacing circles of various colors (light gray, red, yellow, and blue).<sup>55</sup> The panels are oriented to the east. The subjects of three of the four panels can be identified: a goose or swan, a krater with birds within it (Fig. 28), and, near the central axis of the basilica, an eagle with a halo. Comparison with mosaics elsewhere with similar stylistic and thematic content suggests a late-5th- or early-6th-century date for the mosaic.<sup>56</sup>

Excavations in trench G2 also unearthed fragments of painted plaster or fresco, hundreds of glass sherds, and numerous nails in the earth above the mosaic. A small marble column was also found in the northern aisle of the basilica near Wall BS/BW. Because of its diminutive size and location near the bema of the basilica, the column may have decorated the chancel screen that would have separated the bema from the nave.

Study of the basilica continued during the summer of 1993.<sup>57</sup> Its foundation walls are rubble masonry of limestone and tiles held together by lime plaster with inclusions of sand, shells, and small pebbles. The foundation walls are visible on all but the western side of the basilica. A few blocks of the upper courses of the walls remain on the north, south, east, and southwestern sides. The ashlar masonry of these upper courses is augmented in a few places by small stones and tiles bonded with plaster. The plaster coats most of the blocks of the upper courses in their entirety, on both exterior and interior surfaces. Linear and figural designs, including



**Figure 27. Late Roman mosaic in nave of basilica from west**



**Figure 28. Mosaic panel with birds in chalice**

the representation of a fish, are incised into the plaster on the outer surface of Wall DE and on the interior of the apse.

The basilica had a narthex at its western end.<sup>58</sup> Its southern wall (Wall DE) protrudes to the west of Wall DG, the preserved western wall of the nave. From photographs taken during the Goldman/Walker excavations at Halai, it is clear that the narthex extended the full width of the basilica (see Fig. 24, broken lines). Large, upright blocks in several of the photographs suggest the door frame for a single, central entrance into the narthex. The photographs indicate that the narthex wall was constructed of rubble foundations with upper courses of ashlar masonry augmented with smaller stones like that of the surviving foundations and walls of the basilica. Goldman's notes and photographs also show that the narthex and nave of the basilica were paved with large, rectangular blocks.<sup>59</sup>

58. Cf. Quinn 1996, pp. 61–67.

59. A typed transcript of the Goldman expedition's 1913 excavation notes describes the floor of the narthex and nave as being constructed of "large marble blocks, poros column bases," and miscellaneous building stones. None of these large marble blocks survives on the site today.



Further excavation is necessary before the architectural phases of the basilica can be fully understood. There is already much evidence, however, that it went through different periods of use. For instance, the northern aisle stylobate (Wall BW), built of the same materials as the other walls of the basilica, seems to have had a second, thinner wall (Wall BS) built on top of it. Wall BS was constructed of small stones and tiles bonded with plaster and was probably not intended to be load-bearing. It may have served to seal off the northern aisle from the nave during a late building phase when only the nave was in use. The suggestion that the aisles were not used during later phases of the church would also explain why there was no floor level in the northern aisle corresponding in level with that of the mosaic in the nave.<sup>60</sup> The basilica was probably abandoned in the late 6th or early 7th century, since there are no remains at the site dating between the Late Roman period and the later years of the Byzantine period.<sup>61</sup>

Previous excavation in Areas C and H had revealed several Hellenistic buildings and a cross-street (bounded by Walls AA and AB/AC) of the same period running perpendicularly to the main east-west road.<sup>62</sup> Additional digging in Area H during 1992 exposed parts of the northeast and northwest walls of a building designated Room 5 in trench H6 (Fig. 2, "Late Roman Building"). The walls, of rubble masonry typical of the Late Roman period, are built over the southern branch of the cross-street and are at a higher stratigraphic level than the excavated street surface. This suggests that the cross-street was no longer in use during the Late Roman period. Room 5 contained a sealed ceramic deposit below a large tile fall in the southern part of the room. The pottery can be dated to the Late Roman period on the basis of the many examples of combed ware and grooved ware sherds.<sup>63</sup>

Excavation in trench H7 revealed a large tomb (Grave VII) of limestone blocks with a gabled vault (Figs. 2, 29–31). Its precise stratigraphic relationship to Room 5 just discussed could not be determined because of the proximity of both structures to the initial ground surface. The interior dimensions are 2.37 m × 2.20 m and the maximum height is about 1.37 m. The floor is paved with flat terracotta tiles. A mass of concrete binds the exterior of the gable together. Entrance to the tomb was gained through an antechamber adjacent to the eastern end. This subterranean chamber led to a doorway at the eastern end of the tomb. When found, the antechamber was sealed by three large limestone blocks resting on earth filling up the antechamber. The top surfaces of these blocks was at the same level as those of the antechamber walls.

The scattered condition of the skeletal remains and the almost complete lack of grave goods suggests that Grave VII was looted in antiquity, probably through the antechamber, as this is the only means of entry to the tomb. However, fifteen lamps found in a pile in the southwest corner of the antechamber (Fig. 30) were undisturbed and two more were found in the tomb chamber itself. They date to the 5th or 6th centuries and almost all are of the Late Roman North African variety (or local imitations). Most of the lamps are decorated with Christian symbols, particularly *chi-rho* monograms and crosses. All have blackened nozzles, indicat-

60. A similar situation exists at the Late Roman church at Acrocorinth, excavated by Carl Blegen in 1926. This church, dating to the 4th and 5th centuries, consisted of a nave, two aisles, and a shallow apse of dimensions similar to the Halai basilica. Blegen believed that at a later stage of use the aisles of the basilica were closed off with walls constructed along the line of the original aisle colonnades; see *Corinth III*, i, pp. 4–24.

61. A follis of Leo VI (A.D. 886–912) is the only object from these intervening periods found by the Goldman/Walker excavations (Quinn 1996, pp. 101–102).

62. Coleman 1992a, pp. 276–277.

63. Jacquelyn Collins-Clinton, unpublished field report on the Hellenistic and Roman pottery (1993).



Figure 29. Area H, Grave VII  
from east



Figure 30. Area H, Grave VII,  
antechamber with lamps in situ,  
southwest at top

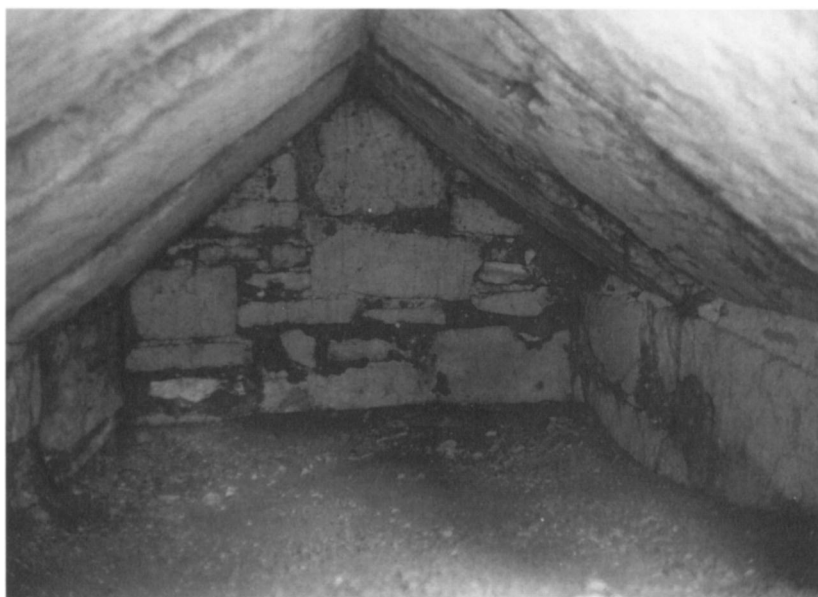


Figure 31. Area H, Grave VII,  
interior from east

Figure 32. Late Roman lamps (30,  
31) from antechamber of Grave VII



ing that they were used. Preliminary examination of the scattered skeletal remains from Grave VII suggests that it contained the burials of at least twelve people.<sup>64</sup> A single gold earring had also escaped the notice of the ancient looters.

### 30 Lamp

H92-716 (H7c(34)172).  
Antechamber, Grave VII. Intact except for minor chips and abrasions, primarily on knoblike handle. L. 0.127, W. 0.076, H. 0.032, H. with handle 0.06. Reddish brown terracotta with dark reddish brown glaze, coarsely applied. Round lamp

### Fig. 32

with extended nozzle, not clearly set off from body. Discus with jeweled cross combined with a *rho*.  
North African, 6th century A.C.

### 31 Lamp

H92-724 (H7c(934)180).  
Antechamber, Grave VII. Intact except for minor chips. L. 0.13,

### Fig. 32

64. Smith 1993.

W. 0.076, H. 0.033, H. with handle  
0.06. Brownish ocher terracotta with  
brownish red glaze, coarsely applied.  
Round lamp with extended nozzle,

not clearly set off from body. Discus  
with Greek cross.

North African, 6th century A.C.

Two other graves were found in Area H. Grave V, a small tile grave of a child found south of and parallel to Grave VII (Fig. 2), was devoid of offerings (Figs. 33, 34). It probably dates to the same period as Grave VII based on its location directly south of and parallel to the larger tomb. Another tile grave (Grave I) was found in the northern extension of trench H5. A grooved tile served as a cover piece. The alignment of this grave



Figure 33. Area H, Grave V with cover in situ from above, south at top



Figure 34. Area H, Grave V, burial level from above, south at top

parallels that of the two other tombs but Grave I is located between the walls that served as boundaries for the cross-street (Walls AA and AB/AC). Hence, it clearly postdates the use of the cross-street.

