HALAI, 1992-1994

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 Goldman and Alice Walker (Kosmopoulos) from 1911 to 1935. 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. Digging took place on the acropolis in 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.

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. The survey area, roughly 185 km², was chosen to include the maximum area that could conceivably have belonged to the Greco-Roman town of Halai. 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. 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. The 280 tombs of Archaic through Roman date excavated by Goldman and Alice Walker (Kosmopoulos) and other recently excavated tombs seemed 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 continued to be of great value in recording architecture and horizontal exposures of finds. Balloon photographs also proved useful for photogrammetric purposes.

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; 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.12

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 re-excavation of a large
trench first excavated by the Goldman/Walker Kosmopoulos expedition in 1931.13 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.14 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 2002.

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), in trench F3 and probably in Room 11 of
trench F9 (Fig. 3). In trench 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 roughly 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.15

The architectural remains were summarized in the previous preliminary report for Hesperia.16 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).17
Some stone walls still stand to heights of 1 m. or so. House plans are generally rectilinear (see Figs. 3, 4),
although their overall plans are difficult to reconstruct because of the frequency of renovations and the
gradual rise of ground level. The best preserved room is that of 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 unroofed courtyard and contained 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 in 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 bounding 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/Hellenistic fortifications, to judge by the stratigraphy in trench F9 and, since the pottery associated with the Neolithic wall reported earlier in Area H 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.

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 and 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 beads for ten days or so in the summer of 1993 as part of a Ph.D. dissertation.

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 sea shells that have also 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, barleys, 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 true wares may be distinguished; petrographic analysis and neutron activation analysis have so far been employed.

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). However, this stratigraphic
division cannot yet be extended to the whole of Area F 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 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. 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. 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 suggest 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, 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. 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.

Six small Neolithic stone objects are catalogued below.

1 Stone pendant
F5b(12)41a (H91-464). Stone pendant. 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.

2 Stone pendant
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.

3 Stone pendant
F2a(1)3 (H90-22). Coleman 1992a, pl. 70, d, F. Stone pendant. 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.

4 Stone pendant  
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.

5 Stone pendant  
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 more smaller holes, D. 0.002, one at either side of the pair of larger holes.

6 Stone celt  
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.

**Radiocarbon determinations**

Thirteen 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 mostly give increasingly later datings for stratigraphically later deposits. I have chosen to leave out of consideration the four other 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 run 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 5900-5800 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. 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 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 convenient to date the beginning of Middle Neolithic a little earlier than is customary.

<table>
<thead>
<tr>
<th>Lab. No.</th>
<th>Exc. Field No.</th>
<th>Sample</th>
<th>Uncal. BP date</th>
<th>Calibr., 1-sigma</th>
<th>Calibr., 2-sigma</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-7271</td>
<td>F2c(168)580</td>
<td>wood</td>
<td>7325±160</td>
<td>6360-5980 B.C.</td>
<td>6460-5840 B.C.</td>
<td>EN</td>
</tr>
<tr>
<td>A-7268</td>
<td>F2c(127)275</td>
<td>wood</td>
<td>7530±200</td>
<td>6350-6170 B.C.</td>
<td>6760-5970 B.C.</td>
<td>EN</td>
</tr>
<tr>
<td>A-7267</td>
<td>F2c(124)250</td>
<td>charcoal</td>
<td>6905±90</td>
<td>5930-5630 B.C.</td>
<td>5960-5580 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>A-7264</td>
<td>F2c(118)216</td>
<td>wood</td>
<td>6980±170</td>
<td>6010-5630 B.C.</td>
<td>6190-5520 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>A-7266</td>
<td>F2c(121)263</td>
<td>charcoal</td>
<td>7285±145</td>
<td>6220-5970 B.C.</td>
<td>6410-5820 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>A-7622</td>
<td>F2c(173)581c</td>
<td>wood</td>
<td>7065±75</td>
<td>6005-5810 B.C.</td>
<td>6080-5710 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>Beta-66803</td>
<td>F2c(173)581b</td>
<td>wood</td>
<td>6850±70</td>
<td>5730-5600 B.C.</td>
<td>5930-5580 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>A-7270</td>
<td>F2c(148)426</td>
<td>wood</td>
<td>6935±170</td>
<td>5960-5600 B.C.</td>
<td>6140-5490 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>Beta-66802</td>
<td>F2c(139)400</td>
<td>soot</td>
<td>6750±60</td>
<td>5660-5580 B.C.</td>
<td>5700-5500 B.C.</td>
<td>MN</td>
</tr>
<tr>
<td>A-7265</td>
<td>F2c(119)222</td>
<td>soot</td>
<td>7070±165</td>
<td>6100-5710 B.C.</td>
<td>6270-5590 B.C.</td>
<td>MN</td>
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<tr>
<td>A-7273</td>
<td>F10c(16)87</td>
<td>wood</td>
<td>6615±75</td>
<td>5580-5440 B.C.</td>
<td>5600-5350 B.C.</td>
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Table 1. SELECTED HALAI RADIOCARBON DETERMINATIONS (in rough stratigraphic order, earlier to later from top to bottom). 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 bidecadal data set; the rest are calibrated with the decadral data set.
Halai was founded anew in the Archaic period, probably in the late 7th century B.C. Its seaside location is significant and its foundation is probably to be connected with increases in trade and communication by sea at that time as a result of Greek colonization in the North Aegean and the Black Sea (see further below). The acropolis was laid out in a regular way with its long axis aligned roughly west/northwest-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. 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 differently aligned and, since its long axis is almost exactly east-west, it is likely that religious custom was more important in 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 10 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. 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 clay-like material in the south corner. The depositional history and purpose of these lenses and layers is as yet uncertain and will become clear only with further excavation.

