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EXCAVATIONS IN THE HAGIOS CHARALAMBOS CAVE

A Preliminary Report

ABSTRACT

The cave of Hagios Charalambos is a Minoan secondary ossuary in the Lasithi plain in the mountains of east-central Crete. It was excavated in two campaigns (1976–1983 and 2002–2003). Artifacts include pottery, figurines, seals, stone tools, metal tools and weapons, jewelry, and other objects buried with the deceased. The original burials range in date from Neolithic to Middle Minoan IIB, but the bones were all moved to the ossuary within a relatively short period in MM IIB. Some of the bones were partly sorted before their secondary deposition. The skulls indicate many traumas and three sophisticated trephinations, the earliest thus far known in Greece.

INTRODUCTION

Philip P. Betancourt, Costis Davaras, and Eleni Stravopodi

The Hagios Charalambos cave is located at the eastern edge of the village of Hagios Charalambos (formerly named Gerontomouri) on the western side of the Lasithi plain in east-central Crete (Figs. 1, 2).[1] The cavern has no name of its own, and it is known only by the name of the village. It was discovered during road construction in 1976 when dynamite blasts broke into the upper part of the underground spaces, and Costis Davaras conducted rescue excavations there in 1976, 1982, and 1983.[2] More recently, the cave was excavated with an American permit under the direction of Philip P. Betancourt and Costis Davaras in 2002 and with the addition of

1. Thanks are due to many people for help with this project, especially Stavroula Apostolakou, Director of the 24th Ephorate of Prehistoric and Classical Antiquities, Stephen Tracy, former Director of the American School of Classical Studies at Athens, Thomas Brogan, Director of the INSTAP Study Center for East Crete, and Alekos Nikakis, Chief Conservator, 24th Ephorate. Financial support was provided by the Institute for Aegean Prehistory, Temple University, and the University of Pennsylvania.

Unless otherwise credited, all of the photographs and drawings reproduced here are from the project's archives. The official photographers were Erietta Attali and Chronis Papanikolopoulos. In the catalogues, pottery nomenclature follows Betancourt 1985. Colors are recorded in the Munsell system (Kollmorgen Instruments Corporation 1992). The following abbreviations of museums are employed: HM, Archaeological Museum, Herakleion; HNM, Archaeological Museum, Hagios Nikolaos.

2. Davaras 1983, 1986, 1989a, 1989b.

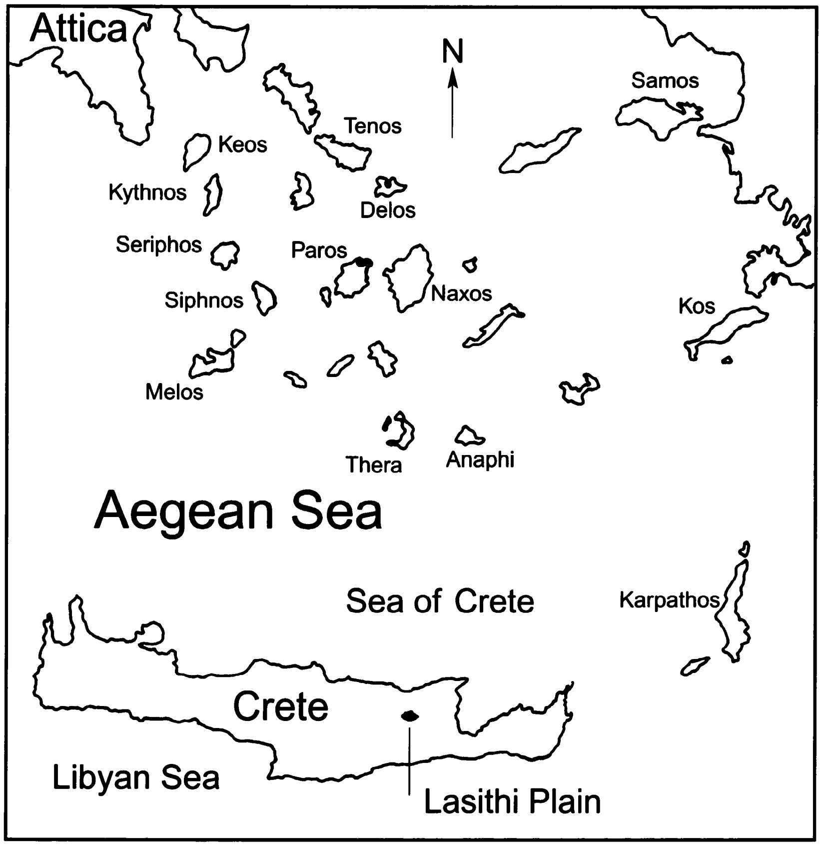


Figure 1. Map of the Aegean

Eleni Stravopodi as a third codirector in 2003. James D. Muhly and Albert Leonard Jr. were field directors.

The cave is especially important for several reasons. It is an extreme case of the Minoan funerary practice that involved collecting, sorting, and redepositing human bones in new locations. The artifacts are of interest because they come from a remote part of Crete about which little is known, and they include both local objects and a surprising number of pieces that provide information about relations with other parts of Crete as well as with overseas locations. The skeletal material constitutes the largest preserved corpus of human bones from the Cretan periods before Middle Minoan (MM) III. Although the settlement that used the cave is not known with certainty, a surface survey of the Lasithi plain has documented habitation from the Late Bronze Age on the hill adjacent to the ossuary.[3]

The cave was used as an ossuary during the Minoan period. The earliest pottery found was from the Final Neolithic (FN), with the possibility of a sherd or two of Late Neolithic date. Except for a few sherds from Late Minoan (LM) I–III (fewer than five), the finds seem to have all been placed in the ossuary within a relatively short period in MM IIB. In addition to human bones, the ossuary contained sherds and complete examples of Minoan pottery, animal bones, stone vases, stone tools, figurines, seals, beads and other pieces of jewelry, copper and bronze tools, six examples of the musical instrument called the sistrum,[4] and other items that had been deposited with the original burials before the remains were moved from their earlier place of deposition to this cave.

3. Watrous 1982, p. 65.

4. For a more complete preliminary report on the sistra, see Betancourt and Muhly 2006.

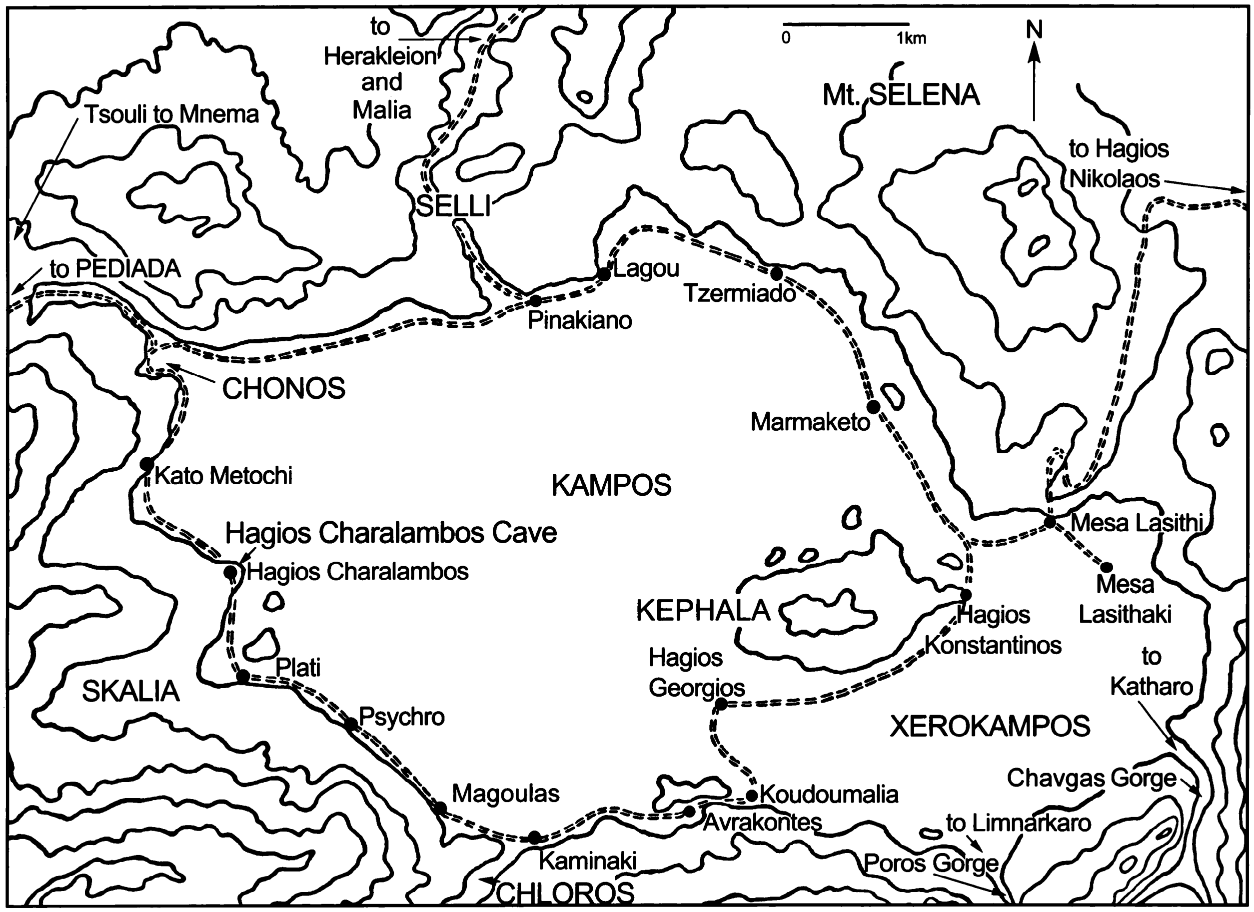


Figure 2. Map of the Lasithi plain

The cave is relatively small. It had an original length of ca. 9 m north–south by 10 m east–west (Fig. 3). The original entrance was at 834.95 m above sea level (masl), above room 1. The cavern had seven underground spaces, but the front two rooms were removed in 1982 because the bedrock there was so cracked from the dynamite explosions that uncovered the ossuary that conditions were unsafe for entering the cave until after their removal.[5] Rooms 1, 2, 3, and 4 were excavated by Davaras and his team. Room 6, a passageway at the west not used by the Minoans, became blocked with sediment in 1982. The lower spaces (rooms 5 and 7 and the room 4/5 entrance) were left untouched by the early campaign. In the new project in 2002 and 2003, rooms 3 and 4 were cleaned, trenches outside the cave were opened, and room 5 (Fig. 4) and the room 4/5 entrance were excavated. Room 7, not used by the Minoans, was cleaned to remove material that had washed into this space from room 5.

The position of the finds inside the cavern leaves no doubt that the human bones were deposited after they were disarticulated. Near the bottom of the deposit in room 5, which was over a meter high, some of the long bones were arranged in a grid to form a sort of platform (Fig. 5). This careful placement of bones proves that the deposit was not disturbed after it was laid in place. Above the grid was a mass of disarticulated human bones mixed with pottery and other artifacts. The top of the deposit in every room consisted of a layer of human skulls and complete vases (additional proof

5. Davaras 1989a, p. 387.

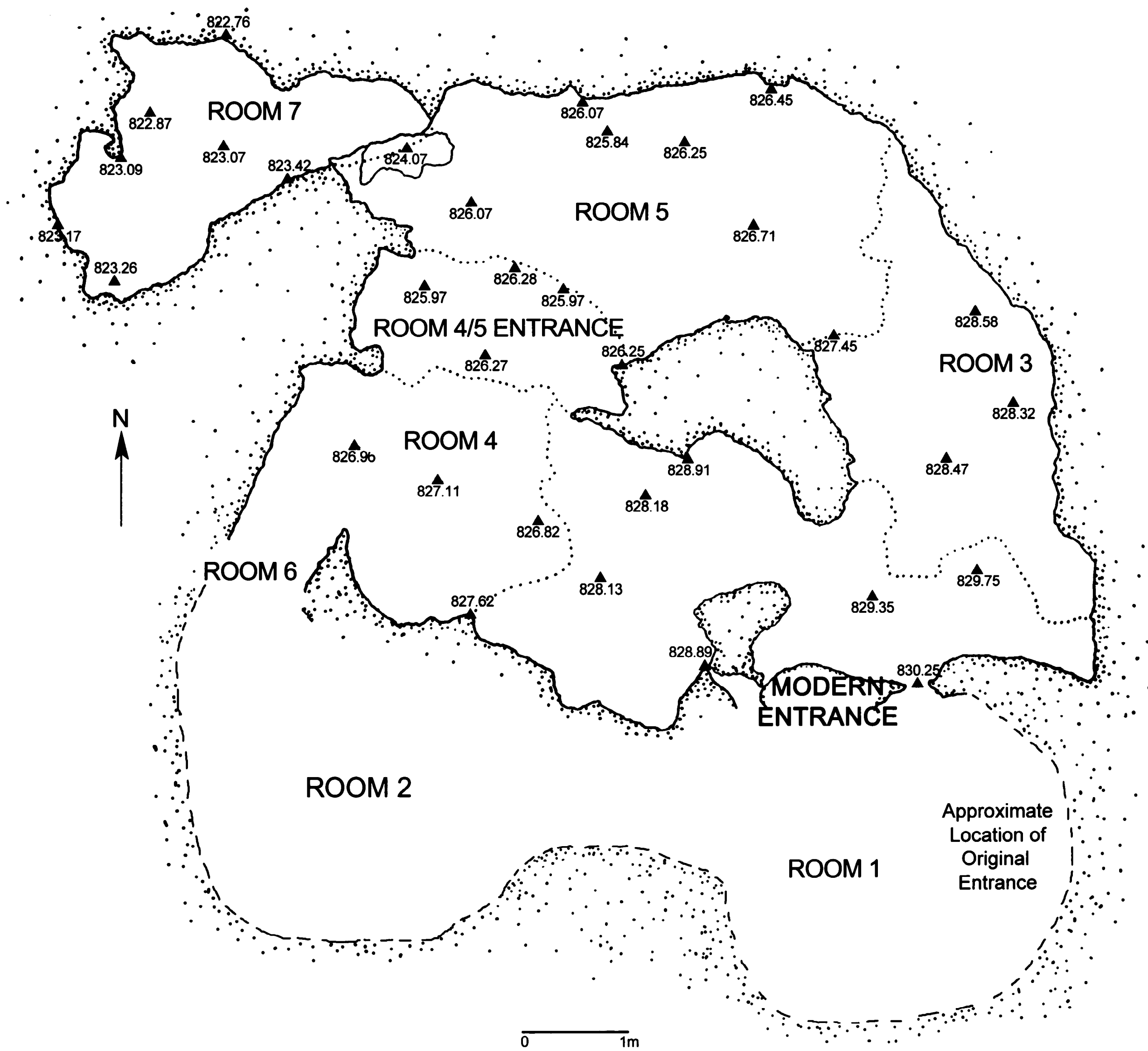


Figure 3. Plan of the cave at Hagios Charalambos. T. McDermott

that the deposit had not been disturbed since the Bronze Age). Both FN and MM IIB sherds were found on the surface of the deposit as well as within it and lying on the cave's bedrock floor at the base of the deposit in room 5. Most of the complete vases were found by the first campaign in the course of excavating rooms 1–4.