The main east–west street may have served as a boundary between the secular and sacred components of the site during the Late Roman period. Goldman and Walker record the presence of many late period buildings on the northern half of the acropolis, and remnants of *opus spicatum* pavements that they excavated can be seen in Areas A, D, and E.<sup>65</sup> In contrast, the area south of the main road has yielded features of religious importance dating to the 5th or 6th centuries, including the large basilica and numerous tombs (most of which surround the basilica) in addition to the building of unknown function in Area H.<sup>66</sup>

Study of the remains in Area E suggests that the structure near the northeast corner of the acropolis described by Goldman as a Late Roman bath<sup>67</sup> may in fact have been an olive press and associated facilities.<sup>68</sup>

## BYZANTINE PERIOD

The Byzantine period at Halai is represented by a small chapel located within the Late Roman basilica in Area G (Fig. 24),<sup>69</sup> which by then was in ruins. The chapel consists of the foundations and walls of an apse and nave. Part of the south colonnade wall of the basilica (Wall DF) serves as the south wall of the chapel. In contrast, the north wall (Wall DH) appears to have been built specifically for the chapel; it is constructed of tiles, mortar, and stones arranged in a rough approximation of Byzantine cloisonné masonry.<sup>70</sup> Two buttresses built in the cloisonné style survive on the exterior of Wall DH. The apse has been identified and reconstructed from the few remaining stones laid out in an apsidal shape (Wall DK) at the eastern end of the chapel. A small structure attached to the north wall (DH) of the Byzantine chapel and delineated by Walls DI and DJ overlies the north colonnade wall (Wall BS/BW) of the Late Roman basilica. Only the two walls of this structure remain, and its purpose is unclear.

During the 1993 study season, remains of a tomb were uncovered inside the Byzantine chapel as a result of erosion during the preceding year. The tomb (Grave IX; Figs. 24, 35) was located at the west end of the chapel abutting and parallel to Wall DH. To prevent further damage to the exposed remains a rescue excavation was approved by the Ephoreia. The tomb was lined with stones and contained a single burial. No cover slabs were found, but blocks forming the walls of the tomb remain on the north, east, and south sides; the west side had evidently been destroyed by the Goldman excavations. The head of the body was positioned at the west end of the tomb. The left arm was preserved to the elbow and lay extended at the side of the body; the right arm rested across the chest. Preliminary observation suggests that the body is that of a young male.<sup>71</sup> Artifacts found with the body included a few fragments of black-glazed Hellenistic pottery, Roman combed ware, Byzantine yellow-glazed pottery, several pieces of glass, and one small coin depicting an obscured frontal figure with a raised hand. The orientation of Grave IX parallel to and

65. Quinn 1996, p. 82.

66. Quinn 1996, pp. 97–100.

67. Goldman 1940, p. 490. The interpretation of the structure as a bath seems to have rested on the evidence of tanks, a “stove,” and brick pilasters to support an upper floor.

68. Quinn 1996, pp. 83–97. The main evidence for this interpretation is the presence of a large stone press found above the remains of the earlier Hellenistic tower (visible in Coleman 1992a, pl. 74:d, toward the upper right). The dating of the press is difficult because the Goldman/Walker notebooks report a jumble of late walls crisscrossing the area; Goldman, however, believed that this facility was later in date than the Early Roman shops she discovered in the area to the south (Goldman 1940, pp. 487–490).

69. Goldman refers to this chapel as Turkish (Goldman 1940, p. 432), but the only clearly Turkish object she found at Halai is a seal from a cemetery she and Walker excavated outside the acropolis proper (see Quinn 1996, p. 110).

70. This type of masonry was popular from the late 10th century onward in Greece and involves framing square stones between horizontally and vertically placed bricks or tiles. See Krautheimer 1975, p. 376.

71. D. le Berrurier, personal communication, July 1993.



Figure 35. Grave IX in Byzantine chapel

abutting the north wall of the chapel suggests that the body was interred after the construction of the wall, perhaps beneath the floor of the chapel. A flat row of tiles protruding from the chapel wall just above the grave may mark the position of the floor.

During the later centuries of the Byzantine period (particularly from the 12th to the 14th centuries) aisleless buildings similar to the Halai chapel were used primarily as local village churches or funerary chapels.<sup>72</sup> While the recent investigations have yielded only a few clues to help date the chapel, Goldman's records reveal a cluster of Byzantine material in the southwestern end of the acropolis around the chapel. These artifacts include nine coins of Manuel I (A.D. 1143–1180); several deposits of Byzantine green-glazed pottery (ca. 13th century) and Byzantine yellow-glazed pottery (ca. 12th–13th centuries);<sup>73</sup> and at least two other graves of Byzantine date.<sup>74</sup>

## CONSERVATION

A conservation plan for overall preservation and display of the fenced-in part of the acropolis (Fig. 36)<sup>75</sup> is briefly mentioned here as an example that other archaeological projects may find helpful. The plan, the details of which have been fully approved by the Greek authorities, calls for what may be the largest backfilling operation of archaeological remains ever attempted in Greece. Halai requires drastic conservation measures because of its proximity to the sea. Seawater has penetrated the whole site and has had damaging effects on the local limestone that comprises the principal material of the surviving architectural remains. This is particularly evident from the crumbling condition of many of the building stones left exposed by the excavations of Goldman and Walker. Freezing in winter also contributes to the deterioration of the stones.

Many of the trenches excavated long ago by Goldman and Walker

72. Krautheimer 1975, p. 441.

73. Cf. *Corinth* XI, p. 36.

74. Numbered G30 and G31 in Quinn 1996, p. 112.

75. This plan, which comprises both a verbal description and a drawing, owes much to preliminary studies on the condition of the site by Martha Demas in 1991.

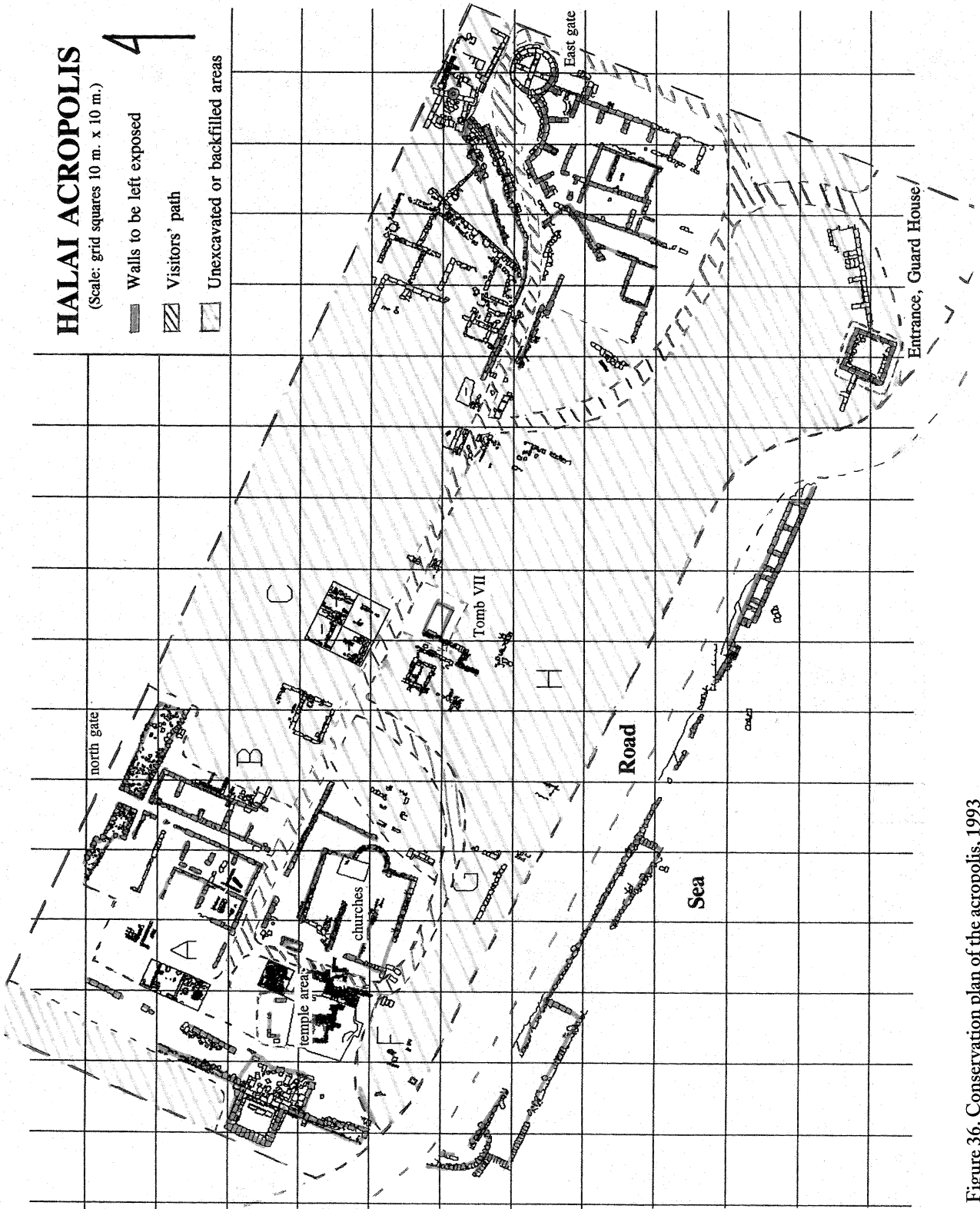


Figure 36. Conservation plan of the acropolis, 1993

and some of those excavated more recently by our expedition are to be backfilled until the architectural remains within them are completely covered. The lowest 0.10 m of fill is gravel, with earth above it. After such backfilling, any excess water from precipitation that is not absorbed by the soil will generally drain away from the acropolis. Some walls and features will be left partially visible for visitors to the site, but for protection even these will be backfilled to the level of the topmost course or two of stones. A system of drainage channels will be established to carry off excess water from precipitation from the areas left open. Most of the earth for backfilling must be brought in from outside the acropolis, although new trenches excavated by the Cornell University expedition will be backfilled with the earth that was removed from them during excavation, since this has been retained on the acropolis itself.