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 amphorae, apparently fallen...
The group is to be dated to the late sixth and early fifth centuries. 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. In any case, the Archaic buildings in trench A5 probably remained in use thereafter.

**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, lime-like flecks and elongated voids suggesting organic temper; fired gray at the core. Oatmeal-colored and -textured exterior, Munsell 5YR 7/4; interior Munsell 7.5 YR 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 initials “alpha rho” inscribed after firing near top of one handle. Corinthian A-style transport amphora, ca. 500-480 B.C.

Corinthian A amphorae 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 in Corinthian A amphorae (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 would likely inscribe 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 5 YR 7/4), with heavy pink lime incrustation (Munsell 7.5 YR 7/4) on exterior, part of interior and some breaks. Molded rim; concave neck; short, cylindrical, sloping, oval handles with thumb impressions where handles join neck and shoulder; curving shoulder; apparently spherical body. Transport amphora, probably late sixth or early fifth 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 eighth-century examples.

**9 Amphora**  [Fig. 14]
rim 0.165, H. of neck (including rim) 0.096. Fairly fine reddish-yellow fabric (Munsell 5 YR 7/6) with light-pink incrustation (Munsell 5 YR 7/4); tempered with same probable mudstone as 7, tiny pebbles, lime-like flecks and elongated voids suggesting 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 sixth, early fifth century.

Since the later trend in amphorae is away from the bulging spheres of the late sixth and early fifth centuries (cf. Koehler 1978, plates 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


11 Oinochoe


12 Lid


Further digging in Trench A3 revealed details of the circular stone platforms mentioned in the previous report (Fig. 10; cf. Coleman, 1992a, p. 275, pl. 71, a). They are roughly one meter 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. 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--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. The ritual at Halai might have been in connection with a hero or heroized city founder.

TRENCH A3 (around circular platforms)

13 Skyphos

14 Miniature kotyle

15 Column crater

16 Oinochoe

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. The catalogue below is of finds from
debris probably to be 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**

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 figure’s 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 with crudely carved, probably female head and neck in relief. Flowing hair divided into strands by vertical incisions extends 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**


A local Corinthianizing work of Archaic date.

**19 Kotyle**


**20 Lekane**


Early sixth century B.C. The bridge-spouted lekane is far more common in the seventh century than

the sixth but the early ones, unlike ours, have a pronounced everted rim. The band begins broad, then narrows rapidly; cf. Agora XII, pp. 212, 359-360 and pl. 83 and, for similar narrowing of the bands on oinochoai, pl. 4.

21 Lekane
H91-629. Wren 1996, p. 111, no. B14. Part of rim (molded) and shoulder; one (non-joining) 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 close-spaced incisions beneath outer rim. Wavy line and black stripe lie between incisions and black zone. Probably Eretrian, ca. 490 B.C.

The wavy line on Attic lekanai disappears after the early sixth century (though they continue elsewhere, particularly East Greece) but the Attic version has a thicker, more tightly crimped line than the extended waves on our 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

The vicup, distinguished by the concave outer face of its foot, was made 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

No close parallel was found, though the apparently short-lived plain-walled variety was in its infancy in the late sixth and early fifth 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, 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 much greater than importance in antiquity. As a new foundation of the late seventh 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). So far as we are aware, for instance, it is one of only two towns on the Greek mainland that have produced

evidence for a regular plan in the Archaic period. 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.

Much further excavation is necessary, however, if the history and society of Archaic Halai is ever to be understood. Meantime, the scarcity of finds clearly datable to the later fifth century B.C. either from our trenches in Areas A and F or the excavations of Goldman below the “poros pavement” in the Temple Area, suggest the possibility that Goldman may have been in error in dating the destruction that resulted in the deposition of much of the debris that she assigns to the “second temple area” to 426 B.C. rather than earlier.