The authors of this preliminary report discuss both the discoveries from the 1976–1983 excavations and those from the more recent seasons. Following the introduction, the report is divided into 11 sections: (1) Local and Regional Geomorphology, (2) Early and Middle Minoan Pottery, (3) The Metal Artifacts, (4) The Gold Strips, (5) Chipped and Ground Stone Implements, (6) The Stone Vessels, (7) The Human Figurines, (8) The Neritid Shells, (9) The Sistra, (10) The Human Remains, and (11) Discussion and Conclusions. An appendix is also included: Handling and Care of Excavated Osseous Material.

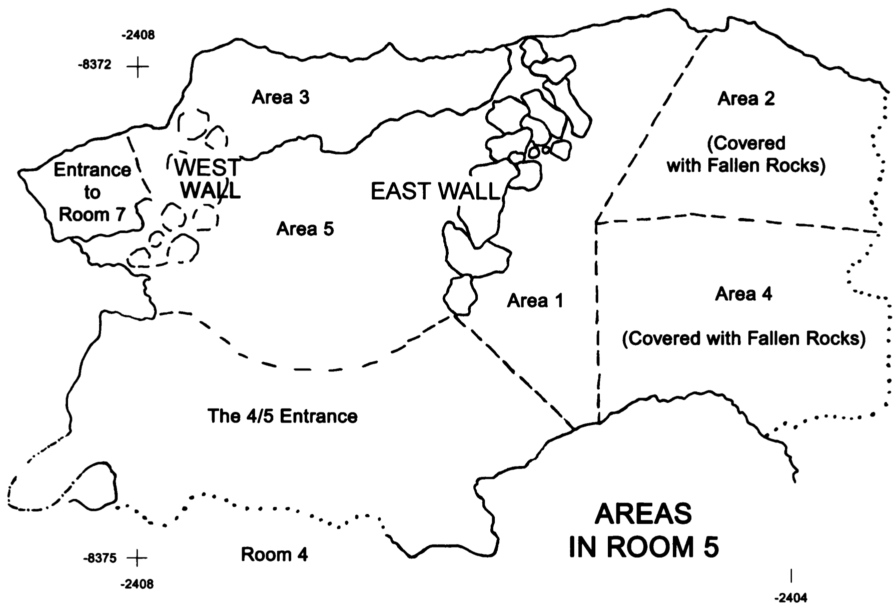


Figure 4. Areas in room 5.
T. McDermott

Figure 5. Grid of long bones under the deposit of disarticulated human bones

All of the pottery and other finds are being studied as a unit because they constitute a single deposit in the cave with numerous joins between the sherds and bones uncovered during both campaigns. These joins between fragments found in different levels and in different rooms help demonstrate that the material was mixed before it was placed in the cavern. The study of the human bones and artifacts is not completed. Final publication is tentatively planned in five volumes: I. *The Topography, Geology, and Small Finds,* II. *The Pottery,* III. *Discussion and Interpretation,* IV. *The Human Remains,* and V. *The Faunal Remains.*

Methodology

Methodology in 1976–1983

The work carried out between 1976 and 1983 was a rescue excavation conducted with very limited resources. In 1976, during road construction, the cave was opened by a dynamite blast that created a hole in the roof of room 1. The original entrance was not visible until later when, as noted above, the cracked upper part of the cavern was removed with power equipment in 1982 to eliminate the danger of falling stones from the unstable ceiling. Before removal of the bones and artifacts, the floors of the rooms inside the cave were covered with human skulls and complete vases, and disarticulated bones mixed with both broken and complete artifacts were underneath this surface level.

Because of the danger of looting, the bones and artifacts had to be removed quickly and taken to the Hagios Nikolaos Archaeological Museum. Complete vases were marked with their room number, and many sherds were marked as well. No plans were drawn or photographs taken. Because the ephorate had very limited resources for conducting the type of excavation required by this specialized site, the room 4/5 entrance and room 5 were left intact to wait for a future time when more resources would be available to excavate this unusual site properly, and the cavern was closed with a stone and concrete wall to preserve it. The pottery was saved by room at the time of excavation, but by 2002 it had become mixed. Complete vases were mended at the museum after the conclusion of the excavations.

Methodology in 2002 and 2003

After looters broke through the concrete wall in the year 2000 and removed objects lying on the surface inside the unexcavated rooms (but did not do any digging inside the cave), the senior author (PPB) was invited by Davaras and by the director of the 24th Ephorate, the late Nikos Papadakis, to organize a new excavation of the cavern. Because of the unusual character of the archaeological site, specialized techniques for recovery and conservation were used in 2002 and 2003. An EDM Survey Instrument was used both for mapping and for plotting locations inside the cave. Over a hundred plotted reference points inside the cavern were used to establish the locations of features and artifacts. Technical and logistical support was provided both by the 24th Ephorate through the Hagios Nikolaos Archaeological Museum and by the INSTAP Study Center for East Crete in Pacheia Ammos, so that the project was able to make use of outstanding facilities for conservation, photography, water sieving, and petrography, as well as study space, computer facilities, and other necessary support.[6]

The main focus of the project was the excavation of the room 4/5 entrance and room 5, the spaces that had not been previously investigated. Before excavation, room 5 consisted of an elliptical room with about 25 skulls and numerous long bones on the surface, with these large bones lying on a layer consisting mostly of smaller human bones in a disarticulated condition. At the north and in the center of the room, no soil at all was visible because the surface was completely covered with bones at the north

6. The complete transformation of the science of archaeology in East Crete between 1983 and 2002 completely justifies the 1983 decision to leave one part of the cave for a future generation to excavate with proper resources. See the appendix to this report for additional comments on conservation techniques.

and with stones that had recently fallen in from the cracked ceiling at the south. The upper parts of two terrace walls in the room that had been constructed by the Minoans in order to hold back the deposit (required because the natural floor of the room was inclined with the lower part at the northwest) were visible, but their nature was not discovered until later. Both walls were oriented roughly north–south (Fig. 4).

For ease in mapping and recording of bones and artifacts, room 5 was divided into five areas based on the location of the Minoan terrace walls as well as stalagmites and other natural topographic features (Fig. 4). All excavation proceeded in arbitrary successive levels of ca. 10–20 cm because no stratigraphy was present within the mass of bones and artifacts, apart from the absence of soil within the upper part of the deposit.[7] Bones lay at all angles, and many of them extended above and below the arbitrary levels. The locations of artifacts were plotted in when they became visible as the bones were removed.

Bones and artifacts in these two spaces were lifted and removed by Alekos Nikakis (Chief Conservator, 24th Ephorate). In a tent outside the cave, the bones and artifacts were cleaned and processed by a team under the direction of field directors Albert Leonard Jr. and James Muhly and conservator Stephania Chlouveraki. Processing consisted of removing mud with wooden tools, providing preliminary conservation as required by specific categories of the finds (such as ivory and metals),[8] and packing everything for transport either to the conservation facility at the INSTAP Study Center for East Crete or to the Archaeological Museum in Hagios Nikolaos, depending on the nature of the material. All soil was labeled, bagged, and shipped to the INSTAP Study Center for processing by a water separation machine.[9]

Artifacts were given accession numbers in the field, and they were drawn in a preliminary way before shipment to the museum or the INSTAP Study Center. For study purposes, all sherds from the earlier campaign were temporarily moved to the INSTAP Study Center, where numerous joins were found between the material from the two campaigns. All complete vases and all sherds from the first campaign were returned to the museum after the completion of the pottery study in 2005. As stated above, this preliminary report presents material from both campaigns.

The Excavation

Deposition inside the Cave

The recent project uncovered evidence for the preparation of the cave by the Minoans as well as information on the nature of the deposition inside the underground spaces. Rooms 1, 2, 3, 4, the 4/5 entrance, and 5 were used for the deposition of human bones. Except for room 5, the rooms had relatively level floors. Because the floor in room 5 had a slope of about 30 degrees, two terrace walls were built inside it in order to hold the bones and prevent them from sliding into room 7, which was at a lower level at the northwest of the cave (Fig. 4). The western wall was near a hole that provided access to room 7, and the eastern wall was across the room near a prominent stalagmite. Where the floor was uneven and cracked, the

7. Water had washed through the cave every year and removed all soil from the upper part of the deposit. In this upper part of room 5, the "excavation" consisted of picking up loose bones one at a time. Soil in the lower part of the deposit had migrated in from the surface through fissures in the rock; see the section by Karkanas, below.

8. See Appendix, below.

9. The water separation machine is an adaptation of the one described by French (1971). It separates residue and flotated remains from the soil and retrieves them for later study.

grid of human leg bones referred to above was laid down (Fig. 5), and the massive deposit of loose bones and artifacts was carefully placed over this grid, across the room uphill from the terrace walls. The bones and artifacts were deposited in the room in two stages, both within MM IIB. The first stage took place in the cave when the eastern terrace wall was only partly constructed, and some of the human bones were spread across it. After an additional course of stones was placed on the wall, the remainder of the deposit was put in the ossuary. After the rooms were filled with the deposit, a pile of skulls was placed over the other bones.[10]

A micromorphological study of the sediments in room 5 showed that no soil was placed in the cave along with the bones and artifacts. After the deposition, soil accumulated only in the lower part of the deposit. All the soil was recent enough to have modern plastic bits and modern seeds in it, washed into the cave through the tiny cracks in the ceiling. As a result of this situation, the upper part of the deposit consisted of only clean bones, artifacts, and stones.

Deposition outside the Cave's Mouth

In 2003, the area outside the mouth of the cave was excavated in two places. A small lens of black soil at the edge of the mouth of the cave (at the top of the east side of the original entrance) was excavated and examined by water sieving. Four small adjoining trenches (trenches 11–14), beginning ca. 7.5 m south of the entrance to the cave and extending 5 m to the south, were opened (Fig. 6). Before excavation, the elevation at the northeast corner of trench 14, the trench closest to the cave, was 835.66 masl, and the elevation at the southwest corner of trench 11, which was the farthest trench from the cave, was 834.76 masl.

The lens of dark soil (ca. 20 × 30 cm in size) was clearly visible in the scarp left by the bulldozed removal of the cave's front rooms (rooms 1 and 2). It was carefully removed in 2003 because it was the only part of the original soil inside the cave's entrance that survived. The tiny lens of dark soil included a handle from a typical MM II cup made of red-firing clay, several small pieces of animal bones, and many tiny charcoal bits. The animal bones had cut marks on them that showed they were the remains of food from which the meat had been removed. The bones were from sheep or goat, pig, and a small mammal, probably a hare. The handle sherd was made of the local fabric used for a majority of the pottery from this site (Lasithi-Pediada Red Fabric group). The shape is typical of cups from MM II, the latest date for the majority of the deposit inside the ossuary. This sherd suggests a date of MM II for the lens of soil. No human bones were found in this deposit, confirming that the entrance was separate from the ossuary. The evidence indicates that the lens contained part of the remains from a feast held outside the cave at the time of or just after the deposition in the ossuary.

In the trenches excavated outside the mouth of the cave (Fig. 6), two strata were above bedrock. The lower one consisted of patches of disturbed soil and stones moved there by the road construction. Small areas of the original soil from the hillside were present in this lower level, especially in trench 11 (trenches 12 and 14, which were closer to the cave, were more

10. The piles of skulls were in all the rooms used by the Minoans. In room 5, they did not cover the entire floor but were piled next to the east wall.