The conservation plan was approved by the Greek Archaeological Service in the spring of 1994 and backfilling of the fortifications and other structures near the east corner of the site (Areas E and K) began in the summer of 1994. We expect to continue backfilling much of the site in the years to come.



# APPENDIX 1

## NEOLITHIC CHIPPED STONE ARTIFACTS

**TABLE 3.**  
**RAW MATERIALS**

	<i>Obsidian</i>		<i>Chert</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Stratum 1	56	77	17	23
Stratum 2	233	87	34	13
Stratum 3	160	96	6	4
Total	449	89	57	11

After three seasons of excavation, the Neolithic chipped stone assemblage from Halai numbers thousands of pieces of obsidian and chert. This report focuses on a representative selection of 506 pieces: 442 from the north-west section of the east quadrant of trench F2, a column of earth whose stratigraphic integrity seems secure and which spans the entire period of occupation of Halai during the Neolithic; and sixty-four pieces from a column of earth in the nearby trench F4, whose stratigraphy corresponds to that of F2.<sup>76</sup> The pieces are analyzed with regard to material, technology, and typology. A representative selection is illustrated in Figure 37.

Of the 506 pieces in the assemblage, 449 are obsidian (89%), and 57 are chert (11%) (Table 3).<sup>77</sup> As reported earlier,<sup>78</sup> a significant quantity (163 pieces, or 32%) of the lithics from Halai are tiny pieces recovered from the heavy fraction of floated soil.<sup>79</sup> As a result of this intensive recovery method, the percentage of debris in the Halai assemblage is much higher than in the assemblages from many other Neolithic sites.<sup>80</sup> The scrupulous recovery of even the tiniest pieces of chipped stone will eventually pay dividends in the analysis of the entire assemblage. The remaining pieces, except for two core fragments, can be divided by blank into

76. For the division into strata see the first part of this report. Since the pieces studied here are a small proportion of the total assemblage and were recovered from a very localized area within the site, conclusions must be regarded as provisional. Since the later levels in trench F2 had been removed by the Goldman expedition, our excavations started in Neolithic levels. For chipped stone in historic levels at Halai and Elean Pylos see note 26 above.

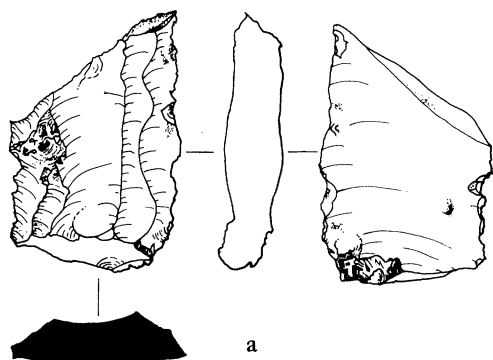
77. The figures for the LN Kitsos Cave assemblage (Perlès 1981) reflect an even greater preference for obsidian (97.55%) over other materials (2.45%). The LN assemblage at Skoteini,

Tharrounia (Perlès 1993), too, is dominated by obsidian (95%). By contrast, obsidian represents only 12% of the assemblage from the EN stratum in the Franchthi Cave (*Franchthi* 5, p. 95).

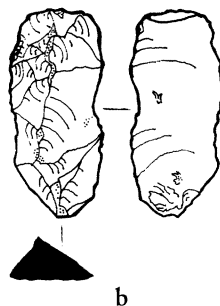
78. O'Neill and Pomeroy 1992.

79. See Appendix 3 for an explanation of the procedures and methodology of the flotation of excavated soil at Halai.

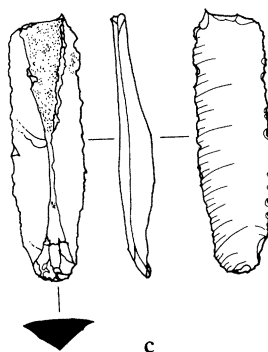
80. The term "debris" encompasses the by-products of debitage, usually pieces without discernible bulbs, platforms, etc. (Kardulias and Runnels 1995, pp. 78–79), and includes tiny pieces (as small as 0.1 × 0.1 cm) that could be produced by deliberate retouch, incidental use-wear, or accidental abrasion.



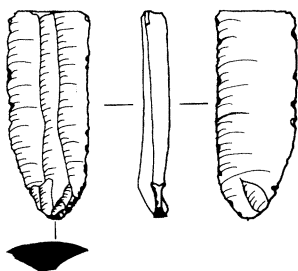
a



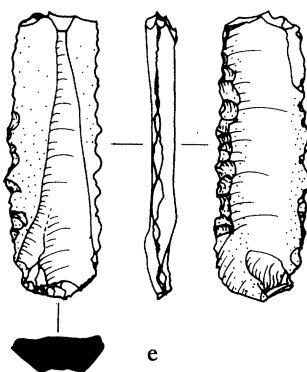
b



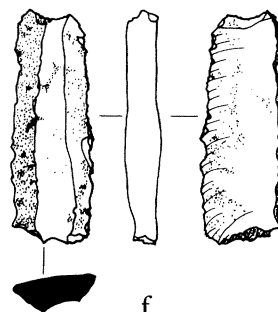
c



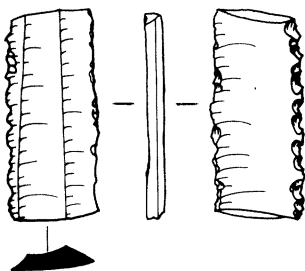
d



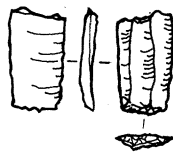
e



f



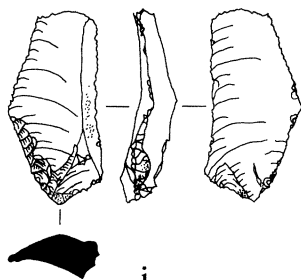
g



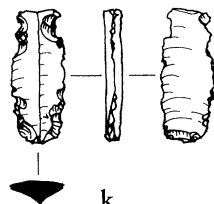
h



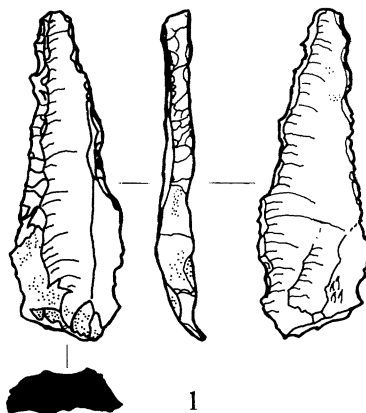
i



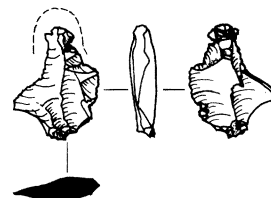
j



k



l



m

Figure 37 (*opposite page*). Examples of Neolithic chipped stone tools: (a) core fragment, F4c(32)31; (b) crested blade, F2c(114)182; (c) blade, F4c(36)53; (d) blade, F2c(114)182; (e) chert sickle element, F2c(115)192; (f) chert sickle element, F2a(4)81; (g) obsidian sickle element, F2c(117)212; (h) truncated point, F2c(115)194; (i) end-scraper, F2c(128)227; (j) scraper, F2a(13)78; (k) notched piece, F4c(35)45; (l) chert pointed piece, F2c(107)155b; (m) drill, F2a(6)41. Scale 1:1

TABLE 4. ANALYSIS OF FLAKING TECHNOLOGY<sup>81</sup>

	<i>Blade Pieces</i>		<i>Flake Pieces</i>		<i>Debris</i>		<i>Core Frags.</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Stratum 1	31	42	18	25	24	33	0	0
Stratum 2	95	35.6	85	31.8	86	32.2	1	0.4
Stratum 3	56	33.7	56	33.7	53	32	1	0.6
Total	182	36	159	31.4	163	32.2	2	0.4

TABLE 5. TOOL TYPES BY STRATUM<sup>82</sup>

<i>Tool Types</i>	<i>Stratum 1</i>	<i>Stratum 2</i>	<i>Stratum 3</i>	<i>Total</i>
Retouched	6	6	3	15
Pointed piece	0	1	0	1
Drill	0	1	1	2
Projectile point	0	0	1	1
Truncated	0	0	2	2
Notched	0	3	3	6
Sickle element	0	3	1	4
Pièce esquillée	0	1	1	2
Scraper	0	0	2	2
End-scraper	0	2	0	2
Totals	6	17	14	37

81. The identification and analysis of cortical flakes within this group is as yet incomplete.

82. For the most part, all these tool types match those from Kitsos and Franchthi, but I did not employ the various subdivisions of retouched pieces that Perlès employed in her Kitsos publication (1981). I have, however, separated drills from pointed pieces. In this report, a drill is a tool that has clearly been employed to bore holes and has extensive traces of rounding and crushing on its point, whereas a pointed piece exhibits wear on only one side of the point. In addition, I also distinguish between scrapers and end-scrapers.