HELLENISTIC PERIOD

Almost no material from the fifth or fourth centuries B.C. has been recovered at Halai by our expedition, although the excavations of 1992 in Area C in and beside the main NW-SE road that subdivides the acropolis suggests that it continued in use during these centuries. 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 fourth century B.C., including renovation of the fortification wall and its extension toward the southeast (her System II) and the construction of the North Gate Buildings, a predecessor to the Northeast Gate Building, and “the whole network of regularly laid out buildings” she encountered in trial trenches throughout the acropolis. 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. Although our expedition has as yet produced no new evidence as to 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 “fetters of Greece” (Polybius xviii, 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 NW-SE 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 further below under Late Roman.

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. In trench H8, on the other side of the main NW-SE road, a newly excavated room (Room 16; Fig. 9) is 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.

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, are scanty. The Late Roman building just mentioned that blocks the cross-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 a pottery amphoriskos. The stamps on loomweights 24-26 are of particular interest, since, as Wendy Yielding first observed, they were made by sheep or goat astragali.

24 Terracotta loomweight
H5b(16)111 (H91-451). Circular, flat, disk-like. H. 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), Wendy Yielding observed in the summer of 1994 that they must come from sheep or goat astragali. The photograph includes an astragalus from Neolithic levels as a model for the stamp. Cf. 25-27.

25 Terracotta loomweight
F6b(03)7 (H91-534). Like the preceding. 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
H5b(14)88. Like the preceding. 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; the photograph includes an astragalus from Neolithic levels as a model.

27 Terracotta loomweight
H3a(01)4a (H90-58). Like the preceding. Intact, chipped edge. D. 0.125, Th. 0.300, Wt. 570 g. Flat, disk-like. One piercing, D. 0.012, near edge. Stamp impression of shell, W. 0.015, off center on one face.

28 Lamp
C3c(45)163 (H92-904). Broken, handle missing. L. 0.150, H. 0.031, D. 0.054. Greyish clay with black glaze, somewhat flaked. Moulded lamp with 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

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, non-micaceous clay, light reddish-brown in color (5YR 6/3). Surface with lustrous brown (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

Recent attention has been focused on the basilica church in Area G and the remains of the latest structures in Area H. A test trench was excavated in 1992 near the eastern end of the basilica (G2; Figs. 2, 24, 25). 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 our 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 multi-colored intersecting circles (light grey, red and yellow) forming quatrefoils set on edge and inscribed with small yellow circles. 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 grey, red, yellow, and blue). 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. Comparisons with mosaics elsewhere with similar stylistic and thematic content suggests a late fifth or early sixth century date for the mosaic.

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 which would have separated the bema from the nave.

Study of the basilica continued during the summer of 1993. Its foundation walls are rubble masonry of limestone and tiles held together by a 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 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. 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 Kosmopoulos 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. The Goldman notes and photographs also show that the narthex and nave of the basilica were paved with large, rectangular blocks.59

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.60

The basilica was probably abandoned in the late sixth or early seventh century, since there are no remains at the site dating between the Late Roman period and the later years of the Byzantine period.61

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 perpendicular to the main east-west road.62 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.63

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 with 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. by 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 fifth or sixth 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, indicating 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. A single, gold earring had also escaped the notice of the ancient looters.

**Terracotta lamps from Grave VII**

30 Lamp
H92-716 (H7c34/172). Antechamber. Intact except for minor chips and abrasions, primarily on knob-like 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 with extended nozzle, not clearly set off from body. Discus with jewelled cross combined with a *rho*. North African, 6th century A.D.

31 Lamp
H92-724 (H7c934/180). Antechamber. Intact except for minor chips. L. 0.13, W. 0.076, H. 0.033, H. with handle 0.06. Brownish ochre 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.D.

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 (Figs. 33, 34), was devoid of offerings. 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. This grave is aligned parallel to the two other tombs but is located between the walls which served as boundaries for the cross-street (Walls AA and AB/AC). Hence, it clearly post-dates 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 which they excavated can be seen in Areas A, D, and E. In contrast, the area south of the main road has yielded features of religious importance dating to the fifth or sixth 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.

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

**BYZANTINE PERIOD**

The Byzantine period at Halai is represented by a small chapel located within the Late Roman basilica in Area G (Fig. 24), 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. 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 and associated burial (Grave IX; Figs. 24, 35) were 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 burial was within a stone-lined tomb. 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. 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 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. While the recent investigations have yielded only a few clues to help date the chapel, the Goldman 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. the thirteenth century) and Byzantine yellow-glazed pottery (ca. the twelfth and thirteenth centuries); and at least two other graves of Byzantine date.