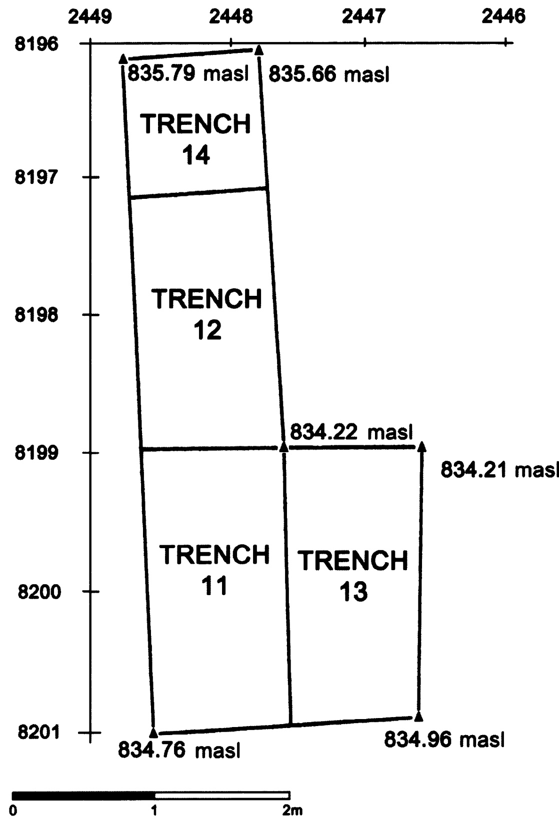


Figure 6. Trenches excavated outside the original entrance to the cave

disturbed). These small lenses showed that the original soil on this part of the hill contained small bits of charcoal and a few tiny worn Neolithic sherds but no human bones. Above this layer of material shoved here by the bulldozers was a part of the dump from the earlier excavations. The dump contained many small pieces of human bones. The upper level was mixed with terra rossa soil that had washed down to this location from higher on the hill after the end of the 1983 season.

LOCAL AND REGIONAL GEOMORPHOLOGY

Panagiotis Karkanas

The cave of Hagios Charalambos is a blocked inactive sinkhole located on the western side of the Lasithi plain. The original entrance of the cave is ca. 834.95 masl and about 13 m above the present surface of the plain in the area. The lowest altitude of the Lasithi plain is observed in the area of the active Chonos sinkhole (ca. 810 masl), about 2 km northwest of the cave on the same side of the plain (Fig. 2). Circular depressions in the alluvial plain, a few hundred meters to the north of the cave, are features of the complex underground karstic system that provides drainage.

The continuous drop of the Lasithi base level must be due to a combination of climatic and tectonic processes. Accelerated tectonic uplift rates would have enhanced erosion and lowering of the level of the plain. During glacial times the intramontane valleys around the plain would have been charged with debris from glacial processes (freeze-thaw activity, glacier

Figure 7. Contact of light-colored limestone (left) and gray dolomite (right), with arrow pointing to the trace of a fault plane

drift, etc.). The Dicti mountain range beyond the eastern part of the plain has peaks more than 2000 m high, and it probably witnessed high-altitude glaciation during the Pleistocene. Indications of glacial formations are reported for the White Mountains and the Idean Mountains.[11] At the transition to interglacial runoff periods, the sediment could have been progressively transported to the lowlands.

Continuing runoff during the following warm periods probably led to wash-out of the sediment fill of the alluvial plain into the karstic drainage conduits around the plain. Today, a similar process can be seen in the progressive lowering of the base of the plain from the east to the west (where the major sinkholes are located). Recent flood deposits can be observed in the area of Hagios Konstantinos, toward the eastern part of the plain (Fig. 2) where the exit of a major drainage system from Mt. Dicti is found (i.e., the Chavgas gorge). It is not clear, though, to which interglacial-glacial cycle the corresponding base level of the Hagios Charalambos cave should be assigned. The combination of climatic and tectonic processes described above would have resulted in a complex evolution of the plain.

The cave is formed along a fault that separates gray dolomite from limestone, both of Upper Triassic to Upper Jurassic age (Fig. 7). The tectonic contact facilitated the dissolution of the rocks, and the resulting cavity was gradually enlarged. When the sinkhole was active, water draining through it probably eroded and further enlarged the cave. After the sinkhole became inactive, formation of speleothems (stalagmites-stalactites, flowstones, and other travertine formations) accelerated and gradually filled and blocked the lower parts of the sinkhole.

Remnants of the rim and the entrance of the sinkhole can be seen on the outer edge of the present open-air part of the cave's original entrance in the form of steeply inclined and polished rock surfaces with local travertine crusts (Fig. 8). Although the original entrance extended along the entire length of the recently collapsed depression, the only passage to the lower part of the cave was the one that can be seen today. Between the original entrance and the modern entrance was a chamber (room 1) that is now

11. Nemec and Postma 1993.

Figure 8. Steeply inclined and naturally polished rock surface delineating part of the original sinkhole entrance

totally exposed to the open air (Fig. 3). However, a small and very narrow conduit (room 6, now blocked with sediment) also once connected the collapsed room 2 with the lower rooms.

The steeply inclined walls of the sinkhole prevented the accumulation of sediment on the interior floor surface of the cave. In most places the surface is covered by thick speleothem formations. The thin sediment cover that is observed in the areas where the human bones were located resulted from the construction of leveled surfaces for their deposition by the Minoans. The bones themselves acted as sediment traps. The sediment cover is reddish clay that was gradually transported and infiltrated through the fractures and conduits of the rock from the top of the hill above the cave. Coarse clastic material from the outside area did not enter the cave.

EARLY AND MIDDLE MINOAN POTTERY

Louise Langford-Verstegen

The pottery assemblage from the Hagios Charalambos cave illustrates the local styles of production in the Lasithi-Pediada region, and it also indicates that the residents had a taste for wares imported from elsewhere on the island of Crete.[12] Over 15,000 sherds come from the cave.[13] This assemblage seems to represent a chronological continuum with no significant gaps. Pottery belonging to phases later than MM IIB consists of only a very few LM III sherds. It is assumed that these items were left at the front of the cave as a result of a different activity from that which produced the assemblage of objects dating from the Final Neolithic to

12. Special thanks to Philip Betancourt and Costis Davaras for allowing me to participate in the excavation, and also to study the pottery. The manifold expertise of Alekos Nikakis contributed greatly to this study, especially in the conservation of objects now on display in the Hagios Nikolaos Archaeological Museum. Stephania Chlouveraki, Chief Conservator at the INSTAP Study Center for East Crete, also contributed many hours of expertise. Research for this study was supported by travel grants from Temple University.

13. For the early excavations, see Davaras 1983, 1989a, 1989b.

the MM IIB period. As is typical of pottery associated with burials, most of the vessels found in the cave were used for the pouring and drinking of liquids. In addition, small vessels that presumably held oil or a special unguent, vessels that can be classified as offering stands, and a few other shapes were also present. Cups and jugs are the dominant shapes of both imported and locally made objects.

The majority of the pottery from the site was made locally. The local fabric consisted of a medium-coarse, reddish clay with distinctive phyllite inclusions (Lasithi-Pediada Red Fabric group). Petrographic analysis provides a thorough description of this fabric.[14] Local fabric groups of the Pediada region have been previously discussed in a study of pottery from Galatas and Kastelli.[15] In addition, distinctive fabrics of a "Lasithi group" are discussed in an earlier study of Early Minoan (EM) III–MM IA pottery from Knossos.[16] The pottery from Hagios Charalambos fits well with the conclusions of these studies; the authors identify a series of production centers that made pottery for use in the Pediada and Lasithi region using the local phyllite-rich clays that fire to a red color.

A locally made workshop group decorated in a manner imitating East Cretan White-on-Dark ware[17] from the northeast coast of the island has been identified (Fig. 9:**1**–**3**). White-on-Dark ware flourished in EM III–MM IA. The pottery in this style from the cave consists mostly of cups, shallow bowls, and jugs. Most numerous are cups that are rounded to almost conical in profile with one vertical handle (with round or elliptical section) attached at or across the rim and on the lower body of the vessel. The cups have a dark slip that is applied to the exterior and either to the inside of the rim (Fig. 9:**1**) or to the entire interior (Fig. 9:**2**). Decoration in white is added over the dark undercoat in imitation of the East Cretan White-on-Dark ware.

The local Lasithi production uses a more limited repertoire of decorative motifs than is used elsewhere for this ware, especially from sites along the north coast of eastern Crete from Malia to Palaikastro. Ornamentation includes motifs that are both rectilinear and curvilinear. The most common decoration consists of triangles containing hatching. This motif is a variation of the more usual triangle. The triangle motif of the East Cretan variety of this ware is a frequently occurring design that is sometimes filled with crosshatching, dots, or other patterns.[18] Here, the triangle is only filled with parallel lines. The chevron, a very common motif that occurs in all phases of East Cretan White-on-Dark ware, does not occur here. Two phases of imitation are indicated because in the Gulf of Mirabello region, the group of cups with paint on the interior of the rim (Fig. 9:**1**) recedes the group with paint and decoration on the whole interior (Fig. 9:**2**), with the former group dating to EM III and early MM IA, and the latter from MM IA to MM IB.[19] The exact chronological point at which the change occurs is still uncertain.

Imported pottery found in the cave ranges in date from EM I to MM IIB. Early Minoan imports are from Knossos, the Mesara, and the Mirabello Bay area. These imports include EM I Hagios Onouphrios ware (Fig. 9:**4**), EM IIB Vasiliki ware (Fig. 9:**5**), and EM III–MM IA Knossian goblets (Fig. 9:**6**).[20] Imports from early in the Middle Minoan

14. I am grateful to Eleni Nodarou, Head of Petrography at the INSTAP Study Center, for undertaking a petrographic study of pottery from the site.

15. Rethemiotakis and Christakis 2004.

16. Momigliano 2000, p. 76. See also Cadogan 1990; Momigliano 1991, pp. 261–264; MacGillivray 1998, pp. 88–89.

17. Betancourt 1984.

18. Betancourt 1984, p. 22.

19. The change can be recognized between the Middle Phase (EM III and early MM I) and the Late Phase (MM IB) of East Cretan White-on-Dark ware as described by Betancourt (1984, pp. 6–20).

20. Cf. Momigliano 1991, p. 177, fig. 5, no. 1; 2000, p. 79, fig. 8, nos. 24–26.

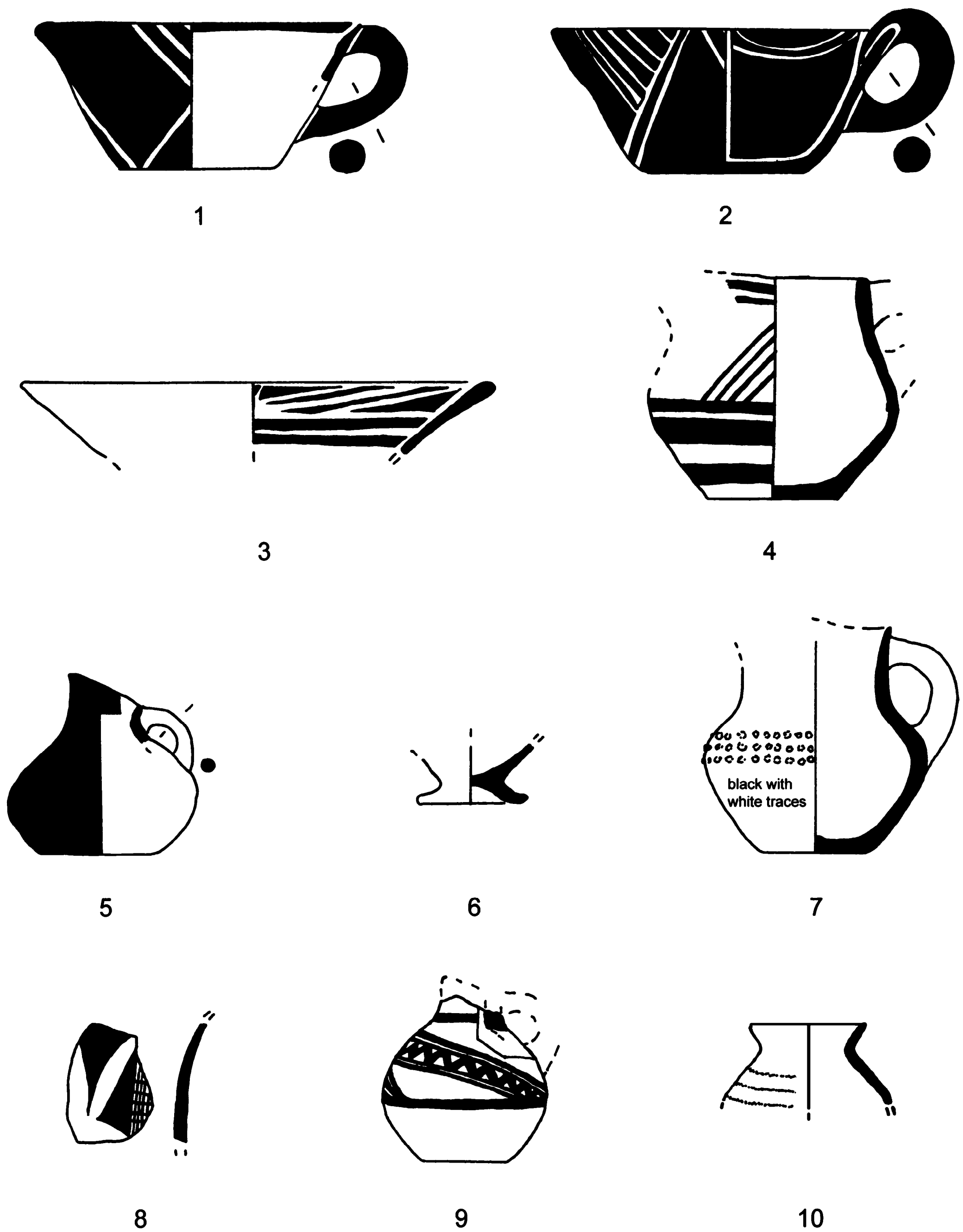


Figure 9. Minoan pottery from the cave, 1–10. Scale 1:3

period include pieces of Barbotine ware from central Crete, either the Mesara or Malia (Fig. 9:7). Among the MM II sherds are a fragment of Classical Kamares ware (Fig. 9:8) and a number of imports into Lasithi from production centers that are related to the region of Malia (Figs. 9:9, 10 and 10:11–13).[21] This situation in MM II represents a notable shift in the origin of imports, with a new emphasis on a single region as a source of ceramics. The Hagios Charalambos assemblage has several parallels with published objects from Malia as well as objects that, as petrographic analysis has shown, match a Malian pale fabric. Among these objects are