83. With the exception of debris, all lithics are measured for length, width, and thickness.

84. The balance between blade and flake production at Halai is markedly different from the EN production at Franchthi (*Franchthi* 5, p. 97) and LN Saliagos (Evans and Renfrew 1968, pp. 46–62), both of which heavily favored flake production (90% flakes, 10% blades). By contrast, at the Kitsos Cave, blade production was favored (39% flakes, 61% blades); see Perlès 1981, p. 146.

85. No sickle elements were identified at Saliagos; see O'Neill and Pomeroy 1992, p. 281 and note 31.

blade pieces (i.e., blades or blade tools) and flake pieces (i.e., flakes or flake tools).<sup>83</sup> Blade pieces number 182 (36%) and flake pieces number 159 (32%) (Table 4).<sup>84</sup>

There are thirty-seven tools (7.3%) in the assemblage. Of these, twenty-eight are obsidian (75.7%), and nine are chert (24.3%). Obsidian tools make up 6.2% of the total number of obsidian pieces, while chert tools make up 15.8% of the total number of chert pieces. Ten different tool types are represented: projectile point, pointed piece, drill, truncated piece, notched piece, sickle element, pièce esquillée, scraper, end-scraper, and retouched piece (Table 5). There are nine obsidian tool types and four chert tool types. These overlap with one exception. There is one pointed piece in the assemblage and it is chert. The most common category of tools is that of retouched pieces (fifteen examples); this miscellaneous group comprises pieces with only slight retouch that do not fit into any of the other types. The next most common tools are notched pieces (six examples) and sickle elements (four examples). Three of the sickle elements are chert, all displaying traces of silica gloss on at least one edge. The obsidian sickle element does not exhibit the dulling or matte finish that results from cutting plant stems. The identification of these sickle elements is of particular interest because, at the time of our previous preliminary report, only one sickle element had been identified, leading us to draw comparisons with Saliagos.<sup>85</sup>

**TABLE 6.**  
**TOOLS BY MATERIAL**

	<i>Obsidian</i>		<i>Chert</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Stratum 1	4	67	2	33
Stratum 2	12	71	5	29
Stratum 3	12	86	2	14
Total	28	76	9	24

**TABLE 7.**  
**TOOLS BY BLANK**

	<i>Blade Tools</i>		<i>Flake Tools</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Stratum 1	4	67	2	33
Stratum 2	11	65	6	35
Stratum 3	5	36	9	64
Total	20	54	17	46

Stratum 1, the earliest stratum, has only seventy-three pieces. Seventeen of the pieces are chert (23%). The other fifty-six pieces are obsidian (77%). This stratum yields no core fragments, but there are twenty-four pieces of debris (33%). Here, there does appear to be a preferred blank; there are thirty-one blades or blade tools (42%), and eighteen flakes or flake tools (25%). There are six tools (8%), all retouched pieces (Table 6). Two (33%) of these six tools are chert. Four of the tools are made from blades (67%), and two from flakes (33%) (Table 7).

Stratum 2, the largest, has 267 pieces. Of these, thirty-four are chert (13%); the other 233 pieces are obsidian (87%). There is a core fragment, and the breakdown of the rest of the pieces is as follows: eighty-six debris (32%), eighty-five flakes or flake tools (32%), and ninety-five blades or blade tools (36%). There are seventeen tools of seven different types in this stratum (6%). Five of these are chert (29%) (Table 6). Eleven of the tools have blades for blanks (65%), and six have flakes (35%) (Table 7).

Stratum 3 yielded 166 pieces. Only six of these pieces are chert (4%), and the other 160 are obsidian (96%).<sup>86</sup> There is one core fragment, and fifty-three pieces are debris (32%). The rest of the pieces from this stratum are evenly split between fifty-six flakes or flake tools (34%), and fifty-six blades or blade tools (34%). There are fourteen tools in stratum 3 (8% of the total number of pieces) of eight different types. Just two of these tools are chert (14%) (Table 6).<sup>87</sup> Of the fourteen tools, five are made from blades (36%), and nine have a flake as their blank (64%) (Table 7).

The data from the analyses by stratum of this assemblage indicate that the use of chert was at its peak during the earliest phase of occupation at Halai.<sup>88</sup> The percentage of chert declines sharply from stratum to stratum. Moreover, while the percentage of tools (as opposed to blanks or debris) remains constant for each stratum, the percentage of tools made from chert drops sharply from stratum 2 to stratum 3.<sup>89</sup> The statistics also reflect another major change between stratum 2 and stratum 3. Whereas two-thirds of the tools in stratum 2 are made from blades and only one-third from flakes, these proportions are reversed in stratum 3, with one-third made from blades and two-thirds made from flakes.<sup>90</sup> This change in tool manufacture is not paralleled by patterns in blank production. Stratum 2 yielded a slightly higher percentage of blades, but in stratum 3 there are equal quantities of each type of blank. The largest difference between stratum 1 and the others is the lack of variation in tool types. Stratum 1

86. This percentage is consistent with the proportion of obsidian (over 95%) found in the lithic assemblages at LN sites in what Perlès (1992, p. 146) calls the "direct supply zone" (the Cyclades and coastal sites of southern Greece).

87. At Saliagos, 8.55% of the tools were made from a material other than obsidian. In the Kitsos assemblage, 10% of the tools were not made from obsidian.

88. The same holds true for EN and MN Lerna. Kozłowski, Kaczanowska, and Pawlikowski (1996, pp. 299, 311, 315, 328, fig. 7, and table 12) show that materials other than obsidian slip from 16.9% in Lerna I to 7.6% in Lerna I/II and 8.4% in Lerna II. The phenomenon of a significant increase in the proportion of obsidian and a corresponding decline in the use of local resources has been observed all over southern Greece by the Late Neolithic (Demoule and Perlès 1993, p. 393).

89. Chi-square tests indicate, however, that the probability that this distribution is random is approximately 50%.

90. In this case, a chi-square test suggests that there is a 20% chance that this distribution is random.

91. An increase in the number of tool types during the Neolithic at Halai follows a pattern discernible in the regional survey of the Southern Argolid (Kardulias and Runnels 1995, pp. 90–91, 96).

92. At Lerna, the trend runs in the opposite direction. Flakes predominate in Lerna I, but blades are the dominant group in Lerna I/II and Lerna II (Kozłowski, Kaczanowska, and Pawlikowski 1996, p. 331, and table 11).

yielded only one type of tool, the retouched piece. Stratum 2 has seven different tool types, and stratum 3 has eight.<sup>91</sup>

In conclusion, despite the limited size of this assemblage and the restricted area from which it was collected, some general observations may be made. Obsidian was the preferred material from the earliest occupation of Halai and continued to gain in popularity over chert. In stratum 1, the selection presented here creates the impression that the lithic industry at Halai was dominated by blades. By stratum 3, however, there is an even split between blades and flakes.<sup>92</sup> Strata 2 and 3 have comparable levels of differentiation in tool production, while stratum 1 has only retouched pieces among the tool types. Thus, it seems likely that tool production was less sophisticated, or less specialized, in the earliest of the strata.

*Kerill O'Neill*

COLBY COLLEGE

DEPARTMENT OF CLASSICS

WATERVILLE, MAINE 04901

KNONEILL@COLBY.EDU

## APPENDIX 2

### NEOLITHIC ANIMAL BONES

This summary is based on approximately 3,063 animal bones from Neolithic levels excavated in 1990, 1991, and 1992 in Area F.<sup>93</sup> It does not include bones recovered from the flotation process (both the heavy and light fraction), which are at a preliminary stage of analysis. The material falls within the 6th millennium B.C. and most of it dates to the Middle Neolithic period.<sup>94</sup>

In 1994 a preliminary analysis was carried out to assess the state of preservation and produce a general species and element count. Final analysis began in 1997. Only the material from trench F2 excavated in 1990 and 1991 has been completely studied. The extremely fragmentary nature and poor preservation of this assemblage has meant that only 526 bones (including teeth) could be identified to species, with a much larger number identified under the sheep/goat and cattle size categories (Table 8). Another 303 bone fragments from other trenches excavated in 1990–1992 were identified to species, while 1,147 fragments could not be categorized this way. In this report, all deposits from F2a and F2b have been grouped together.<sup>95</sup> Once the complex stratigraphy has been worked out for the whole site, a detailed analysis of the bones in relation to time period across the site will be presented.

The Halai assemblage as a whole appears to be derived from food preparation and cooking waste as the bones were heavily butchered with visible cut marks and frequent evidence of charring. Consequently, the largest category of bones was that of small fragments that could not be identified to species.<sup>96</sup> Domestic taxa make up the vast majority of animal species in this assemblage, representing 93% of the total number of identified specimens. Sheep/goats predominate with evidence that pigs were also very important food animals. The bones of other animals (i.e., domesticated cattle, dogs and wild mammals, birds and fish) were found in very modest numbers, suggesting that only occasionally were they consumed or their products utilized to any extent.

#### SHEEP AND GOATS

The bones of sheep and goats are notoriously difficult to differentiate morphologically; hence a large number of bone specimens from Halai are

93. For fuller treatment of much of this material see Richards (Yielding) 1994.

94. The radiocarbon dates suggest that the levels so far excavated represent a relatively short time, from ca. 5900 B.C. to 5300 B.C., during which there was little change in the lifeways of the inhabitants; see “Neolithic Period,” above.

95. Only bones from secure Neolithic contexts have been studied. Measurements are not presented in detail in this preliminary report.

96. To compound this problem was the common occurrence of calcareous incrustations and heavy root etching on a large proportion of the sample. Attempts to remove the incrustation with light acids (i.e., weak solutions of hydrochloric acid and ascorbic acid) had very limited success.