CONSERVATION

A conservation plan for overall preservation and display of the fenced-in part of the acropolis (Fig. 36) may here be briefly mentioned 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 which 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 Hetty Goldman from 1911-1935. Freezing in winter also contributes to the deterioration of the stones.

Many of the trenches excavated long ago by Goldman 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 which is not absorbed by the soil will generally drain away from the acropolis. Some walls and features are to be left partially visible for visitors to the site, but for protection even these are to 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 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.
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 northwest 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 Age; and 64 pieces from a column of earth in the nearby trench F4, whose stratigraphy corresponds to that of F2. The pieces are analyzed with regard to material, technology and typology. A representative selection is illustrated in Figure 12.

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<tr>
<th>Stratum</th>
<th>Obsidian no.</th>
<th>Obsidian %</th>
<th>Chert no.</th>
<th>Chert %</th>
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<td>77</td>
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<td>Stratum 3</td>
<td>160</td>
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<tr>
<td>Total</td>
<td>449</td>
<td>89</td>
<td>57</td>
<td>11</td>
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Table 3. Raw materials at Halai

Of the 506 pieces in the assemblage, 449 are obsidian (89%), and 57 are chert (11%) (Table 3). As reported earlier, a significant quantity (163 pieces, or 32%) of the lithics from Halai are tiny pieces recovered from the heavy fraction of floated soil. 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. 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

<table>
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<tr>
<th>Stratum</th>
<th>Blade Pieces no.</th>
<th>Blade Pieces %</th>
<th>Flake Pieces no.</th>
<th>Flake Pieces %</th>
<th>Debris no.</th>
<th>Debris %</th>
<th>Core Frags. no.</th>
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<td>159</td>
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Table 4. Analysis of flaking technology

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<th>Stratum 3</th>
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</table>

Table 5. Tool types by Stratum

There are 37 tools (7.3%) in the assemblage. Of these, 28 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 (15 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 which 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.

Stratum 1, the earliest stratum, has only 73 pieces. Seventeen of the pieces are chert (23%). The other 56 pieces are obsidian (77%). This stratum yields no core fragments, but there are 24 pieces of debris (33%). Here, there does appear to be a preferred blank; there are 31 blades or blade-tools (42%), and 18 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, 34 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: 86 debris (32%), 85 flakes or flake-tools (32%), and 95 blades or blade-tools (36%). There are 17 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%). There is one core fragment, and 53 pieces are debris (32%). The rest of the pieces from this stratum are evenly split between 56 flakes or flake-tools (34%), and 56 blades or blade-tools (34%). There are 14 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). Of the 14 tools, five are made from blades (36%), and nine have a flake as their blank (64%) (Table 7).
Table 6. Tools by material

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Obsidian</th>
<th>Chert</th>
</tr>
</thead>
<tbody>
<tr>
<td>no.</td>
<td>%</td>
<td>no.</td>
</tr>
<tr>
<td>Stratum 1</td>
<td>4</td>
<td>67%</td>
</tr>
<tr>
<td>Stratum 2</td>
<td>12</td>
<td>71%</td>
</tr>
<tr>
<td>Stratum 3</td>
<td>12</td>
<td>86%</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>76%</td>
</tr>
</tbody>
</table>

Table 7. Tools by blank

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Blade-Tools</th>
<th>Flake-Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>no.</td>
<td>%</td>
<td>no.</td>
</tr>
<tr>
<td>Stratum 1</td>
<td>4</td>
<td>67%</td>
</tr>
<tr>
<td>Stratum 2</td>
<td>11</td>
<td>65%</td>
</tr>
<tr>
<td>Stratum 3</td>
<td>5</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>54%</td>
</tr>
</tbody>
</table>

The data from the analyses by stratum of this assemblage indicate that chert use was at its peak during the earliest phase of occupation at Halai.\(^8\) 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.\(^8\) 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.\(^9\) This change in tool manufacture runs against the grain of 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 biggest difference between stratum 1 and the others is the lack of variation in tool types. Stratum 1 yielded only one type of tool, the retouched piece. Stratum 2 has seven different tool types, and stratum 3 has eight.\(^9\)

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 here presented creates the impression that Halai was a blade-dominated industry. By stratum 3, however, there is an even split between blades and flakes.\(^9\) Stratum 2 and stratum 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.

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This summary is based on approximately 3063 animal bones from Neolithic levels excavated in 1990, 1991 and 1992 in Area F. 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 sixth millennium B.C. and most of it dates to the Middle Neolithic period.