21. For the influence of Malia and discussion of a Malia-Lasithi state, see Cadogan 1995; Knappett 1997, 1999.

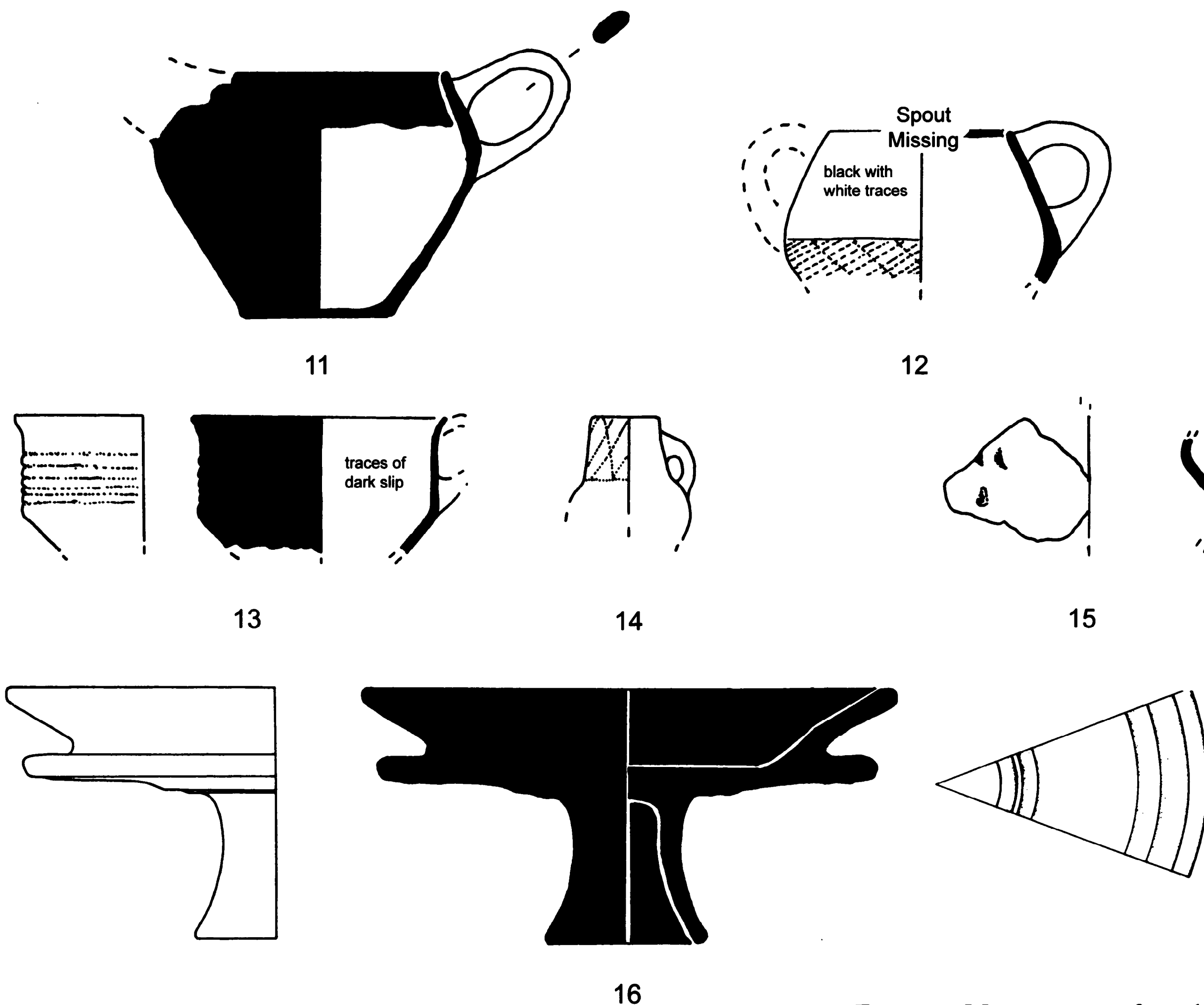


Figure 10. Minoan pottery from the cave, 11–16. Scale 1:3

small jugs with a dark-on-light diagonal line decoration (Fig. 9:**9**),[22] jugs with incised bands at or near the neck (Fig. 9:**10**),[23] tall, open-spouted jugs (Fig. 10:**11**),[24] two-handled, spouted kantharoi with painted and incised decoration (Fig. 10:**12**),[25] carinated cups with grooves (Fig. 10:**13**),[26] and straight-sided cups with conical profiles and large handles.[27]

Several examples of imported Chamaizi pots (Fig. 10:**14**) are present in the assemblage,[28] and they have previously been considered to be of Malian manufacture. Petrographic analysis has not yet confirmed this connection, and the analysis of an example from the cave does not match the Malia samples currently in the collection of the INSTAP Study Center.

The closest parallel for the Hagios Charalambos cave is the Trapeza cave.[29] This cavern lies at an altitude of 850 m on the northeast outskirts of the village of Tzermiado at the eastern side of the Lasithi plain. The overall stratigraphy of the cave was mixed, but a stratum with Neolithic occupation could be identified. Human bones and objects including pottery, figurines, bronze and copper artifacts, jewelry, and sealstones were found. At both the Trapeza cave and the cave at Hagios Charalambos, human bones and broken artifacts were mixed and scattered between different rooms and levels. This situation suggests that Trapeza was used as a secondary deposit in much the same way that Hagios Charalambos was. Although no intact Neolithic level was detected at Hagios Charalambos, Neolithic

22. Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 74, fig. 17, no. 643; Demargne 1945, pl. 28, nos. 8598–8601; Momigliano 1991, p. 241, fig. 29, no. 6.

23. Cf. Poursat 1996, pls. 22:a–g, 33:f.

24. Cf. Poursat 1996, pl. 33:l.

25. Cf. Deshayes and Dessenne 1959, pl. 53:c.

26. Cf. Demargne 1945, pl. 33:2, no. 8657.

27. Examples from Quartier Mu associate this vase with MM II at Malia: Poursat 1996, pl. 33:b; Poursat and Knappett 2005, pl. 36, nos. 1125–1148.

28. Cf. Demargne 1945, pl. 32:2, no. 8602.

29. Pendlebury, Pendlebury, and Money-Coutts 1935–1936.

sherds of open vessels with punctation marks (Fig. 10:**15**) were found mixed with the other finds. Their fabric is dark brown, and the surface is burnished.

The two caves seem to have served as ossuaries during the same periods, and they were relatively near each other. Their proximity strongly suggests that those utilizing one cave would have known of the other cavern. They were used concurrently, so this is not a case of one being filled and then the other coming into use. Nowicki proposed that the cave at Hagios Charalambos may have served many sites occupying the plain: "The number of bodies may indicate that it was a very special site used by the majority of the plateau rather than by a small local community in the vicinity of it."[30] Perhaps we may also consider Trapeza as servicing many settlements rather than a single local community.

The pottery provides important evidence of a shift in economic and possibly political dominance and influence for the Lasithi region during the Prepalatial and early Protopalatial periods. A change in the consumption of imports after EM I–MM I, when imports came from various locations, to more directional trade in MM IIB, when many imports came from Malia, is apparent. This fact may contribute to our knowledge of the Malian sphere of influence at this time with regard to the Lasithi-Pediada region.

In addition to the discovery of locally made and imported vessels for pouring and drinking, several examples of a type of offering stand (Fig. 10:**16**) were found. The shape begins in EM I and may persist to the end of the Prepalatial period, MM IA. The stands are made out of a phyllitic, coarse, red fabric. The surface is black and highly burnished. The shape is a shallow, circular receptacle with a flat bottom and low, flaring to almost straight walls attached to a short, cylindrical stem. Plastic decoration is sometimes applied to the outer surface of the underside of the vessel in the form of raised concentric rings, bosses, and in one unparalleled example, a radiating motif.

The typology of offering stands from Crete shows 12 variations in decoration added to a relatively standardized shape. These variations include the addition of raised ridges, bosses, and "rays." On an unpublished example from Mochlos, "rays" are added to the surface by incision. On stands from Lebena, the profile is more rounded and bowl-like than for other types, although the function is assumed to be the same. Four types of offering stand are represented in the Hagios Charalambos assemblage, namely, those decorated on the flat underside of the bowl with one inner ridge; two inner ridges and two outer ridges (Fig. 10:**16**); three inner ridges, two outer ridges, and three sets of three bosses; and one inner ridge plus four sets of three bosses and plastic rays joined at one inner ridge and extending outward.

The fabric of the stands from Hagios Charalambos was analyzed petrographically and shown to belong to the local Lasithi-Pediada Red Fabric group. Consequently, a pattern of distribution can be discerned because parallels are known from sites elsewhere in the Lasithi plain, along the north coast of Crete, and in the Mesara, including Trapeza,[31] Mochlos,[32] Gournia,[33] Myrsini (unpublished), Knossos,[34] Koumasa,[35] Platanos,[36] Pyrgos,[37] Malia,[38] and Lebena.[39] Convincing arguments suggest that these objects are stands.[40] Given their exclusively funerary contexts, these vessels may have been used as dishes or perhaps as handheld, portable offering stands. They may have held a liquid or grain offering and been placed so that they stood on their cylindrical stems.

30. Nowicki 1996, p. 34.
31. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 53.
32. Seager 1912, p. 71.
33. Soles 1992, pp. 14, 26, figs. 5, 10, pls. 5, 11.
34. Hood 1990, p. 373, fig. 2:18.
35. Xanthoudides 1924, pls. 18, 20.
36. Gerontakou 2003, p. 309, no. 16.
37. Xanthoudides 1921b, p. 157, fig. 12.
38. Pelon 1970, pl. 24, fig. 3.
39. Alexiou and Warren 2004, pls. 7, 58:b, c.
40. Seager 1912, p. 18; Soles 1992, p. 15.

The pottery assemblage from the cave at Hagios Charalambos presents new information that contributes to an overall picture of the Early and Middle Bronze Age in the Lasithi plain. More specifically, the pottery associated with burial practices provides evidence for local production as well as for the use of both local and imported wares. Influences range broadly from East Crete to the Mesara, Protopalatial Malia, and Knossos. This range of influences speaks not only of trade relations and political spheres of influence, but also of tastes in pottery production and consumption.

Selected Catalogue

1 Cup, complete Fig. 9

HNM 12,434. Room 4 (1983 season). H. 6.3, Diam. of rim 13.7, Diam. of base 6.6 cm. A coarse fabric, light red (2.5YR 6/6). Cup with straight sides and conical shape; handle with circular section attached at rim. Slipped: red (2.5YR 5/6) to reddish brown (2.5YR 3/4) on exterior and interior of rim. Added white: hatched triangles.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 57, 65, fig. 13, no. 519 (Trapeza).

EM III–MM IA.

2 Cup, almost complete Fig. 9

HNM 13,810. Room 4 (1983 season). H. 6.2, Diam. of rim 13.4, Diam. of base 5 cm. A coarse fabric, red (2.5YR 5/8). Cup with straight sides and conical shape; handle with circular section attached across rim. Slipped: on exterior and interior. Added white: swags on interior; hatched triangles on exterior.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 65, no. 521 (Trapeza).

MM I–IIA.

3 Bowl, rim sherd Fig. 9

HCH 120. Room 4 (1976–1983 seasons). Diam. of rim 20 cm. A coarse fabric, red (10R 4/8). Shallow bowl with convex profile. Slipped: traces. Added white: diagonal bands at rim on interior and exterior.

Cf. Warren 1972, p. 116, fig. 51, P196 (Myrtos).

EM III–MM IA.

4 Jug, complete profile Fig. 9

HCH 04-278. Room 4 (1983 season). H. (excluding spout) 9.3, Diam. of rim 8, Diam. of base 6.1 cm. A coarse pale fabric, pink (7.5YR 7/4); slipped and burnished. Jug with rounded profile; straight rim; flat base. Dark paint: two thin, horizontal bands at rim; four thin, diagonal bands from rim to middle of the body; three horizontal bands at base.

Hagios Onouphrios ware. Cf. Alexiou and Warren 2004, pl. 49:a (Lebena, Tomb 2).

EM I.

5 Small jug, complete profile Fig. 9

HNM 12,460. Rooms 1–4 (1983 season). H. 7, Diam. of base 4.6 cm. A pale fabric, pink (7.5YR 7/6); burnished. Small jug with rounded profile; raised spout; bosses on either side of neck. Slipped. Surface mottled black to red.

Vasiliki ware. Cf. Betancourt 1983, pl. 15, no. 191 (Vasiliki).
EM IIB.