TABLE 8. FAUNAL SAMPLES FROM F2A AND F2B IDENTIFIED TO SPECIES AND SIZE

	<i>F2a Frags.</i>	<i>F2b Frags.</i>	<i>Total Frags.</i>	<i>%</i>	<i>Loose Teeth</i>
<b>SPECIES</b>					
Sheep ( <i>Ovis aries</i> L.) and goat ( <i>Capra hircus</i> L.)	77	130	207	47.9	69
Sheep	7	18	25	5.8	2
Goat	8	9	17	3.9	2
Pig ( <i>Sus scrofa</i> dom. L.)	39	86	125	28.9	12
Cattle ( <i>Bos taurus</i> L.)	14	9	23	5.3	8
Dog ( <i>Canis familiaris</i> L.)	2	4	6	1.4	0
Roe deer ( <i>Capreolus capreolus</i> L.)	1	5	6	1.4	0
Deer ( <i>Cervid</i> sp. indet.)	0	3	3	0.7	0
Fox ( <i>Vulpes vulpes</i> L.)	1	0	1	0.2	0
Canid indet. ( <i>Canid</i> sp.)	0	1	1	0.2	0
Brown hare ( <i>Lepus europaeus</i> Pall.)	0	8	8	1.9	0
Fish indet.	5	5	10	2.3	0
Birds ( <i>Aves</i> sp. indet.)	1	0	1	0.2	0
<b>Total identified to species</b>	<b>155</b>	<b>278</b>	<b>433</b>		<b>93</b>
<b>SIZE CATEGORIES</b>					
Sheep/goat	322	839	1,161		
Cattle	7	16	23		
<b>Total identified to size categories</b>	<b>484</b>	<b>1,133</b>	<b>1,617</b>		

TABLE 9. SHEEP/GOAT LOOSE TEETH AND MANDIBLES ASSIGNED TO AGE STAGES

<i>Stage</i>	<i>Age</i>	<i>Loose Mandible Dpm4 Frags. and M3</i>			<i>Total</i>
A	0–2 months	0	0	0	
B	2–6 months	2	2	4	
C	6–12 months	5	4	9	
D	1–2 years	4	0	4	
E	2–3 years	2	1	3	
F	3–4 years	1	1	2	
G	4–6 years	0	4	4	
H–I	6–10 years	2	0	2	

Stages defined in Payne 1973.

grouped together into the sheep/goat fragment category. Nevertheless, an attempt was made to distinguish between the two using morphological criteria described by Boessneck, Payne, and Prummel and Frisch.<sup>97</sup> Due to the poor preservation and fragmentary nature of the assemblage, separation was rarely attained. However, a good split between sheep and goat distal metacarpals was apparent when measurements (W. cond and W. troch) taken on the distal condyles<sup>98</sup> were plotted against one another (Fig. 38). The morphologically larger bones of goats (whether fused or unfused) and the smaller bones of sheep naturally form two distinct groups. To enhance this split, the Halai metacarpal measurements were plotted against those published by Payne on material from Nea Nikomedeia in northern Greece.<sup>99</sup> In general, assemblages dating to the Early and Middle Neolithic usually demonstrate that sheep predominate in numbers over goats;<sup>100</sup> whether this is true at Halai remains to be seen. Presently, the number of fragments that could be identified to either sheep or goats is statistically too small to be significant.

In order to determine the ages at which the Halai sheep/goat were killed, the wear stages of mandibles, loose third permanent molars (M3) and fourth deciduous premolars (Dpm4) were recorded according to the technique described by Payne.<sup>101</sup> Table 9 shows the breakdown of mandibles and loose teeth assigned to various wear stages. Unfortunately, the present sample is very small and no definite trends can be determined.

97. Boessneck 1962; Payne 1969 and 1985; and Prummel and Frisch 1986.

98. The measurement location is described by Payne (1969, p. 296).

99. Payne 1969.

100. For EN assemblages, see Halstead 1981; 1987, p. 74; and 1996; see Kotjabopoulou and Trantalidou 1993; Halstead 1996; and Jullien 1981 for exceptions at LN sites.

101. Payne 1973.

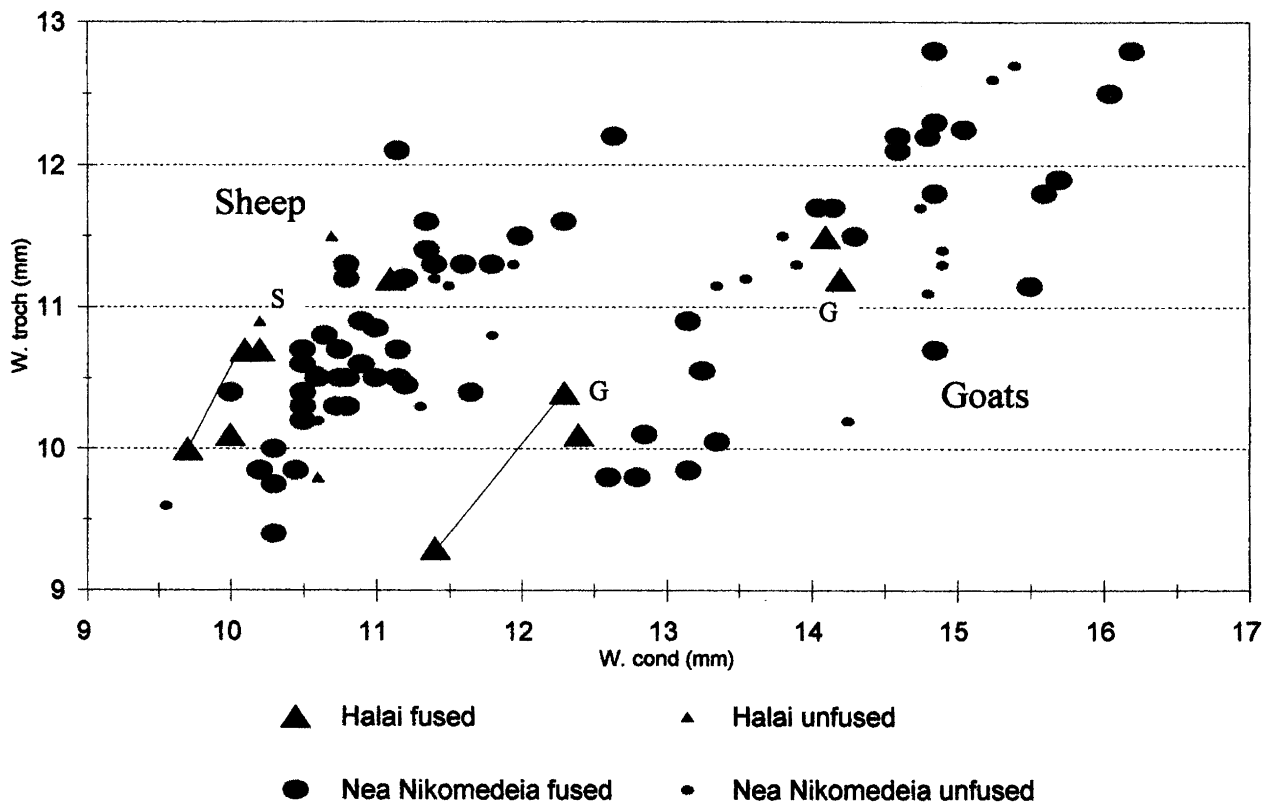


Figure 38. A scatterplot of sheep/goat distal metacarpal measurements (W. cond and W. troch) from Halai plotted against metapodial measurements taken by Payne (1969) at Nea Nikomedeia

Even with the small sample size, it appears that there is a predominance of animals killed before two years of age, although not overwhelmingly so. In an assemblage from the Middle Neolithic, it would be expected that most of the jaws would come from animals killed at less than two years of age—the optimum age for sheep and goats intended to be eaten.<sup>102</sup> Faunal evidence for more specialized forms of animal husbandry (combined meat/wool or meat/milk strategies as demonstrated by a divergence from the typical kill-off pattern for meat and/or by a change in the ratios of male to female animals) does not appear in Greece until the Late Neolithic. To date, faunal studies from only two Late Neolithic sites, Kastri on the island of Thasos<sup>103</sup> and Skoteini Cave in central Euboea,<sup>104</sup> have demonstrated a split from the typical Neolithic model of keeping domestic sheep and goats primarily for their meat. At Kastri, an especially high juvenile kill-off with a second subadult slaughter is suggestive of a combined meat/milk model (the initial juvenile mortality is likely to represent an emphasis on the slaughter of surplus males not needed for breeding purposes); at Skoteini Cave, the survival of both male and female sheep/goats older than six to ten months of age is suggestive of a different pattern—one in which not only meat but also wool was becoming important. Since male sheep and goats produce the most wool, the equal presence of bones from male and female animals in the archaeological record may indicate that there was a deliberate selection for wool-producing males.

In general, the faunal evidence from these two sites is still reminiscent of a small-scale, mixed farming strategy, which is thought to have been the

102. Payne 1973, p. 297.

103. Halstead 1987.

104. Kotjabopoulou and Trantalidou 1993.



norm throughout the Neolithic.<sup>105</sup> Large-scale specialization of sheep herding for milk and wool production is not apparent until it is described in the Bronze Age Linear B texts from Pylos and Knossos.<sup>106</sup> Again, such specialization perhaps should only be directly associated with the palatial economy with only modest specialization taking place within a predominantly small-scale mixed animal economy on the village or household level.<sup>107</sup>

## PIGS

Pigs are the second most common animal in the Halai assemblage.<sup>108</sup> The abundance of pig bones is somewhat surprising for a site of this date. It remains to be seen whether the ratio of sheep/goat to pigs will change to a more normal one (in which sheep/goat make up more than half of the total number of bone fragments within an assemblage) as the size of the assemblage increases with further study. How the bones are distributed spatially through time and across the site will also be a factor in determining whether their distribution is restricted to certain phases or even deposits.