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). In this report, all deposits from F2a and F2b have been lumped together. Once the complex stratigraphy (discussed in Part 1 of this report) 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.
<table>
<thead>
<tr>
<th>Species</th>
<th>F2a</th>
<th>F2b</th>
<th>Total</th>
<th>%</th>
<th># of loose teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep (Ovis aries L.) and goat (Capra hircus L.)</td>
<td>77</td>
<td>130</td>
<td>207</td>
<td>47.9</td>
<td>69</td>
</tr>
<tr>
<td>Sheep</td>
<td>7</td>
<td>18</td>
<td>25</td>
<td>5.8</td>
<td>2</td>
</tr>
<tr>
<td>Goat</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>3.9</td>
<td>2</td>
</tr>
<tr>
<td>Pig (Sus scrofa dom. L.)</td>
<td>39</td>
<td>86</td>
<td>125</td>
<td>28.9</td>
<td>12</td>
</tr>
<tr>
<td>Cattle (Bos taurus L.)</td>
<td>14</td>
<td>9</td>
<td>23</td>
<td>5.3</td>
<td>8</td>
</tr>
<tr>
<td>Dog (Canis familiaris L.)</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>1.4</td>
<td>0</td>
</tr>
<tr>
<td>Roe deer (Capreolus capreolus L.)</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>1.4</td>
<td>0</td>
</tr>
<tr>
<td>Deer (Cervid sp. Indet.)</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>0.7</td>
<td>0</td>
</tr>
<tr>
<td>Fox (Vulpes vulpes L.)</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Canid Indet. (Canid sp.)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Brown hare (Lepus europaeus Pall.)</td>
<td>0</td>
<td>8</td>
<td>8</td>
<td>1.9</td>
<td>0</td>
</tr>
<tr>
<td>Fish Indet.</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>Birds (Aves sp. Indet.)</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total identified to species</strong></td>
<td>155</td>
<td>278</td>
<td>433</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Sheep/goat sized</td>
<td>322</td>
<td>839</td>
<td>1161</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle sized</td>
<td>7</td>
<td>16</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total identified to “size categories”</strong></td>
<td>484</td>
<td>1133</td>
<td>1617</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**All other trenches from 1990, 1991 and 1992 - preliminary study 1994 (excluding bones from F2a and F2b).**

| Total fragments identified to species | 303 |
| Total fragments not identified to species | 1147 |

Table 8. Number of bone fragments identified to species for faunal samples from trench F2a and F2b with
preliminary results from other trenches excavated in 1990, 1991 and 1992. Also included are the numbers of sheep/goat and cattle sized bones recovered from F2a and F2b.

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.\(^6\) Domestic taxa makes 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 Halai bone specimens are lumped 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.\(^7\) 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. Troch and W. Cond) taken on the distal condyles\(^8\) were plotted against one another (Figure 13). 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 Nikomedia, in Northern Greece.\(^9\) In general, assemblages dating to the Early and Middle Neolithic usually demonstrate that sheep predominate in numbers over goats;\(^10\) whether this is true at Halai remains to be seen. Presently, the number of fragments which could be identified to either sheep or goats is statistically too small to be significant.

In order to access the ages at which the Halai sheep/goat were killed, the wear stages of mandibles, loose M3 (permanent molar 3) and Dpm4 (deciduous premolar 4) were recorded according to the technique described by Payne.\(^11\) 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. 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. As an assemblage from the Middle Neolithic, it would be expected that most of the jaws would come from animals killed less than two years of age - the optimum meat kill-off age for sheep and goats.\(^12\) Faunal evidence for more specialized forms of animal husbandry (combined meat/wool or meat/milk strategies as demonstrated by a diverging from the typical meat model kill-off pattern 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\(^13\) and Skoteini Cave in central Euboea\(^14\) 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 sub-adult slaughter is suggestive of a combined meat/milk model (the initial juvenile mortality likely represents an emphasis on the slaughter of surplus males not needed for breeding purposes);
while at Skoteini Cave, the survival of both male and female sheep/goats past 6-10 months of age is suggestive of a different pattern - one where 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.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Age</th>
<th># of mandible fragments</th>
<th># of loose Dpm4 and M3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0-2 mths.</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>2-6 mths.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>6-12 mths.</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>1-2 years</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>2-3 years</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>3-4 years</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>G</td>
<td>4-6 years</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>H-I</td>
<td>6-10 years</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 9. Numbers of sheep/goat loose teeth and mandibles assigned to approximate age stages (after Payne 1973).

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 norm throughout the Neolithic.\textsuperscript{105} Evidence for large scale specialization of sheep herding for milk and wool production does not become clear until it is described in the Bronze age Linear B texts from Pylos and Knossos.\textsuperscript{106} Again, such specialization perhaps should only be directly associated with the palatial economy with only modest specialization taking place within a predominately small-scale mixed animal economy on the village or household level.\textsuperscript{107}

Pigs

Pigs are the second most common animal in the Halai assemblage.\textsuperscript{108} 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 (where sheep/goats make up more than $\frac{1}{2}$ 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 spacially through time and throughout the site will also be a factor in determining whether their distribution is restricted to certain phases or even deposits.