6 Goblet, base sherd Fig. 9

HCH 45. Rooms 1–4 (1983 season). Diam. of foot 4.6 cm. A coarse pale fabric, pink (5YR 7/6). Footed goblet with rounded profile. Slipped: light reddish brown (5YR 6/4) on exterior.

Knossian. Cf. Momigliano 1991, p. 177, fig. 5, no. 1; 2000, p. 79, fig. 8, nos. 24–26 (Knossos).
EM III–MM IA.

7 Jug, complete profile Fig. 9

HCH 04-320. Room 4 (1983 season). P.H. 9.8, Diam. of rim ca. 7.5, Diam. of base 4.6 cm. A pale fabric, reddish yellow (7.5YR 7/6). Jug with rounded profile. Slipped: grayish brown (10R 5/2) on exterior. Added white: traces. Added bosses: three horizontal rows at middle of the body.

Barbotine ware. Cf. Betancourt 1985, p. 83, pl. 7:E (South Crete).
MM IB–IIA.

8 Jug, neck sherd Fig. 9

HCH 04-388. Room 1 (1982 season). Max. dim. 5.2, Diam. of neck 3.8 cm. A pale fabric, pink (5YR 7/4). Jug with rounded profile. Slipped: on exterior. Added white: two vertical "petals." Added red: vertical band.

Classical Kamares ware. The origin of this import is uncertain because of the small size of the fragment. Parallels for petals like those of this piece include Levi 1976, pl. vol. 1**, pl. XLIV:c (Phaistos); MacGillivray 1998, pl. 60, no. 257 (Knossos); Poursat and Knappett 2005, pl. 59:a, c (Malia); and Macdonald and Knappett 2007, p. 72, no. 227 (Knossos).
MM IIB.

9 Small jug, almost complete Fig. 9

HNM 13,826. Rooms 1–4 (1976–1983 seasons). Restored H. ca. 8, Diam. of base 3.4 cm. A pale fine fabric, reddish yellow (5YR 7/6). Small jug with rounded profile. Dark paint: band at base of neck; diagonal lines flanking a zigzag motif; one band on lower body.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 74, fig. 17, no. 643 (Trapeza); Demargne 1945, pl. 28, nos. 8598–8601 (Malia); Momigliano 1991, p. 241, fig. 29, no. 6 (Knossos). The class occurs as an import in a MM IA deposit at Mochlos (E. Sikla [pers. comm.]).
MM IA.

10 Jug, rim and body sherds at shoulder Fig. 9

HCH 122. Rooms 1–4 (1983 season). Diam. of rim 4.8, max. dim. 3.4 cm. A fine fabric, between light red (2.5YR 6/6) and red (2.5YR 5/6). Small jug with convex profile. Added decoration: three incised horizontal lines on upper shoulder.

Cf. Poursat 1996, pls. 22:a–g, 33:f (Malia).
MM IIB.

11 Open-spouted jug, complete profile Fig. 10

HCH 04-349. Room 4 (1983 season). P.H. 9.9, Diam. of rim 12, Diam. of base 6 cm. A pale fine fabric, reddish yellow (5YR 7/6). Tall, open-spouted jar with convex profile; one vertical handle with thin elliptical section across from spout; slightly pronounced base. Slipped: black (5YR 2.5/1), on interior of rim and exterior.

Cf. Poursat 1996, pl. 33:l; Poursat and Knappett 2005, pl. 49, nos. 642, 644 (Malia).

MM IB–II.

12 Spouted kantharos, rim and body sherds Fig. 10

HCH 04-288. Room 4 (1983 season). Diam. of rim ca. 7–8 cm. A pale fine fabric, reddish yellow (5YR 7/8). Spouted kantharos with rounded profile; straight rim; two opposed handles with circular section. Dark paint: wide band on body. Added white: three bands; chevrons. Added decoration: incised diagonal cross-hatching.

A Malia fabric. Cf. Deshayes and Dessenne 1959, pl. 53:c (Malia).

MM IIB.

13 Carinated cup with grooves, rim sherd with handle Fig. 10

HCH 66. Rooms 1–4 (1983 season). Diam. of rim 10, max. dim. 4.4 cm. A pale fine fabric, pink (5YR 7/4). Carinated cup with grooves above carination; straight rim; handle with flat, oval section. Slipped: from black to light red (2.5YR 6/6) on interior and exterior.

A Malia fabric. Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 10, no. 549 (Trapeza); Demargne 1945, pl. 33:2, no. 8657 (Malia); Poursat and Knappett 2005, pl. 27, nos. 769, 772 (Malia).

MM IIB.

14 Chamaizi pot, complete except for lower body and base Fig. 10

HNM 13,811. Room 4 (1976–1983 seasons). Restored H. 7, Diam. of rim 2.7 cm. A pale fine fabric, pink (7.5YR 7/4). Small jug with rounded profile; incised, cylindrical neck; small handle with circular section.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 10, nos. 645–649 (Trapeza); Demargne 1945, pl. 32, no. 2, no. 8602 (Malia); Poursat and Knappett 2005, pl. 36, nos. 1125–1148 (Malia).

MM II.

15 Carinated bowl with everted rim, body sherds Fig. 10

HCH 160. Rooms 1–3 (1982 season). Diam. of rim 22 cm. A brown fabric, reddish brown (5YR 4/3), with carbonate; burnished on interior and exterior. Carinated bowl with everted rim. Added punctation marks.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 27, fig. 6, no. T16 (Trapeza); Mantelli and Evely 1995, pl. 2:d (Knossos).

Late Neolithic.

16 Stand, complete Fig. 10

HNM 12,570. Rooms 1–4 (1976–1983 seasons). H. 10.2, Diam. of rim 21.4, Diam. of handle/base 6.2 cm. A coarse red fabric, red (2.5YR 4/6), with phyllite, noncalcareous; black-burnished surface on interior and exterior. Shallow, circular receptacle with flat bottom; low, flaring walls (H. 3.5) attached to a short, cylindrical stem (handle). Added plastic decoration of two inner ridges and two outer ridges.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 9, no. 404 (Trapeza).

EM II–MM IA.

THE METAL ARTIFACTS

James D. Muhly

The excavations at the Minoan secondary burial cave at Hagios Charalambos produced over 40 metal artifacts. They can be divided into three categories: (1) objects of gold, silver, and lead; (2) objects of copper or bronze; and (3) seal rings.

These metal artifacts constitute a relatively small group of finds, but they are of considerable importance for two reasons. Since we know relatively little about metal usage on the Lasithi plain during Minoan times, any addition to the corpus of metal artifacts from the high plain is significant. Apart from the Hagios Charalambos sample, the only collection of metal finds we possess from Lasithi is the one from the excavations at the Trapeza cave conducted by the British School of Archaeology during a very short season (May 4–19) in 1936.[41] The other reason why the metal finds from Hagios Charalambos are important is that the corpus, though limited in scope, contains several pieces of exceptional interest.

The finds include a remarkable gold ring with a "Marine Style" decorative motif (Fig. 11:**17**). It has three cockle shells and irregular rockwork arranged on an asymmetrical plate and decorated in repoussé technique. The plate, in turn, was joined to the hoop of the ring. A ring exhibiting such a "Marine Style" motif would normally be dated LM I, even LM IB, but little from the Hagios Charalambos cave seems to be later than MM IIB.

Also from the cave is a round silver shield, representing all that is left of what must have been a silver seal ring (Fig. 11:**18**). The incised decoration on the shield shows a clump of five stalks of "papyrus" or "sea daffodils" growing in a rocky landscape. Such a floral motif would also normally be dated LM I, possibly LM IA, or even MM III. Do these two precious-metal rings from Hagios Charalambos present us with serious chronological problems? Not necessarily. The recent discovery of a very similar floral motif on a fragment of wall painting from the MM IIB–IIIA Minoan palace at Galatas[42] should caution us to not be too rigid in making chronological distinctions based upon the existence of certain stylistic motifs.

In addition to rings of precious metal, the cave also yielded a gold tubular bead (Fig. 11:**19**) and a number of gold discs and strips or bands of gold foil, objects that have close parallels in finds from the Chrysolakkos deposit at Malia.[43] As the Chrysolakkos deposit has objects from MM IB to MM II,[44] these gold objects from Malia are probably of the same chronological horizon as those from the Hagios Charalambos cave. The examples from the Trapeza cave[45] could also be of the same date.

Semi-quantitative analyses of a number of the precious and base metal objects from Hagios Charalambos, carried out in the Hagios Nikolaos Archaeological Museum in June 2004 using a LIBS machine,[46] indicated that the gold artifacts from the cave contained significant amounts of silver, perhaps on the order of 10wt% Ag. This is of considerable interest because gold quartz lode deposits in Nubia tend to have a high silver content, averaging ca. 20wt% Ag.[47] Indeed, it has long been argued that, as Egypt has no argentiferous galena deposits and therefore no local source of silver,

41. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 13.
42. Rethemiotakis 2002, p. 57, color pl. 16:a.
43. Demargne 1930, pl. 18; 1945, pl. 65.
44. Stürmer 1993.
45. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 15, bottom.
46. LIBS = Laser-Induced Breakdown Spectroscopy, for which see Ferrence et al. 2003.
47. Schneiderhöhn 1962, p. 115; Rehren, Hess, and Philip 1996, p. 6; Philip and Rehren 1996, p. 139.

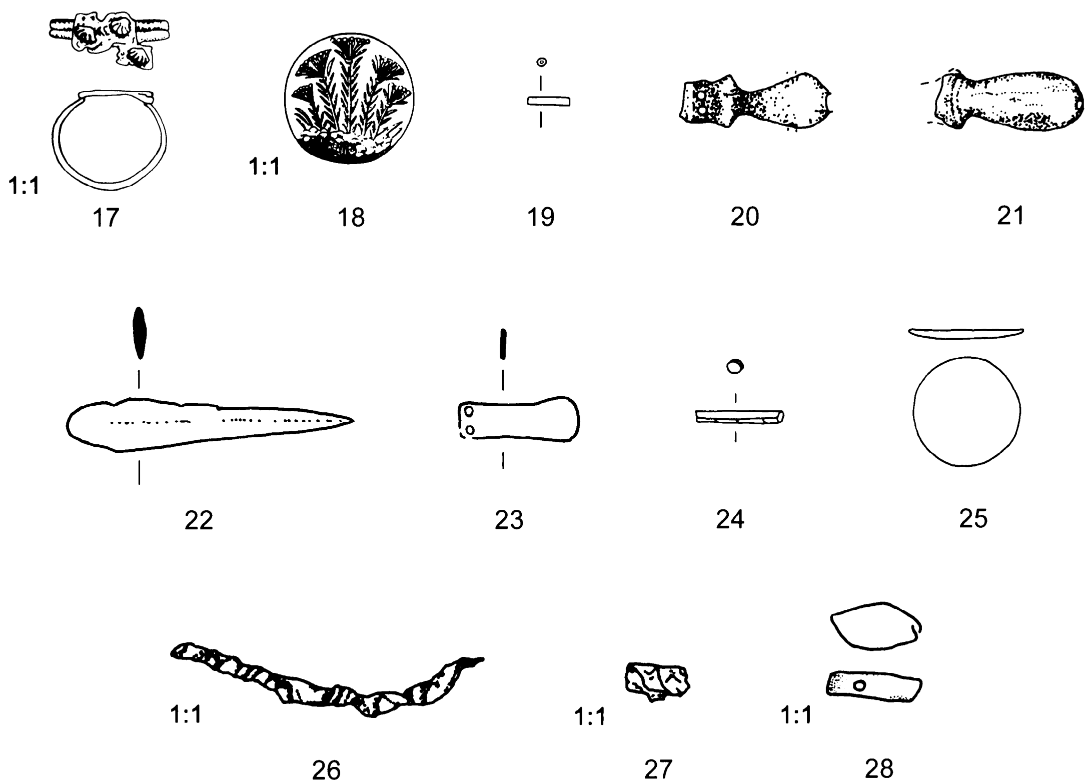


Figure 11. Metal objects 17–28.
Scale 1:2 except as marked

Egyptian silver actually came from so-called aurian silver deposits (that is, from nuggets of gold having a very high silver content).[48] This theory has now been discounted,[49] but it does not alter the fact that all Egyptian gold deposits do have a high silver content and that this is also true of those ancient Egyptian gold artifacts that have been analyzed.[50] W. F. Hume pointed out this fact almost 70 years ago in his great multivolume study on the *Geology of Egypt*.[51]

This evidence does suggest that the source of gold utilized for the artifacts found in the Hagios Charalambos cave was Egypt. This is hardly a revolutionary suggestion, as Egypt has long been regarded as a major source of gold for the Bronze Age Aegean, but usually only because Egypt was the most famous source of gold in Bronze Age times. Here, there is some real reason for suggesting that the gold found in the Hagios Charalambos cave came from Egypt. This suggestion finds support in other finds from the cave, made of material that almost certainly came from Egypt. This must have been true for the hippopotamus ivory used to make a number of the incised seals found in the cave.[52] Hippopotamus ivory was also used to make two handles from the cave, meant to be attached to some sort of copper or bronze blade. One (Fig. 11:**20**) still preserves a tiny portion of the blade attached to the handle with two rivets. It is certainly a razor or a scraper and has a very nice parallel from the Trapeza cave (HM 2301).[53] Similar in shape is a miniature example from Platanos (HM 1944),[54] but the Platanos example is made entirely of bronze, cast as a single piece. The other ivory handle from Hagios Charalambos (Fig. 11:**21**) has the same distinctive shape, resembling the pawn in a chess set, and was probably also attached to the blade of a razor.