The distinction between wild and domestic pigs is usually based on size variation (the wild being significantly larger than the domesticated). However, the predominance of immature bones (i.e., long bones consisting of a shaft [diaphysis] and an unfused bone portion [epiphysis]) and the fragmentary nature of the Halai collection made such a distinction extremely difficult. No bones of wild pigs have yet been identified in the finds from trench F2 in 1990 and 1991. In terms of age of slaughter, of thirty-seven fragments that could be assigned an age based on fusion (long bones and bones of the pelvis and lower extremities, with vertebrae, cranial bones, and teeth excluded), thirty are from animals killed at less than two years of age.<sup>109</sup> Of the seven jaw fragments, five came from animals killed at less than one year of age and two within the ages of one to two years (based on tooth eruption and wear).<sup>110</sup> Since pigs were kept primarily for their meat (and skins), there was no reason to maintain these animals into adulthood as they did not offer the secondary products that somewhat older sheep and goats (milk and wool) and cattle (traction and milk) can provide.

105. Halstead 1996, p. 32.

106. Halstead 1996, p. 32.

107. See Halstead 1996 for a fuller treatment of this complex subject.

108. Note that the bone counts of this species are not overly inflated by the presence of metapodials or phalanges. In the lower limb of the pig, the ankle consists of four metapodials, while the foot consists of six phalanges (digits). These bony structures can sometimes greatly increase the counts for pigs—distorting the actual number of animals represented.

109. Based on Silver 1969; and Bull and Payne 1982.

110. Bull and Payne 1982.

111. Halstead 1987, p. 74.

## WILD FAUNA

Bones from wild fauna have been rarely encountered thus far. The lack of wild animals may simply be a reflection of the small sample size, but assemblages from Greek Neolithic sites typically do not yield high numbers of wild animals in proportion to the relative sample size of the collection.<sup>111</sup> The few bones of wild animals that were recovered are of the same species as those recovered from other Greek Neolithic sites. When analysis of the heavy and light fraction is carried out, more bones from smaller wild animals, including birds and fish, will probably be encountered.

## CONCLUSION

Since the Halai assemblage, although not large, is the only Middle Neolithic collection from central Greece yet under study, its analysis is of great importance.<sup>112</sup> Excavations are continuing at the site and the conclusions drawn here must be regarded as tentative. Nevertheless, the general breakdown of animal species at Halai is similar to that of other studied assemblages in Greece with the bones of sheep/goat and pigs predominating and much smaller quantities of cattle and bones of wild animals. Further in-depth analysis of previously and newly recovered material may help to clear up some of the many questions that remain about the Neolithic diet and local environment of Halai.

112. Other previously studied Neolithic collections in central Greece include those from Kitsos Cave in Attica (Jullien 1981) and Skoteini Cave in Euboea (Kotjabopoulou and Trantalidou 1993); both date to the Late Neolithic. More comparable in terms of site type, geographical location, and time period are faunal assemblages from sites in Thessaly and Macedonia, such as Achilleion (Bökönyi 1989), Argissa-Magoula (Boessneck 1962), and Sitagroi (Bökönyi 1986).

### *Wendy Yielding*

UNIVERSITY OF DURHAM  
DEPARTMENT OF ARCHAEOLOGY  
SOUTH ROAD  
DURHAM DH1 3LE  
ENGLAND  
URNAMMU@WORLDNET.ATT.NET

## APPENDIX 3

### PALAEOETHNOBOTANICAL INVESTIGATIONS

This report of palaeoethnobotanical investigations at Halai from 1992 through 1994 concentrates on the Neolithic deposits.<sup>113</sup> Although numerous intensive palaeoethnobotanical studies have been published from Neolithic sites in northern and southern Greece,<sup>114</sup> few examples exist for the central region.

All Neolithic levels so far excavated at Halai have been sampled for archaeobotanical remains. All of the soil excavated from trenches in Area F was dry-screened through a wire screen (1-cm<sup>2</sup> mesh) before being sent to flotation in order to remove the sherds that were abundant throughout. These sherds ranged in size from less than 1 cm to more than 10 cm and were viewed as a potential threat to the botanical remains during the flotation process since large objects in the soil can crush the wet, fragile, charred remains.<sup>115</sup> In addition, the fact that all soil was floated meant that, without hand-picking and prescreening, all artifacts would have gone through flotation whether it was desirable for them to be washed or not. A total of 232 excavation units were processed by means of a modified Siraf-style flotation system<sup>116</sup> and nested geological sieves for flot collection (1 mm and 0.25 mm). Soil volumes for these units ranged from 10 to 340 liters. The sampling strategy was adopted after initial trials showed that the density of remains was low (i.e., fewer than ten noncharcoal remains per 10-liter sample on average). Even with 100% sampling, the number of botanical specimens collected from individual units was low.

Of the 232 Neolithic samples processed, 208 were scanned, while the remaining 24 were fully sorted. The scanning procedure consisted of a visual examination of samples in which specimens were identified but not separated from the samples. Species were recorded using ordinal categories (e.g., 1 = 1–5 remains, 2 = 6–20 remains, 3 = 21 or over). Full sorting included separation of remains into vials and then counting and weighing them. Scanned samples were quantified using the presence or absence of taxa. Specimen densities per volume of soil were calculated for sorted samples and recorded along with presence/absence of particular taxa.

All 232 samples were analyzed for the presence or absence of sixteen categories of botanical material. Table 10 summarizes the results in two

113. See also Near 1992.

114. E.g., Renfrew 1989; *Franchthi* 7; Hopf 1961.

115. Dry screening before flotation can also cause mechanical break-up of botanical remains so this decision was made on the basis of the abundance of large artifacts within the soil samples.

116. Pearsall 1989, pp. 29–31.

ways: (1) the total *number* of samples in which the particular category was found, and (2) a *percentage* of the total samples in which the botanical type was found.

In twenty-four samples, seeds and other noncharcoal remains were counted and ratios of taxa (number of remains) to soil volume were calculated. Charcoal was separated and weighed, and this weight (in milligrams) was used in the density ratios. Table 11 summarizes the results.

The barley (*Hordeum vulgare*), einkorn wheat (*Triticum monococcum*), and emmer wheat (*Triticum dicoccum*) remains are identified as predominantly domesticated varieties based on morphological features. Several of the einkorn grains can be categorized as wild einkorn. Since many of the grains could not be identified beyond genera, however, an accurate account of wild to domesticated grains is impossible. Both einkorn wheat and barley are known to have grown in wild stands in the hilly steppic regions of Greece up to modern times;<sup>117</sup> thus it is possible that while domesticated cereals that were introduced into the area during the Neolithic were being cultivated, wild stands could still have been harvested. Alternatively, wild cereals can be found as weeds of cultivated fields and thus their presence could be explained as crop processing residues.

Pulses are notoriously difficult to classify as wild or domesticated in archaeological assemblages, since they can be identified as wild or domesticated only if the ephemeral seed coat is still preserved.<sup>118</sup> Wild legumes grow abundantly in this region and could have been exploited before they were fully domesticated. Nevertheless, collecting wild pulses is an intensive process, as most pods contain only two seeds, and the plants are frequently tangled in surrounding vegetation. The relative abundance of lentils in the analyzed assemblages tends to suggest that they were being cultivated.

Remains of pistachio (*Pistachia* sp.), fig (*Ficus* sp.), and grape (*Vitis* sp.) are also difficult to classify as either wild or domesticated by morphology alone. Since domestication of these taxa is more complex than that of the cereals, their domestication is assumed to have taken place later than that of barley and wheat. Discussion persists, however, regarding morphological markers of domesticated grape, and claims have been made that domesticated *Vitis vinifera* could have occurred earlier than the third millennium B.C.<sup>119</sup> Since the finds of *Vitis* sp. at Halai fall into the range for wild grape, even on the basis of an expanded classification scheme, it is likely that the inhabitants of Halai were exploiting wild varieties of these species.

Ethnoarchaeological analysis of crop-processing techniques is useful in determining what activities and technologies were used at prehistoric agricultural sites.<sup>120</sup> It can also help to clarify the usages of particular contexts within a site (i.e., a threshing floor, a clean grain storage area, etc.). Thus far, the remains at Halai have all been clean or mostly clean (i.e., almost entirely grain without chaff or weed seeds), which indicates that they were fully processed and in a ready-to-use state. None of the contexts sampled can be distinguished as processing areas, but as most of them are thought to be within the confines of houses or other closed architectural

TABLE 10. SPECIMENS BY BOTANICAL TYPE

Botanical Type	No. of Samples	%
<i>Triticum</i> indet.	63	27
<i>Triticum mono.</i>	23	10
<i>Triticum dicoc.</i>	6	2
<i>Hordeum</i> indet.	76	33
<i>Hordeum vulg.</i>	28	12
Cereal indet.	166	72
Chaff	18	8
<i>Lens</i> sp.	86	37
Pulse indet.	97	42
<i>Pistachia</i> sp.	25	11
<i>Ficus</i> sp.	124	53
<i>Vitis</i> sp.	22	10
Weed indet.	51	22
Weed grass	11	5
Other	61	26
Charcoal	230	99

TABLE 11. NUMBER AND DENSITY OF SPECIMENS BY BOTANICAL TYPE

Botanical Type	No. of Remains	Density
<i>Triticum</i> sp.	86	23.76
<i>Hordeum</i> sp.	124	34.25
Cereal indet.	520	143.64
<i>Lens</i> sp.	198	54.70
<i>Vicia</i> sp.	12	3.28
Pulse indet.	32	8.86
<i>Pistachia</i> sp.	211	58.29
<i>Ficus</i> sp.	410	113.20
Polygonaceae	3	0.82
Salsolaeae	6	1.64
Crucifereae	12	3.28
Weed indet.	7	1.91
Other	20	5.53
Charcoal	2094 mg	0.58

Density is calculated using number of specimens per liter of soil  $\times$  1000.