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 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, out of 37 fragments which could be assigned an age based on fusion (long bones and bones of the pelvis and lower extremities, with vertebra and cranial bones and teeth being excluded), 30 are from animals killed at less than two years of age. Out 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). Since pigs are kept primarily for their meat (and skins), there was no reason to maintain these animals much into adulthood as they do not offer the secondary products that somewhat older sheep, goats (milk and wool) and cattle (traction and milk) can provide.

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. The few bones of wild animals that were recovered are of the same species as those recovered from other sites in Greece dating to the Neolithic. 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. 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 with much smaller quantities of cattle and bones of wild animals. Further in-depth analysis of previously and newly recovered material from Halai may help to clear up some of the many questions that remain about the Neolithic diet and local environment of Halai.

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APPENDIX 3: PALAEOETHNOBOTANICAL INVESTIGATIONS

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

The Neolithic levels so far excavated at Halai have been 100% sampled for archaeobotanical remains. All soil excavated from trenches in Area F was dry screened through a 1cm. wire screen before being sent to flotation in order to remove the ceramic sherds which were abundant in all samples excavated at this site. These sherds which ranged in size from <1cm. to more than 10 cm. were viewed as being a potential threat to the botanical remains during the flotation process since large objects in the soil can crush the wet, fragile, charred remains. In addition, the fact that 100% of the soil was floated meant that without hand picking and pre-screening all artifacts would have necessarily gone through flotation whether it was desirable for them to be washed or not. Two hundred thirty-two excavation units were processed by means of a modified Siraf style flotation system and nested geological sieves for flot collection (1 mm. and 0.25 mm.). Soil volumes for these units ranged from 10 liters to 340 liters. The sampling strategy was adopted after initial trials showed that the density of remains was low (i.e., fewer than 10 non-charcoal 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 their counting and weighing. 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 ways: a) the total number of samples in which the particular category was found, and b) a percentage of the total samples in which the botanical type was found.

<table>
<thead>
<tr>
<th>Botanical Type</th>
<th>T. indet</th>
<th>T. mono</th>
<th>T. dicoc</th>
<th>H. indet.</th>
<th>H. vulg</th>
<th>cereal indet.</th>
<th>chaff</th>
<th>Lens sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence (# of Samples)</td>
<td>63</td>
<td>23</td>
<td>6</td>
<td>76</td>
<td>28</td>
<td>166</td>
<td>18</td>
<td>86</td>
</tr>
<tr>
<td>Presence (% of Samples)</td>
<td>27%</td>
<td>10%</td>
<td>2%</td>
<td>33%</td>
<td>12%</td>
<td>72%</td>
<td>8%</td>
<td>37%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Botanical Type</th>
<th>pulse indet.</th>
<th>Pistacia</th>
<th>Ficus sp.</th>
<th>Vitis sp.</th>
<th>weed indet.</th>
<th>weed grass</th>
<th>other</th>
<th>charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence (# of Samples)</td>
<td>97</td>
<td>25</td>
<td>124</td>
<td>22</td>
<td>51</td>
<td>11</td>
<td>61</td>
<td>230</td>
</tr>
<tr>
<td>Presence (% of Samples)</td>
<td>42%</td>
<td>11%</td>
<td>53%</td>
<td>10%</td>
<td>22%</td>
<td>5%</td>
<td>26%</td>
<td>99%</td>
</tr>
</tbody>
</table>

Table 10. Number and percentage of specimens by botanical type

In twenty-four samples, seeds and other non-charcoal 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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of remains</td>
<td>86</td>
<td>124</td>
<td>520</td>
<td>198</td>
<td>12</td>
<td>32</td>
<td>211</td>
</tr>
<tr>
<td>Density (per L x 1000)</td>
<td>23.76</td>
<td>34.25</td>
<td>143.64</td>
<td>54.70</td>
<td>3.28</td>
<td>8.86</td>
<td>58.29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Botanical Type</th>
<th>Ficus sp.</th>
<th>Polygonaceae</th>
<th>Salsolaeae</th>
<th>Crucifereae</th>
<th>Weed indet.</th>
<th>Other</th>
<th>Charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Remains</td>
<td>410</td>
<td>3</td>
<td>6</td>
<td>12</td>
<td>7</td>
<td>20</td>
<td>2094mg</td>
</tr>
<tr>
<td>Density</td>
<td>113.20</td>
<td>.82</td>
<td>1.64</td>
<td>3.28</td>
<td>1.91</td>
<td>5.53</td>
<td>.58</td>
</tr>
</tbody>
</table>