48. Lucas 1928; Ogden 2000, p. 170.
49. Rehren, Hess, and Philip 1996; Philip and Rehren 1996.
50. Ogden 2000, p. 170.
51. Hume 1937, pp. 699–708, 717–723.
52. Davaras and Pini 1992, pp. 32–37, nos. 34–37. See also the ivory pieces discussed by Ferrence in this report.
53. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 15, no. III 1.
54. Xanthoudides 1924, pl. 56.

The other copper or bronze artifacts from Hagios Charalambos consist of the usual array of tools, weapons, and jewelry. There is a small dagger (Fig. 11:22) that, according to the LIBS analysis, is of copper with very little tin. The blade of a razor without surviving handle (Fig. 11:23), on the other hand, seems to have substantially more tin. A bead (Fig. 11:24), made from a rolled-up strip of metal, seems to be made of very pure copper, while a disk (Fig. 11:25) was made of copper with a small amount of lead. What these differences demonstrate is that the assemblage consists of a heterogeneous group of artifacts from several different sources rather than a single body of material that arrived in Lasithi as one shipment.

Selected Catalogue

17 Ring, complete Fig. 11

HNM 11,868. Rooms 1–4 (1976–1983 seasons). Diam. 1.6 cm. Gold. Ring with repoussé decoration composed of three marine shells in a background of irregular rocklike formations; decoration is manufactured as two sheets, with the lower one plain and the upper one with relief decoration; decorative ornament is fused onto the ring, which is made by rolling the sides of a rectangular sheet of gold to produce a pair of rolls next to each other.

MM IIB.

18 Seal ring, plate Fig. 11

HNM 11,877. Room 4, upper levels (Davaras 1989b). Dimensions of plate 1.59 x 1.63 cm. Silver. Round shield; slightly convex upper surface and concave lower surface. Incised decoration consisting of a clump of five stalks of "sea daffodils" or "papyrus" growing from a small area on an irregular ground, with the stems spreading apart as they rise from the ground and terminating in blossoms at the upper ends of the stems, with small leaves at the sides of the composition.

This seal ring fragment is decorated with a floral motif that has been traditionally dated to MM III–LM I (Davaras 1986, pp. 34–48), but the pottery from the cave dates to MM II. The discovery of a similar floral motif on a MM IIB or MM IIIA wall painting at Galatas (Rethemiotakis 2002, p. 57, color pl. 16:a) and the fact that no circular seal ring bezels are known from after MM II increase the likelihood that the ring is from the same period as the pottery found with it. The stiff stems and the way in which the flowers do not radiate from a single place suggest an early date as well.

The motif is rare on seals (for a stylized version of the spreading clump of plants, possibly illustrating leaves of some type, see Platon, Pini, and Salies 1977, p. 279, no. 203). Rather, the floral composition belongs in the same class with compositions in faience (Panagiotaki 1999, p. 102, fig. 27) and in several fresco paintings of clumps of flowers: Cameron 1976, p. 8, fig. 3:a (Knossos); Marinatos 1976, color pl. XXIII (Amnissos); Doumas 1992, pp. 36, 37, 96, 97, 100–105, figs. 2–5, 63–64, 66–71 (Akrotiri, Thera). The motif is already fully mature by MM IIB or IIIA (see the example from Galatas, cited above). The same composition appears on pottery (e.g., Betancourt 1985, p. 124, fig. 92 [Knossos]) and in other contexts, including some with possible religious meaning (for its association with a seated goddess, see Dimopoulou and Rethemiotakis 2000, p. 47, fig. 7 [Poros]).

MM IIB (or slightly later?).

19 Cylindrical bead, complete Fig. 11

HNM 13,762. Rooms 1–4 (1976–1983 seasons). L. 12 mm, Diam. 3 mm. Gold. Rolled-up strip, producing a cylindrical bead.

Cf. Seager 1912, p. 78, no. XXI.19 (Mochlos); Getz-Gentle 1996, p. 231, no. 377 (Cycladic); HNM 4681 (Hagia Photia, made of copper).

EM I–MM II (based on the site's pottery).

20 Blade, broken at base of handle Fig. 11

HNM 13,904. Room 5, area 1, level 2 (unit HCH 02-3-1-2). P.L. 3.5, W. 0.9, max. Th. of the blade 0.1 cm. Hippopotamus ivory handle with copper or bronze blade; pawn-shaped handle with two rivets holding the blade and a third hole pierced in the end of the handle.

Cf. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 15, no. III 1.

EM III–MM IIB.

21 Handle for unknown tool, broken Fig. 11

HNM 13,911. Room 5, area 1, level 3 (unit HCH 02-3-1-3). P.L. 3.7, max. W. 1.3 cm. Hippopotamus ivory (very pale brown, 10YR 7/3), polished. Pawn-shaped hilt; pierced at end; small shoulder; two incised lines at base of bulb; handle has cutting for insertion of a blade.

Similar to **20**, so probably a handle for a razor or some other metal tool.

EM III–MM IIB.

22 Dagger, complete Fig. 11

HNM 11,879. Room 2 (Davaras 1989a, p. 388). L. 7.5, W. 1.4 cm. Copper. Miniature dagger; elliptical section; rounded heel with no rivets.

Analysis by LIBS in 2004 at the Archaeological Museum in Hagios Nikolaos demonstrated that this object is made of copper with a very small amount of tin.

MM IIB (based on the presence of the tin).

23 Blade, almost complete Fig. 11

HNM 11,881. Room 2 (Davaras 1989a, p. 388). L. 3.2, W. 1.7, Th. 0.3 cm. Bronze. Blade; flat heel with two holes for rivets, in line; straight blade with wide, rounded end.

Analysis by LIBS in 2004 at the Archaeological Museum in Hagios Nikolaos demonstrated that this object is made of copper with a substantial amount of tin.

Cf. Seager 1912, p. 55, no. VI.29 (with part of the ivory hilt still in place), and p. 73, nos. XIX.29, 30, 32 (Mochlos); Xanthoudides 1921a, p. 20, fig. 6, lower right (Marathokephalo); Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pl. 15, above (Trapeza); Poursat 1996, pl. 42:b, c (Malia).

MM IIB (based on the presence of the tin).

24 Cylindrical bead, complete Fig. 11

HNM 11,886. Rooms 1–3 (1982 season). L. 23 mm, Diam. 4 mm. Copper. Rolled-up strip of metal, producing a hollow tube.

Analysis by LIBS in 2004 at the Archaeological Museum in Hagios Nikolaos demonstrated that this object is made of pure copper.

EM I–MM IIB (based on the site's pottery).

25 Disk, complete Fig. 11

HNM 11,885. Rooms 1–3 (1982 season). H. 0.3, Diam. 2.8 cm. Plumbian copper. Circular disk, slightly concave.

Analysis by LIBS in 2004 at the Archaeological Museum in Hagios Nikolaos demonstrated that this object is made of copper with a tiny amount of lead.

EM I–MM IIB (based on the site's pottery).

THE GOLD STRIPS

Jane Hickman

Three diadem or strip fragments manufactured from thin sheet gold were recovered from the dry-sieving and wet-sieving operations. Their widths vary from 0.2 to 1.0 cm; the original lengths are not known because all three were broken. The longest preserved strip (Fig. 11:**26**) may have been worn around the forehead as a diadem, or it may have adorned the head in another manner, perhaps as a hair ribbon. One fragment (Fig. 11:**28**), which was found rolled up, had a pierced hole near one end.

The three fragments may have been parts of objects used in life or manufactured for sepulchral purposes. Gold strips, in addition to being used for personal adornment as diadems, other forms of jewelry, or clothing attachments, may also have served as inlays for wooden boxes or may have decorated figurines or other objects made of stone, clay, or a perishable material like wood. Similar copper or bronze strips (HNM 11,880; HNM 11,906; HNM 11,905; HNM 13,794), two with pierced holes, were also recovered from the cave.

The number of Cretan parallels listed below in the catalogue indicates that many settlements in Crete, especially those located in the northern part of the island, may have traded for objects made from precious metals, including thin gold strips. Towns in the Lasithi plain, including the settlement associated with the cave at Hagios Charalambos, participated in this trade.

Plain gold strips manufactured from sheet gold were also recovered from a burial context at Kültepe in Anatolia,[55] where thin gold strips were found in situ on finger bones. Many gold hair ribbons were recovered from the Royal Tombs of Ur in Mesopotamia.[56] A long, thin gold strip, described as a headband, was recovered from a grave at Naga ed-Dêr in Egypt.[57]

All of the parallels to the thin gold strips from Hagios Charalambos, from Crete and elsewhere, were found in funerary contexts. From the Early Bronze Age to the Middle Bronze Age, when objects made from gold are deposited in burial contexts, thin undecorated strips are often part of the assemblage.

Catalogue

26 Gold strip, fragment of one end — Fig. 11

HNM 13,866. Room 3, cleaning (unit HCH 02-1-2-cleaning). P.L. (as found, bent) 4.0, W. 0.2 cm. Gold. Thin strip.

Thin, undecorated gold strips or fragments of strips, as narrow as a centimeter or less, have been found at many sites in Crete. Mochlos, Tomb II: Seager 1912, p. 30, nos. II.17a, b, fig. 8; p. 31, no. II.27, fig. 10; and Tomb VI: Davaras 1975, p. 104, no. 6, pl. 21:b; Pyrgos cave: Xanthoudides 1921b, p. 166, fig. 15; Chrysolakkos at Malia: Demargne 1930, p. 406, pl. 18; 1945, p. 53, no. 565, pl. 65; Phourni, Archanes, Tholos Tomb Gamma: Papadatos 2005, pp. 95–96, nos. J42–J46, fig. 25; and Tomb Epsilon: Sakellarakis 1975, pp. 297, 301, nos. 1391, 1392, pl. 245; Panagiotopoulos 2002, p. 171; Trapeza cave: Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 102–103, pl. 15; Platanos, Tomb A: Xanthoudides 1924, p. 111, no. 493, pl. 57.

EM II–MM II.

55. Özgüç 1986, p. 25, nos. 13a, 14a, pl. 63.

56. Woolley 1934, pp. 119, 148, pls. 10:b, 11:b, 72; Pittman 1998, p. 102, nos. 44–46; Aruz 2003, pp. 122–123, nos. 72a–g.

57. Reisner 1908, p. 144, pl. 9:d.

27 Gold strip, fragment Fig. 11

HNM 13,865. Room 3, cleaning (unit HCH 02-1-3). Irregular piece. Max. dim. (as found, bent) 0.9 cm. Gold. Thin piece of sheet gold.

EM II–MM II.

28 Gold strip, fragment of one end Fig. 11

HNM 11,902. Room 4 (1983 season). P.L. (as found, bent) 1.5, W. 0.4 cm. Gold. One pierced hole near preserved end.

The fragment of gold strip was rolled up. The presence of the pierced hole near the end suggests this strip may have been used as a diadem or attached to another object.

EM II–MM II.

CHIPPED AND GROUND STONE IMPLEMENTS

Heidi M. C. Dierckx

Chipped Stone

The chipped stone tool assemblage from the burial cave of Hagios Charalambos consists of 61 pieces, the majority of which are made of obsidian (Table 1).[58] Six pieces are of chert, and two of quartzite. Over half the pieces recovered are less than 2 cm in length, and they would have been lost to us had it not been for the meticulous sieving methods (including 100% water sieving) employed during the recent campaign.

The obsidian came most likely from Melos, which is the main source of obsidian for Bronze Age Crete.[59] There are two obsidian quarries on Melos, Sta Nychia and Demenagaki. As most of the obsidian from the cave is of the dark gray to black variety (n = 44), it probably came from Sta Nychia. Several pieces (n = 9) look macroscopically different in appearance. These dark gray obsidian pieces with darker stripes appear translucent and lustrous, and may have come from the Demenagaki quarry.[60] It is hard to ascertain the origin of obsidian by mere visual analysis, and the pieces would need to be tested for certainty.

The obsidian assemblage is diverse in character, consisting of prismatic blades, blades belonging to the initial stages of blade manufacture, a prismatic core fragment, flakes, and geometrics (Table 1). The geometrics, which are of special interest, consist of two types: trapezes and lunates. The most common are the lunates, crescent-shaped blanks made from the medial segment of a prismatic blade with rounded abrupt retouch on one edge, while the opposing edge is straight (Fig. 12:**29**, **30**). With the exception of three examples, all the lunates are complete, with an average size of 1.32 × 0.62 × 0.2 cm, with a standard deviation of 0.18 × 0.08 × 0.06 cm. The three partially preserved examples were probably broken during post-burial activities. All the trapezes are complete and measure within the same range as the lunates, with an average of 1.5 × 0.58 × 0.21 cm, with a standard deviation of 0.21 × 0.08 × 0.02 cm (Fig. 12:**31**). Trapezes were manufactured like the lunates, except that they are trapezoidal in shape with semi-abrupt or abrupt retouch on one edge.

58. I would like first to thank Philip Betancourt for allowing me to study this material. I also thank Tristan Carter for providing useful information on his recent studies on obsidian from Bronze Age sites, and for giving me a copy of his dissertation (Carter 1998).