117. Zohary 1986.

118. Zohary and Hopf 1973.

119. Smith and Jones 1990, p. 324.

120. Hillman 1984; Jones 1983, 1984, and 1987a and b.

TABLE 12. PERCENTAGE OF MODE WEIGHT TO TOTAL WEIGHT OF PLANT REMAINS

	<i>Type 1</i>	<i>Type 2</i>	<i>Mode of Arrival</i>		<i>Type 5</i>	<i>Type 6</i>	<i>Type 7</i>
			<i>Type 3</i>	<i>Type 4</i>			
Grams	2.93	0.04	1.96	0.20	<0.01	0	<0.01
%	56.90	0.80	38.00	3.90	0.10	0	0.10

features, it is to be expected that the remains would be found “clean.” Threshing and winnowing are generally outdoor activities. Evidence from other Greek sites indicates the widespread occurrence of small-scale, self-supported, agricultural communities.<sup>121</sup> Since the area surrounding Halai would have been climatically<sup>122</sup> and sedimentologically adequate for crop cultivation, it is likely that most crops were locally produced.

It is useful to identify general mechanisms for the introduction of botanical remains into archaeological sites to gain an understanding of what types of plant/human interactions were occurring as well as why certain plants may be over- or underrepresented on a site.<sup>123</sup> By considering the uses of particular taxa, one can assign remains to one of seven “modes” of arrival onto a site: (1) crop products or by-products (seeds, grain, chaff, etc.), material that arrived when harvested, and material brought to the site from the field or after being traded, etc.; (2) seeds from noncultivated plants gathered as fodder, bedding, or fuel (not including wood charcoals); (3) seeds and plant material of fruits or nuts that represent material (used as food or for other purposes) collected from domesticated or wild sources; (4) seeds that represent plants gathered as foods, condiments, medicines, drugs, or dyes; (5) plant material used for building, furnishing (such as matting or thatching), or fiber; (6) seeds arriving in dung used as fuel or garden material; and (7) seeds arriving fortuitously (nonsystematically, such as plants attached to animal or human hair, fleece, hooves, feet, etc.), plants cleared from an area in the settlement, and seeds from plants used as decorations.<sup>124</sup>

The remains from the twenty-four fully sorted samples were grouped into the above modes. As noted in Table 12, over half of the botanical remains recovered are categorized as those that would have arrived during crop harvesting or as a result of processing. Although no clear processing areas have been observed at Halai, it is not surprising that the majority of remains that form the general botanical assemblage would be related to what we consider the most dominant subsistence strategy, namely, farming. Of interest though is the percentage of recovered remains that can be classified as type 3—material of fruit and nut sources. At Halai these are considered to be wild sources; thus, their inclusion in the botanical assemblage is indicative of the fact that, while agriculturalists, the inhabitants of Halai were also aware of wild resources and purposefully acquired them for use at the site. Percentages of mode weight to total weight of all remains were also calculated. The results are given in Table 12.

121. Renfrew 1989.

122. Greig and Turner 1974.

123. Hillman 1984.

124. Jones 1983, 1984, and 1987a and b; Hillman 1984 and personal communication; Sturtevant 1919.

## CONCLUSION

My studies thus far have shown that the Neolithic inhabitants of Halai were utilizing both wild and domesticated species. Cultivated crops included barley (*Hordeum vulgare*), emmer wheat (*Triticum dicoccum*), and einkorn wheat (*Triticum monococcum*). These crops were found in a fully processed state in the excavation units sampled, and no crop processing residues were recovered. Pulses that were probably local cultivars included lentils (*Lens* sp.) and vetch (*Vicia* sp.). Although most remains arrived at the site as the result of crop harvests, over a quarter of them can be identified as wild taxa. Gathered species included pistachio (*Pistachia* sp.), fig (*Ficus* sp.), and grape (*Vitis sylvesterus*), along with other taxa possibly used for medicines, dyes, housing, and fuel.

In general, the botanical remains at Halai conform to those from contemporary sites in northern and southern Greece and they fall into what has been called the typical “Neolithic package” for Greece and the Near East. Further evidence from excavation and analysis will show whether any aspect of the exploitation of plants at Halai is unusual, such as the level of dependence on particular species or crop technologies.

*Julie Near*

UNIVERSITY OF CALIFORNIA, BERKELEY

DEPARTMENT OF ANTHROPOLOGY

232 KROEBER HALL

BERKELEY, CALIFORNIA 94720

NEAR@SSCL.BERKELEY.EDU

## REFERENCES

- Agora* = *The Athenian Agora: Results of Excavations Conducted by the American School of Classical Studies at Athens*, Princeton.
- XII = B. A. Sparkes and L. Talcott, *Black and Plain Pottery of the 6th, 5th, and 4th Centuries B.C.*, 1970.
- Alcock, S. 1993. *The Landscapes of Roman Greece*, New York.
- Antonaccio, C. 1995. *An Archaeology of Ancestors*, Lanham.
- Boardman, J. 1952. "Pottery from Eretria," *BSA* 47, pp. 1–48.
- Bökönyi, S. 1986. "Faunal Remains," in *Excavations at Sitagroi, a Prehistoric Village in Northeast Greece I* (Monumenta Archaeologica 13), C. Renfrew, M. Gimbutas, and E. Elster, eds., Los Angeles, pp. 63–132.
- . 1989. "Animal Remains," in Gimbutas et al. 1989, pp. 315–339.
- Boessneck, J. 1962. *Die Tierreste aus der Argissa-Magula vom präkeramischen Neolithikum bis zur mittleren Bronzezeit*, Bonn.
- Boyd, T. D., and M. H. Jameson. 1981. "Urban and Rural Land Division in Ancient Greece," *Hesperia* 50, pp. 327–342.
- Bull, G., and S. Payne. 1982. "Tooth Eruption and Epiphyseal Fusion in Pigs and Wild Boar," in *Ageing and Sexing Animal Bones from Archaeological Sites* (BAR-BS 109), B. Wilson, C. Grigson, and S. Payne, eds., pp. 55–71.
- Carr, K. E. 1992. "Appendix 2: Hellenistic and Roman Pottery and Small Finds," in Coleman 1992a, pp. 282–286.
- Coleman, J. E. 1986. *Excavations at Pylos in Elis* (*Hesperia* Suppl. 21), Princeton.
- . 1992a. "Excavations at Halai, 1990–1991," *Hesperia* 61, pp. 265–289.
- . 1992b. "Greece, the Aegean, and Cyprus," in *Chronologies in Old World Archaeology*, R. W. Ehrich, ed., Chicago, pp. 247–288 (vol. I) and pp. 203–229 (vol. II).
- Coleman, J. E., et al. 1996. *Alampra: A Bronze Age Settlement in Cyprus* (SIMA 118), Jonsered.
- Contis, C. 1993. "The Use of Photogrammetry at Halai in 1992," *CSA, Newsletter of the Center for the Study of Architecture* 5.4, p. 3.
- Corinth* = *Corinth: Results of Excavations Conducted by the American School of Classical Studies at Athens*.
- III, i = C. W. Blegen et al., *Acrocorinth: Excavations in 1926*, Cambridge, Mass., 1930.
- VII, i = S. S. Weinberg, *The Geometric and Orientalizing Pottery*, Cambridge, Mass., 1943.
- VII, ii = D. A. Amyx and P. Lawrence, *Archaic Corinthian Pottery and the Anaploga Well*, Princeton 1975.
- XI = C. H. Morgan, *The Byzantine Pottery*, Cambridge, Mass., 1942.
- XVIII, i = E. G. Pemberton, *The Sanctuary of Demeter and Kore: The Greek Pottery*, Princeton 1989.
- Demoule, J.-P., and C. Perlès. 1993. "The Greek Neolithic: A New Review," *Journal of World Prehistory* 7, pp. 355–415.
- Ellett, C. L. 1995. "The Stratigraphy of the Archaic Deposits at Halai" (M.A. thesis, Cornell University).
- Ephesos* = *Forschungen in Ephesos veröffentlicht vom Österreichischen Archäologischen Institut in Wien*, Vienna.
- VIII, ii = W. Jobst, *Römische Mosaiken aus Ephesos I: Die Hanghäuser des Embolos*, 1977.
- Evans, J. D., and C. Renfrew. 1968. *Excavations at Saliagos near Antiparos* (BSA Suppl. 5), Oxford.
- Franchthi* = *Excavations at Franchthi Cave, Greece*, Bloomington.
- 2 = T. H. van Andel and S. B. Sutton, *Landscape and People of the Franchthi Region*, 1987.
- 5 = C. Perlès, *Les industries lithiques taillées de Franchthi (Argolide, Grèce) II: Les industries du Mésolithique et du Néolithique initial*, 1990.
- 7 = J. M. Hansen, *The Palaeoethnobotany of Franchthi Cave*, 1991.
- 8 = K. D. Vitelli, *Franchthi Neolithic Pottery* 1, 1993.