Table 11. Number and density of specimens by botanical type

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, thus it is possible that while domesticated cereals which 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. 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 some claims have been made for the presence of Vitis vinifera in the Neolithic. 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.\textsuperscript{120} 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 indicated 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 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.\textsuperscript{121} Since the area surrounding Halai would have been climatically\textsuperscript{122} 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 under represented on a site.\textsuperscript{123} 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 which arrived when harvested, and material brought to the site from the field or after being traded, etc.; 2) seeds from non-cultivated plants gathered as fodder, bedding, or fuel (not including wood charcoals); 3) seeds and plant material of fruits or nuts which represent material (used as food or for other purposes) collected from domesticated or wild sources; 4) seeds which 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; 7) seeds arriving fortuitously (non-systematically, 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.\textsuperscript{124}

The remains from the 24 fully sorted samples were grouped into the above modes. As noted in Table 12, over one half of the botanical remains recovered are categorized as those which 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 which 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.

<table>
<thead>
<tr>
<th>Mode of Arrival</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
<th>Type 5</th>
<th>Type 6</th>
<th>Type 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>grams</td>
<td>2.93</td>
<td>0.04</td>
<td>1.96</td>
<td>0.20</td>
<td>&lt;0.01</td>
<td>0</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>%</td>
<td>56.9</td>
<td>0.8</td>
<td>38.0</td>
<td>3.9</td>
<td>0.1</td>
<td>0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Table 12. Percentage of mode weight to total weight of plant remains
CONCLUSION

My studies have thus far 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 which 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 one-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 show conformity with contemporaneous sites from both 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 level of dependence on particular species or crop technologies.

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Spiro, M. 1978. *Critical Corpus of the Mosaic Pavements on the Greek Mainland, Fourth to Sixth*


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1. 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 to a page size of 8½x11”. A version of the digitized plans available at the project’s World Wide Web site (http://halai.fac.cornell.edu) shows the remains of each period in a different color.

2. Work took place from June 22 to July 31. A maximum of thirteen local workers (including three pot-washers) was employed. In addition to John E. Coleman, who served as Director, full-time staff members included: Mary Eliot, Associate Director and Area F Supervisor; Jason H. Coleman, Dr. Peter Danner, Curtis L. Ellett, Kerill O'Neill, Melanie Pomeroy, Demetrios E. Sagias, Julia L. Shear, Greg Smith and Patricia S. Wren, Trench Supervisors (in some cases sharing responsibility for a trench); Jackie Ettlinger, Denise McCoskey, Ann Merriman, Michèle Miller, Helen Papademetriou, Edmund Pedersen, Tina Petrihou, Alison Sandman, Sonya Wolff, Field Archaeologists (with responsibility for particular excavating and recording tasks); 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, Draftsperson. Lois Berkowitz, Damian Carr, and Karen E. Carr were also present for part of the season. The following student trainees also participated (from Cornell except as indicated): Vanessa Avery (McGill), Christi Baker, Karen F. Byrne, Treska M. Cole (Brown), Michelle Maxine Ensey (Central Washington University), Celina L. Gray

(Vassar), Megan Katz (Princeton High School), Laura Kellogg (University of Rhode Island), Todd Reed, Carrie A. Shea (Mt. Holyoke), Jeannette L. Stach (Oakland University), Jeremy Yielding. Johanna Eliot was Camp Manager. As in the 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:


3. Study took place from June 21 to July 30. Twenty-one people took part on a long-term basis. They included (in addition to the undersigned): Mary Eliot, Associate Director; Vanessa Avery, Draftsperson; Jacquelyn Collins-Clinton, Hellenistic and Roman pottery; Michèle Miller, Neolithic beads; Julie K. Near, Palaeobotanist; Eric A. Nordgren, Object Conservation; Wendy Yielding, Zooarchaeologist, Valerie Woelfel, Draftsperson; Jeremy Yielding, Chipped stone tools; Christi Baker; Jason H. Coleman; Veronique E. Dupont; Curtis L. Ellett; Kerill O'Neill; Helen Papademetriou; Tina Petrihou; Kathleen M. Quinn; Julia F. Rounds; Melanie Pomeroy; Demetris E. Sagias; Patricia S. Wren. Diane le Berrurier (Department of

Art History, Carleton University; 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. They included (in addition to the undersigned): Mary Eliot, Associate Director; Susan E. Allen, Photography, Neolithic pottery; Diane le Berrurier (Department of Art History, Carleton University), Late Roman levels and finds; Megan Battey, Inventory; Max Kallhammer, Autocad, drawing; Scott J. McDonough, Autocad, dBase; Eric A. Nordgren, Object Conservation; Kerill O’Neill (Department of Classics, Colby College), Chipped stone tools; Wendy Yielding, Zooarchaeologist; Julia F. Rounds, Hellenistic levels and pottery; Emmanuelle Van Rutten, Autocad; Bryan Williams, architectural and stratigraphic recording; Patricia S. Wren, Archaic levels and pottery. Present for a shorter time were Julie 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, to be 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 Drs. 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, I should also like to thank: Eleni Zachou and Sonia Demaki, archaeologists of the 14th Ephoreia; conservator Christos Vapourakis; former archaiophylakas 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 of what I take it to mean

in an archaeological context, see Coleman in Coleman et. al. 1996, vi-vii.