59. A Melian source was established by analysis many years ago: Renfrew, Cann, and Dixon 1965; Renfrew 1971.

60. Tristan Carter (pers. comm.).

TABLE 1. CHIPPED STONE IMPLEMENTS

Category	*Number*
Obsidian prismatic blades	16
Obsidian crested blades	3
Obsidian initial blades	5
Obsidian cores	1
Obsidian flakes	7
Obsidian geometrics	21 (16 lunates and 5 trapezes)
Chert blades/blade-flakes/flakes	6
Quartzite blades/scrapers	2
Total	61

The Hagios Charalambos cave has revealed the largest number of geometrics yet known from any early Minoan funerary context. Only the trapeze has been documented previously, and it has been regarded as a rare form.[61] Parallels for this type have been published from several places in the Aegean. They are known from the Peloponnese (Lerna, Geraki, and sites discovered by the Argolid Exploration Project and the Asea Valley Survey),[62] where they have been dated to the Early Helladic II period. Two EB II trapezes were found in a Cycladic tomb on Naxos.[63] From Crete, one example from Myrtos Fournou Korifi from an EM IIB context has been published.[64]

Further parallels come from EM tholos tombs at Platanos and Lebena in the Mesara (n = 13), and three other pieces are from Tholos Tomb Gamma and the Area of the Rocks at Phourni, Archanes.[65] The additional evidence from Hagios Charalambos adds further credibility to Carter's statement: "In the absence of secure dating for these latter examples [referring to Platanos and Lebena], it would be unwise to overstate the case, but it is tempting to see a localized variant in the construction of funerary assemblages, shared by communities in southern and central Crete."[66] As for the function of these tools, other than as funerary goods, their shape suggests a possible use as blades in sickles or reaping knives. Runnels, however, has suggested a use as projectile points based on examples from the Near East and Egypt.[67] No marks from use can be seen on the examples from the cave.

The 16 lunates from Hagios Charalambos are similar to the trapezes in their method of manufacture. Although this specific type has not yet been found elsewhere, it is safe to recognize these pieces as belonging to the same category of tools. Further study of obsidian assemblages from EM tombs may discover more lunates in Crete. Or could the lunates be a variant concentrated in the Lasithi plain?

Besides the geometric pieces, the assemblage includes 16 prismatic blades and five blades belonging to the initial stages of blade manufacture (Fig. 12:**32–35**). One prismatic blade (**32**), completely preserved, stands out among the group. It measures 9.7 × 1.2 × 0.36 cm and has parallels with the long prismatic blades from the Hagia Photia EM cemetery.[68] Blades of this length are geographically limited to Hagia Photia and tombs in the

61. Carter 1998, p. 298.
62. Lerna: Runnels 1985, p. 372, table 11, fig. 6:c. Geraki: Carter and Ydo 1996, p. 157, ill. 18:9:c; Carter 2002, pp. 38–39, fig. 12 (nos. 495/3, 4492/SF1, 500/1, 4494/SF1). AEP: Kardulias and Runnels 1995, p. 95, figs. 78:3, 80:2, 89:9. Asea Valley Survey: Carter 2003, pp. 148, 150, fig. 110 (nos. CS 173, CS 174).
63. Carter 1998, p. 299, appendix 2.
64. Jarman 1972, p. 326, fig. 128:35.
65. Carter 1998, pp. 298–299, pl. 12:6, 7.
66. Carter 1998, p. 307.
67. Runnels 1985, p. 374.
68. Davaras 1971, p. 397; 1976, pp. 211–212, fig. 120; Davaras and Betancourt 2004, passim.

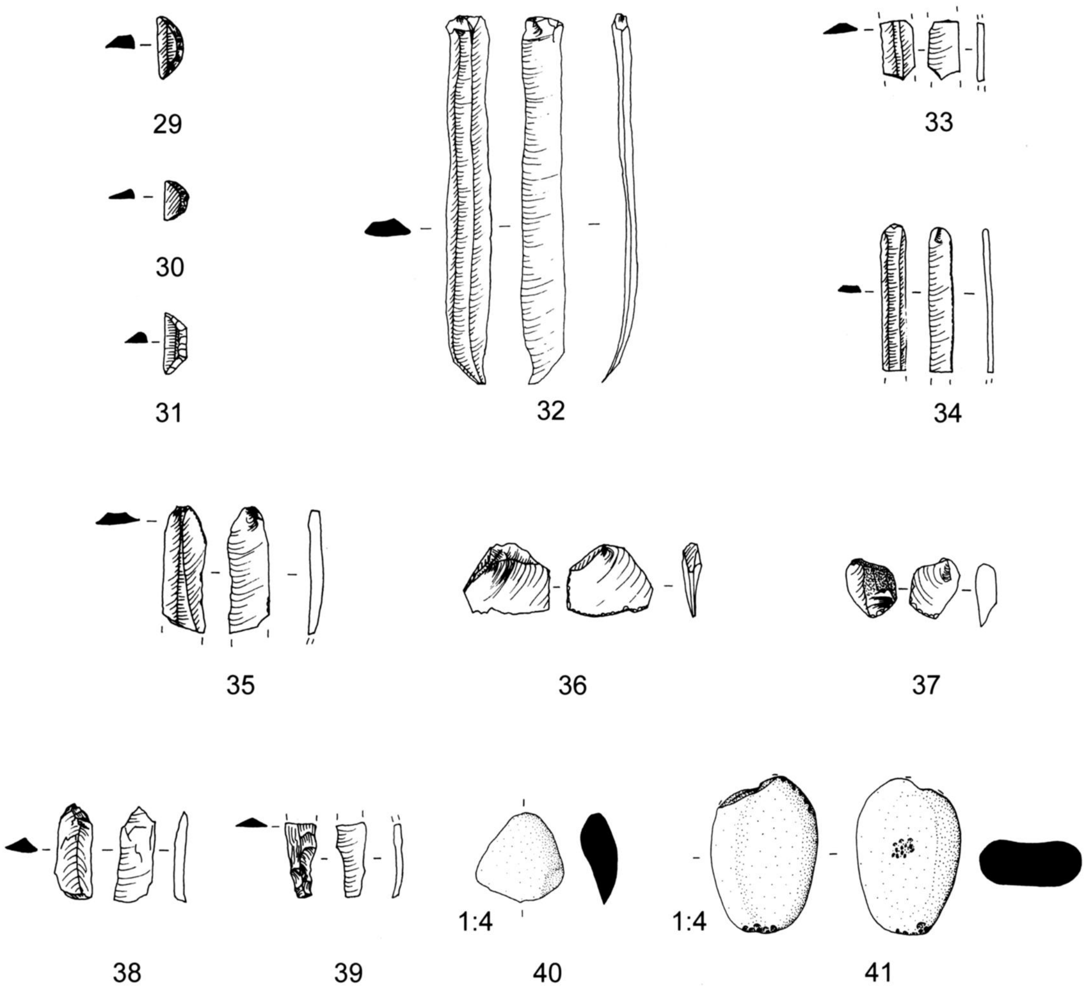


Figure 12. Stone tools 29–41.
Scale 1:2 except as marked

Cyclades where blades measure upward of 7 cm in length.[69] The longest blade from Hagia Photia measures over 12 cm, making the blade from Hagios Charalambos comparable to this group.

Blades were common among the chipped stone finds in EM–MM I tombs, such as those found in the Pyrgos, Kyparissi, and Trapeza caves and in the Hagia Photia cemetery (East Crete), and in tombs in the Mesara and central Crete. Minoan blades from these tombs rarely measure over 7 cm. In fact, the blades published from the Trapeza and Pyrgos caves average 5–6 cm in length.[70] All blades from Hagios Charalambos, except for **32**, were broken, and either the proximal or distal end (primarily) or the medial section was preserved. This situation is similar to that for blades found in the Hagia Kyriaki tomb (EM I–MM I) and others in the Mesara. Secondary deposition, post-burial activity, and disturbance probably account for the breakage of these blades.[71]

Besides the lunates and trapezes, 15 blades and two flakes show signs of retouch (Fig. 12:**36**–**38**), which includes marginal retouch, retouch creating notches (for hafting purposes), retouch to produce pointed tools, and end retouch in the form of serration. The retouched pieces also include two scrapers. One crested blade is present (Fig. 12:**39**).

69. Carter 1998, p. 251.
70. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 16, pl. 17; Carter 1998, p. 251.
71. Carter 1998, p. 250.

As noted above, six pieces made of chert and two of quartzite were also recovered from the cave. Two scrapers, one example each of chert and quartzite, are among the pieces.

The geometrics (**29–31**) and the long prismatic blade (**32**) can probably be dated to FN–MM I, while the incomplete blades can only be assigned dates based on those for the overall range of the bulk of the pottery, which is FN–MM IIB. Like the rest of the remains, the stone tools were not stratified.

Selected Catalogue

29 Lunate, complete Fig. 12

HCH 04-315. Room 4, lower levels, unit 2 (unit HCH 02-2-2). L. 1.59, W. 0.69, Th. 0.32 cm. Obsidian. Crescent shape; rounded abrupt retouch on one edge.

30 Lunate, complete Fig. 12

HCH 04-324B. Room 4/5 entrance, level 3 (unit HCH 02-2/3-3). L. 1.06, W. 0.62, Th. 0.2 cm. Obsidian. Crescent shape; rounded abrupt retouch on one edge; chipped straight edge.

31 Trapeze, complete Fig. 12

HNM 13,858B. Rooms 1–4 (1976–1983 seasons). L. 1.57, W. 0.57, Th. 0.21 cm. Obsidian (from Demenagaki?). Trapezoidal shape; semi-abrupt retouch on one edge; chipped straight edge; scratches on ventral surface from use.

32 Prismatic blade, complete Fig. 12

HNM 11,853. Rooms 1–4 (1976–1983 seasons). L. 9.7, W. 1.2, Th. 0.36 cm. Obsidian. Two parallel ridges; chipped edges.

33 Prismatic blade, center section Fig. 12

HCH 04-338. Rooms 1–4 (1976–1983 seasons, from unit HCH 03-dump). P.L. 1.52, W. 0.86, Th. 0.18 cm. Obsidian. Two parallel ridges; chipped edges.

34 Prismatic blade, proximal and center sections Fig. 12

HNM 13,814. Rooms 1–4 (1976–1983 seasons). P.L. 3.82, W. 0.65, Th. 0.12 cm. Obsidian (from Demenagaki?). Two ridges; marginal retouch on one edge of ventral surface; chipped on one edge (from use).

35 Blade, proximal end Fig. 12

HNM 11,890B. Rooms 1–4 (1976–1983 seasons). P.L. 3.25, W. 1.03, Th.0.26 cm. Obsidian. Two ridges; retouched at proximal end on dorsal surface; retouched on both surfaces: notches for hafting.

36 Worked flake, complete Fig. 12

HCH 04-367. Rooms 1–4 (1976–1983 seasons, unit HCH 03-14-2). Max. dim. 2.29, Th. 0.47 cm. Quartzite. Retouched at edges to shape to a point on dorsal surface with a notch for hafting. Scraper/pointed tool.

37 Initial flake, complete Fig. 12

HNM 11,893. Rooms 1–4 (1976–1983 seasons). L. 1.51, W. 1.29, Th. 0.51 cm.

Obsidian. Some cortex preserved; rounded retouch on distal end on both surfaces. Scraper.

38 Blade, complete Fig. 12

HCH 04-334. Room 3, lower levels, unit 4. L. 2.45, W. 0.96, Th. 0.28 cm. Chert (white, 10YR 8/1). One ridge; retouch at proximal end creating a point.

39 Crested blade, distal end Fig. 12

HCH 204. Room 4, upper levels (1983 season). P.L. 1.95, W. 0.81, Th. 0.15 cm. Obsidian. Chipped edges.

Ground Stone

The ground stone tool assemblage from the cave is not very impressive: five tools and two possible tools, found in a state of poor preservation. The identified tools consist of a sandstone celt (Fig. 12:**40**), a quartzite whetstone and pounding platform (Fig. 12:**41**), and two limestone pounders. The celt is of greatest interest. Stone axes appear to be rare in Minoan funerary contexts, as very few stone axes have been reported from Minoan EM tombs. From the Mesara tombs come two stone axes from Moni Odigitrias,[72] one from Drakones, and two from Kalathiana.[73] Two more stone axes were published from the Trapeza cave, one identified as green stone, the other as black limestone.[74]

Whetstones are more commonly found in tombs, but in the Mesara these tend to be more intricate than the example from the Hagios Charalambos cave. They are made of fine sandstone and are long and narrow with a hole pierced at one end.[75] Five marble and schist whetstones from the Trapeza cave correspond more closely to the Hagios Charalambos example in that they consist of unshaped cobbles with abraded faces and without a hole.[76]

Selected Catalogue

40 Celt, complete Fig. 12

HCH 02-111. Room 4/5 entrance, unit 3 (unit HCH 02-2/3 entrance-3). L. 4.7, W. 4.3, Th. 1.7 cm; Wt. 40 g. Sandstone (red, 2.5YR 5/6, fine-grained and poorly sorted). Waterworn pebble, trapezoidal shape; worn on large end.

41 Whetstone, broken on one end Fig. 12

HCH 65. Room 4, upper levels (1983 season). Max. L. 8.2, max. W. 5.5, max. Th. 2.25 cm; Wt. 162 g. Quartzite (dark grayish brown, 2.5Y 4/2). Natural waterworn cobble, ovoid shape; two faces abraded smooth; pecking on both ends and center of one face.

72. See reference in Carter 1998, appendix 4.
73. Xanthoudides 1924, pp. 80, 86, pl. 46:a.
74. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 114, 116, pl. 17.
75. Xanthoudides 1924, pp. 20, 66, 80, pls. 13, 39, 43, 54 (from Koumasa, Porti, Drakones, and Platanos).
76. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 113, 116, pl. 17.