- Gimbutas, M., S. Winn, and D. Shimabuka, eds. 1989. *Achilleion: A Neolithic Settlement in Thessaly, Greece, 6400–5600 B.C.* (Monumenta Archaeologica 14), Los Angeles.
- Goldman, H. 1940. "The Acropolis of Halae," *Hesperia* 9, pp. 381–514.
- Goldman, H., and F. Jones. 1942. "Terracottas from the Necropolis at Halae," *Hesperia* 11, pp. 365–421.
- Grace, V. 1961. *Amphoras and the Ancient Wine Trade* (AgoraPicBk 6), Princeton.
- Greig, J., and J. Turner. 1974. "Some Pollen Diagrams from Greece and Their Archaeological Significance," *JAS* 1, pp. 177–194.
- Hägg, R. 1983. "Funerary Meals in the Geometric Necropolis at Asine?" in *The Greek Renaissance of the Eighth Century B.C.*, R. Hägg, ed., Stockholm, pp. 189–193.
- Halstead, P. 1981. "Counting Sheep in Neolithic and Bronze Age Greece," in *Pattern in the Past: Studies in Honor of David Clarke*, I. Hodder, G. Isaac, and N. Hammond, eds., Cambridge, pp. 307–339.
- . 1987. "Man and Other Animals in Later Greek Prehistory," *BSA* 82, pp. 71–83.
- . 1996. "Pastoralism or Household Herding? Problems of Scale and Specialization in Early Greek Animal Husbandry," *WorldArch* 28, pp. 20–42.
- Heafitz, A. 1992. "Appendix 3: Balloon Photography," in Coleman 1992a, pp. 287–288.
- Hillman, G. 1984. "Interpretation of Archaeological Plant Remains: The Application of Ethnographic Models from Turkey," in van Zeist and Casparie 1984, pp. 1–41.
- Hopf, M. 1961. "Pflanzenfunde aus Lerna, Argolis," *Der Züchter* 31, pp. 239–247.
- Jones, G. 1983. "Ethnographic and Ecological Models in the Interpretation of Archaeological Plant Remains" (diss. University of Cambridge).
- . 1984. "Interpretation of Archaeological Plant Remains: Ethnographic Models from Greece," in van Zeist and Casparie 1984, pp. 177–192.
- . 1987a. "Agricultural Practices in Greek Prehistory," *BSA* 82, pp. 115–123.
- . 1987b. "A Statistical Approach to the Archaeological Identification of Crop Processing," *JAS* 14, pp. 311–323.
- Jullien, R. 1981. "La faune des vertebres, à l'exclusion de l'homme, des oiseaux, des rongeurs et des poissons," in Lambert 1981, pp. 569–590.
- Kardulias, P. N., and C. Runnels. 1995. "The Lithic Artifacts: Flaked Stone and Other Nonflaked Lithics," in *Artifact and Assemblage: The Finds from a Regional Survey of the Southern Argolid, Greece*, C. Runnels, D. J. Pullen, and S. Langdon, eds., Stanford, pp. 74–139.
- Koehler, C. G. 1978. "Corinthian A and B Transport Amphoras" (diss. Princeton University).
- Kotjabopoulou, E., and K. Trantalidou. 1993. "Faunal Analysis of the Skoteini Cave," in Sampson 1993, pp. 392–432.
- Kozłowski, J. K., M. Kaczanowska, and M. Pawlikowski. 1996. "Chipped Stone Industries from Neolithic Levels at Lerna," *Hesperia* 65, pp. 295–372.
- Krautheimer, R. 1975. *Early Christian and Byzantine Architecture*, Baltimore.
- Lambert, N., ed. 1981. *La grotte préhistorique de Kitsos (Attique)*, Paris.
- Lawall, M. L. 1995. "Transport Amphoras and Trademarks: Imports to Athens and Economic Diversity in the Fifth Century B.C." (diss. University of Michigan).
- Lefkandi* I = M. Popham, L. Sackett, and P. G. Themelis, eds., *Excavations at Lefkandi, Euboea, 1964–66: The Iron Age* (BSA Suppl. 11), Oxford 1979–1980.
- Miller, M. A. 1997. "Jewels of Shell and Stone, Clay, and Bone: The Production, Function, and Distribution of Aegean Stone Age Ornaments" (diss. Boston University).
- Near, J. 1992. "Archaeobotanical Remains from Halai: A Neolithic Settlement from Central Greece" (M.A. thesis, Institute of Archaeology, London).
- O'Neill, K., and M. Pomeroy. 1992. "Appendix 1: Neolithic Chipped Stone," in Coleman 1992a, pp. 278–281.
- Orchomenos* = *Orchomenos*, Munich.
- II = E. Kunze, *Die neolithische Keramik*, 1931.
- Papademetriou, E. 1994. "Η νέα ανασκαφή των Αλών," *Φιλολογική Χίος* 3, pp. 81–90.
- Payne, S. 1969. "A Metrical Distinction between Sheep and Goat Metacarpals," in *The Domestication and Exploitation of Plants and Animals*, P. J. Ucko and G. W. Dimbleby, eds., London, pp. 295–305.
- . 1973. "Kill-off Patterns in Sheep and Goats: The Mandibles from Asvan Kale," *AnatSt* 23, pp. 281–303.
- . 1985. "Morphological Distinctions between the Mandibular Teeth of Young Sheep, *Ovis*, and Goats, *Capra*," *JAS* 12, pp. 139–147.
- Pearsall, D. 1989. *Paleoethnobotany: A Handbook of Procedures*, San Diego.
- Perlès, C. 1981. "Les industries lithiques de la Grotte de Kitsos," in Lambert 1981, pp. 129–222.
- . 1992. "Systems of Exchange and Organization of Production in Neolithic Greece," *JMA* 5, pp. 115–164.
- . 1993. "Les industries lithiques taillées de Tharrounia," in Sampson 1993, pp. 448–495.
- Prummel, W., and H.-J. Frisch. 1986. "A Guide for the Distinction of Species, Sex and Body Size in Bones of Sheep and Goat," *JAS* 13, pp. 567–577.
- Quinn, K. M. 1996. "Late Antique Halai" (M.A. thesis, Cornell University).
- Renfrew, J. 1989. "Carbonized Grains and Seeds," in Gimbutas et al. 1989, pp. 307–310.
- Richards, W. 1994. "An Analysis of the Faunal Collection from Neolithic Halai" (M.A. thesis, University of Durham).
- Ruschenbusch, E. 1985. "Die Zahl der griechischen Staaten und Arealgrösse und Bürgerzahl der 'Normalpolis,'" *ZPE* 59, pp. 253–263.
- Sampson, A., ed. 1993. *Σκοτεινή Θαρρουνιών*, Athens.
- Shear, T. Leslie, Jr. 1993. "The Persian Destruction of Athens: Evidence



- from Agora Deposits," *Hesperia* 62, pp. 383–479.
- Silver, I. A. 1969. "The Ageing of Domestic Animals," in *Science in Archaeology*, D. Brothwell and E. Higgs, eds., London, pp. 283–302.
- Smith, G. 1993. "Dentition of a Late Roman Population from Halai, Greece," *Journal of the Canadian Dental Association* 59.6, pp. 14–15.
- Smith, H., and G. Jones. 1990. "Experiments on the Effects of Charring on Cultivated Grape Seeds," *JAS* 17, pp. 317–327.
- Snodgrass, A. 1980. *Archaic Greece: The Age of Experiment*, London.
- Soteriades, G. 1912. "Fouilles préhistoriques en Phocide," *REG* 25, pp. 253–299.
- Spiro, M. 1978. *Critical Corpus of the Mosaic Pavements on the Greek Mainland, Fourth to Sixth Centuries*, New York.
- Stuiver M., and P. J. Reimer. 1993. "Extended <sup>14</sup>C Data Base and Revised CALIB 3.0 <sup>14</sup>C Age Calibration Program," *Radiocarbon* 35, pp. 215–230.
- Sturtevant, E. 1919. *Sturtevant's Edible Plants of the World*, New York.
- van Zeist, W., and W. Casparie, eds. 1984. *Plants and Ancient Man: Studies in Palaeoethnobotany*, Rotterdam.
- Walker, A. L., and H. Goldman. 1915. "Report on Excavations at Halae of Locris," *AJA* 19, pp. 418–437.
- Weinberg, S. S. 1962. "Excavations at Prehistoric Elateia, 1959," *Hesperia* 31, pp. 158–209.
- Whitbread, I. K. 1986. "The Application of Ceramic Petrology to the Study of Ancient Greek Amphorae," in *Recherches sur les amphores grecques* (BCH Suppl. 13), J.-Y. Empereur and Y. Garlan, eds., Paris, pp. 95–101.
- Wren, P. S. 1996. "Archaic Halai" (M.A. thesis, Cornell University).
- Zohary, D. 1986. "The Origin and Early Spread of Agriculture in the Old World," in *The Origin and Domestication of Cultivated Plants*, C. Barigozzi, ed., Amsterdam, pp. 3–20.
- Zohary, D., and M. Hopf. 1973. "Domestication of Pulses in the Old World," *Science* 182, pp. 887–894.

### *John E. Coleman*

CORNELL UNIVERSITY  
DEPARTMENT OF CLASSICS  
120 GOLDWIN SMITH HALL  
ITHACA, NEW YORK 14853  
JEC13@CORNELL.EDU

### *Patricia S. Wren<sup>†</sup>*

### *Kathleen M. Quinn*

UNIVERSITY OF CINCINNATI  
DEPARTMENT OF CLASSICS  
BLEGEN LIBRARY  
CINCINNATI, OHIO 45221  
QUINNKL@EMAIL.UC.EDU