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

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


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.


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, Demoule and Perlès 1993.


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.


21. Such as those set out 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: the preparation of thin
sections at the Department of Geology and neutron activation analysis at the Ward Laboratory for Nuclear Studies. Timothy O'Donnell (B.A. 1996) 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 (BA 1996). Tyler Kendall (BA 1998) is currently continuing the analyses. We would like to acknowledge our gratitude for the help of Alexander Bentley (MA in Archaeology, 1996) and Cornell staff members, especially Tim Z. Hossain of the Ward Laboratory.


24. Global sea level may have risen as much as 20 m. since 5000 B.C. according to van Andel and Sutton (1987, p. 33 and fig. 9).


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. Halai, however, does not support the view of Kardulias and Runnels (pp. 97-103 and references there cited) that chipped stone artifacts were important in Greco-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 which originated in Middle Helladic activity at the site and which 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.


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


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


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. (Herodotus VIII, 66), see Wren 1996, pp. 27-59.

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.

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, 1979, 1980, pp. 24-25 and pls. 5, 6:c, 7, 8:b) now seems improbable; in fact, it seems more likely to me that the Lefkandi structures also had a ritual purpose (cf. Wren 1996, 66-70).

37. Wren 1996, 73-78. Archaic Greeks tended to utilize heroes in order to strengthen their land claims, 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.


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

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

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.


49. Goldman 1940, p. 396.


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

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

54. For parallels, see the early fifth 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-fifth century Medusa mosaic at Ephesos (Ephesos VIII, ii, p. 100).

55. Cf. parallels on late fifth or early sixth 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-fifth century A.D. Life-like, three-dimensional figures are common in the mid-fifth century examples, while two-dimensional representations are more characteristic of the late fifth and early sixth 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 by in an unpublished field report (1993).


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.

60. A similar situation exists at the Late Roman church at Acrocorinth, excavated by Carl Blegen in 1926. This church, dating to the fourth and fifth centuries A.D., consisted of a nave, two aisles, and a shallow apse of similar dimensions 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 Kosmopoulos excavations (Quinn 1996, pp. 101-102).


64. Smith 1993.

65. Quinn 1996, p. 82.


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 above it.

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, towards the upper right). The dating of the press is difficult because the Goldman/Walker Kosmopoulos notebooks report a jumble of late walls criss-crossing the area; however, Goldman 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, 110).

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


73. Cf. Corinth XI, p. 36.


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.

76. For the division into strata see Coleman, Part 1 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 Late Neolithic Kitsos cave assemblage (Perlès 1981) reflect an even greater preference for obsidian (97.55%) over other materials (2.45%). The Late Neolithic assemblage at Skoteini, Tharrounia (Perlès 1993), too, is dominated by obsidian (95%). By contrast, obsidian represents only 12% of the assemblage from the Early Neolithic stratum in the Franchthi cave (Franchthi 5, p. 95).


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 byproducts of debitage, usually pieces without discernible bulbs, platforms, etc. (Kardulias and Runnels 1995, 78-79), and includes tiny pieces (as small as 0.1 x 0.1 cm) which could be produced by deliberate retouch, incidental use-wear, or accidental abrasion.

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 which Perlès employed in her Kitsos publication (1981). I have, however, separated drills from pointed pieces. In this report, a drill 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 Early Neolithic production at Franchthi (Perlès 1990) and Late Neolithic Saliagos (Evans and Renfrew 1968, 46-62), both of which heavily favored flake production (90% flakes, 10% blades). By contrast, at the Kitsos cave site, blade production was prioritized (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.

86. This percentage is consistent with the proportion of obsidian (over 95%) found in the lithic assemblages at Late Neolithic sites in what Perlès (1992, 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 cave assemblage, 10% of the tools were not made from obsidian.

88. The same holds true for Early and Middle Neolithic Lerna. Kozłowski, Kaczanowska, and Pawlikowski (1996, 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 of correlation 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, 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 (Kozlowski, Kaczanowska, and Pawlikowski 1996, 331, and Table 11).

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.


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


101. Payne 1973


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.


111.Halstead 1987, p. 74.

112.Other previously studied Neolithic collections in central Greece include those from the 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).

113.See also Near 1992.

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

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