THE STONE VESSELS

Heidi M. C. Dierckx

The stone vessels from the Hagios Charalambos burial cave amount to 21 pieces, including two lids (Table 2).[77] The vessels represent a variety of types that are also found in other tomb deposits in the Mesara and northeast Crete, for example in deposits from the Trapeza cave and Mochlos burials.[78] These types consist mainly of bowls, but cups, jars, a jug, and miniature goblets are also represented. The vessels were made from a variety of raw materials, consisting of serpentinite, travertine or marble (sometimes banded), steatite, and limestone. Serpentinite was used most frequently.

Two types of vessels from the cave were common funerary forms in the Mesara tombs: a miniature cup/jar (Fig. 13:**42**; Warren's type 21A) and a bird's nest bowl (Fig. 13:**50**; Warren's type 3). Both types were favored during the MM I period.[79] Another common type in South Cretan EM–MM contexts is the stone lid (Fig. 13:**44**; Warren's type 27.1A and 1B), used primarily for a variety of bowls.

Most of the stone vessels, however, can be related more closely to examples excavated in northern and eastern Crete, including those from tombs at Mochlos and from the Trapeza cave. These pieces include a miniature goblet (Fig. 13:**45**; Warren's type 29A and B) of EM II–III date, and a variety of bowls common in EM II–III contexts. The bowls consist of different types: a spouted bowl (Fig. 13:**52**; Warren's type 37B1); a bowl with rim lugs or handles (Warren's type 10A1); and bowls with everted rim and carinated or rounded profile (Fig. 13:**51**; Warren's type 8, varieties A–C). The last is the most popular type after the bird's nest bowls and can be found in EM–MM I/II contexts, mainly coming from the Mesara, Mochlos, and Trapeza.[80]

The conical cup form (Fig. 13:**48**; Warren's type 16) has parallels from Mochlos, where this type is dated MM I–LM I.[81] A similar case can be made for the spouted jug with carinated body (Fig. 13:**49**; Warren's type 22A), which is closest to an example from an EM II context, even though the type in general dates to MM I.[82] The example catalogued here is similar but has two horizontal handles added below the rim. A parallel for the miniature dish (Fig. 13:**47**) comes from the Trapeza cave and is dated stylistically to EM II–III.[83]

There is one unusual type of vessel found: a cylindrical pyxis or jar (Fig. 13:**43**). No exact parallels are known. It resembles Warren's type 33C, but without the incised decoration. Warren's type, dated to EM II–III, is itself rare.[84]

A comparison of these grave goods from Hagios Charalambos with those from the Trapeza cave, located in the same geographical area, is particularly noteworthy. Of the stone vessels, three miniature goblets, a spouted bowl, a miniature dish, a bowl with lug handles at the rim, possibly five bowls with everted rim, and a lid appear in the assemblage at Trapeza;[85] these same types make up about half of the total Hagios Charalambos assemblage. The similarity in the occurrence of certain stone vessel types as well as of obsidian blades (see above) suggests, not surprisingly, some sort of affinity between the two sites. The exact nature

77. I would like to thank Philip Betancourt and Costis Davaras for allowing me to study this material.
78. Xanthoudides 1924; Pendlebury, Pendlebury, and Money-Coutts 1935–1936; Warren 1969.
79. Warren 1969, pp. 7–11, 45–46.
80. Warren 1969, pp. 21–23, 27, 94–95; Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 109–111, 114–115, fig. 23, nos. 1–17.
81. Warren 1969, pp. 37–38, nos. D118, D119.
82. Warren 1969, p. 47, nos. D162, P274.
83. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 114, fig. 23, no. 3.
84. Warren 1969, p. 82, no. D251.
85. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, pp. 114–116, figs. 23, 24, nos. 1–10, 14, 17, 20, 21, 21A, 26, 32.

TABLE 2. STONE VESSELS

Vessel Shape	*Number*	*Material*
Miniature cylindrical jar/pyxis	1	Travertine
Miniature cup/jar	1	Serpentinite
Miniature goblet	3	Serpentinite
Miniature dish	1	Marble
Bowl	8	Marble, travertine, serpentinite
Cup	2	Serpentinite
Jug	1	Serpentinite
Lid	2	Steatite and serpentinite
Bird's nest bowl	1	Limestone
Jar	1	Limestone
Total	21	

of this relationship needs to be explored further with analysis of the rest of the tomb contents.

In summary, it appears that many of the stone vessel types from Hagios Charalambos are more in line with examples found in tombs from northern and eastern Crete, as are the vessels found at the Trapeza cave,[86] with fewer connections to the Mesara tombs.

The typology in the following catalogue follows Warren 1969.

Selected Catalogue

42 Miniature cup/jar, complete Fig. 13

HCH 02-47. Room 5, area 1, unit 1 (unit HCH 02-3-F1-1). H. 3.3, Diam. of rim 4.4, Diam. of base 3.3 cm. Serpentinite (yellowish red, 5YR 5/6). Straight-sided with straight rim and flat base.

EM II–III. Warren's type 21A.

43 Cylindrical pyxis/jar, complete Fig. 13

HCH 02-82. Room 5, area 5, level 3 (unit HCH 02-3-5-3). H. 4.0, Diam. of rim 4.7, Diam. of base 4.5 cm. Banded travertine (white and reddish yellow, 7.5YR 7/6). Straight rim and wall; pronounced base.

MM I.

44 Lid, complete Fig. 13

HCH 02-84. Room 5, area 5, level 3 (unit HCH 02-3-5-3). Diam. 5.0, knob 0.8, Th. of lid 0.3, Th. of knob 1.0 cm. Serpentinite (gray, 10YR 5/1). Flat circular lid with knob slightly off center.

EM II–MM I. Warren's type 27.1A.

45 Miniature goblet, complete Fig. 13

HNM 11,874. Rooms 1–4 (1976–1983 seasons). H. 2.8, max. Diam. 1.8 cm. Serpentinite (dark green). Tall shape; pronounced base and rim.

EM II–III. Warren's type 29A.

46 Miniature bowl, complete Fig. 13

HNM 11,909. Rooms 1–4 (1976–1983 seasons). H. 2.2, Diam. of rim 4.1 cm. Marble. Straight everted rim.

EM II–III. Warren's type 8A (slightly deeper).

86. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 109.

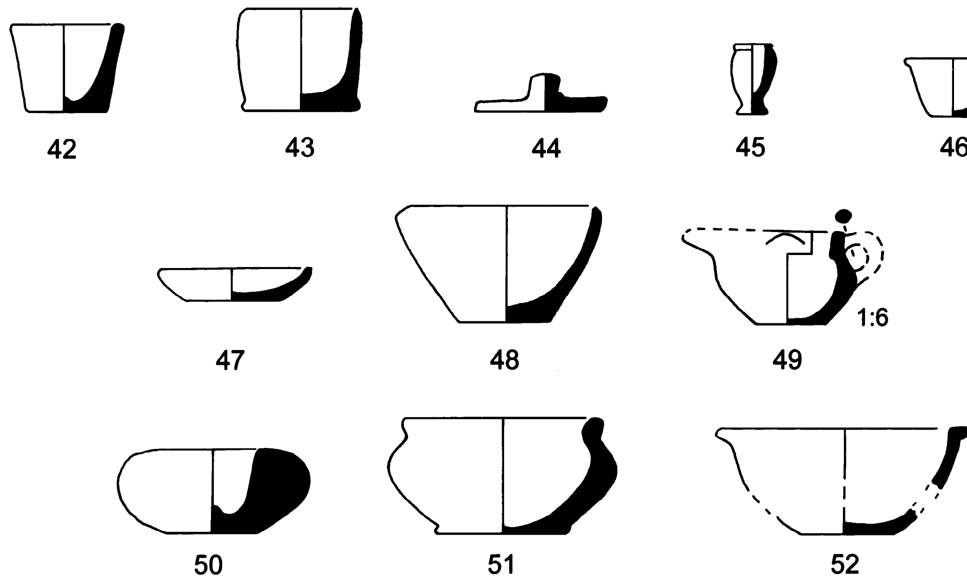


Figure 13. Stone vessels 42–52.
Scale 1:3 except as marked

47 Miniature dish, almost complete Fig. 13

HNM 13,899. Room 4/5 entrance, unit 5 (unit HCH 03-4/5-Ent-5). H. 1.3, Diam. of rim 5.9, Diam. of base 3.8 cm. Banded sandy marble (gray, 5Y 5/1, dark gray, 5Y 4/1, and white, 10YR 8/1). Thin straight rim; flat base.

EM II–III.

48 Conical cup, complete Fig. 13

HNM 12,388. Room 3 (1982 season). H. 4.5, Diam. of rim 8.0, Diam. of base 3.6 cm. Serpentinite (dark green). Straight rim; flat base.

MM I–II. Warren's type 16.

49 Side-spouted jar/jug, almost complete Fig. 13

HNM 13,857. Rooms 1–4 (1976–1983 seasons). H. 7.6, Diam. of rim 7.8, Diam. of base 5.5 cm. Limestone (pinkish gray, 7.5YR 6/2–7/2). Rim spout; two horizontal handles below the rim; vertical handle opposite the spout.

MM I–II. Warren's type 22A.

50 Bird's nest bowl, complete Fig. 13

HNM 12,397. Room 3 (1982 season). H. 3.4, max. Diam. 7.7, Diam. of base 3.4 cm. Limestone (light gray, 5YR 7/1) with white veins.

MM I. Warren's type 3.

51 Bowl, complete Fig. 13

HNM 11,846. Rooms 1–4 (1976–1983 seasons). H. 4.3, Diam. of rim 7.3, Diam. of base 5.2 cm. Banded marble (white and gray). Carinated profile; flat outturned rim; pronounced base.

EM II–MM II. Warren's type 8C2.

52 Bowl with handle, base and body fragment Fig. 13

HCH 02-105. Rooms 1–4 (1976–1983 seasons, from the dump). Max. dim. 3.7, 3.3, 2.6, L. of handle 1.0, Th. of handle 0.4, Diam. of base ca. 4.0 cm. Banded marble (gray, 10YR 5/1, and white). Almost straight rim; small upturned spout; small lug handle at rim; flat base.

EM II–MM I. Warren's type 37B1.

THE HUMAN FIGURINES

Susan C. Ferrence

Considering the small size of the cave of Hagios Charalambos and the remote setting of the settlements in the Lasithi plain, the burial deposit in the cave yielded a surprisingly large number of human figurines rendered in a wide variety of styles and materials. They were sculpted in hippopotamus ivory, animal bone, shell, marble, and a green igneous stone. The figurines were formed in the shape of anthropomorphic and amorphous figures. Half of them were pierced with holes in order to be worn as pendants.

In organizing Early Bronze Age Cretan figurines, Branigan built on Renfrew's foundation of Cycladic figurine classifications.[87] Branigan's work is a typological study because of the small number of figurines found on Crete and the lack of secure dates. He divided his catalogue of Cretan figurines into three large groups: indigenous types, Aegean types, and derivative/hybrid types.[88] He believed that five of the 17 figurine types found on Crete can be called indigenous because the rest exhibit Cycladic and Troadic influences. He attempted to place the figural types into a chronology and mentioned that marble was used more often for carving figures during MM I–II. The indigenous types are also made of limestone, slate, rock crystal, and gypsum. Now, the additional examples from Hagios Charalambos can be added to Branigan's catalogue.

A complete marble figurine from Hagios Charalambos (Fig. 14:53) was carved in a way that was partly derived from a Cycladic figurine style. It has incised eyes and mouth and a slightly worn nose. The shape of the head imitates the true Spedos type of folded-arm figurine from the Cyclades as defined by Renfrew. The arms are folded at the waist and join in the middle of the body (they do not rest on top of each other as in the Spedos, Dokathismata, and Koumasa figurine types). The back of the upper arm is delineated on the backside of the sculpture. The bottom half of the sculpture does not have clearly defined legs, only a stumped torso that is elliptical in section.

This figure is difficult to classify within Branigan's system because some of its characteristics could fall into a few of his types. For example, the blunt bottom of the elliptical torso is a feature of the Indigenous Cretan Figurine Porti type.[89] The folded arms meeting at the center of the torso belong to the Hagia Triada type.[90] Neither of those types, however, exhibits any distinguishable facial features. The presence of eyes, nose, and mouth on figurine **53** is a feature of the Siva type, which is most common in the Mesara (three out of the four known examples published by Branigan were found at the Siva and Hagia Triada tholoi).[91] Branigan assumed a small local workshop was responsible.

Clearly the figurine from Hagios Charalambos should be added to the Indigenous Cretan type, and perhaps it is a new hybrid. Branigan noted that marble was used more frequently to carve figurines during EM I–II. Sapouna-Sakellaraki dated a Porti type of figurine found in the Trapeza cave to EM II based on the presence of Vasiliki ware found in the same level.[92] Also, a parallel for **53** found at Hagia Triada[93] has been dated to

87. Renfrew 1969; Branigan 1972a, p. 57; 1972b.
88. Branigan 1972a, p. 74.
89. Branigan 1972a, p. 67, fig. 1:9.
90. Branigan 1972a, pp. 72–73, fig. 1:11.
91. Branigan 1972a, pp. 71–72, fig. 1:13; 1972b, p. 23, fig. 1:g.
92. Sapouna-Sakellaraki 1983, pp. 56–57, pl. 29:b.
93. Banti 1930–1931, p. 191, fig. 58:g.

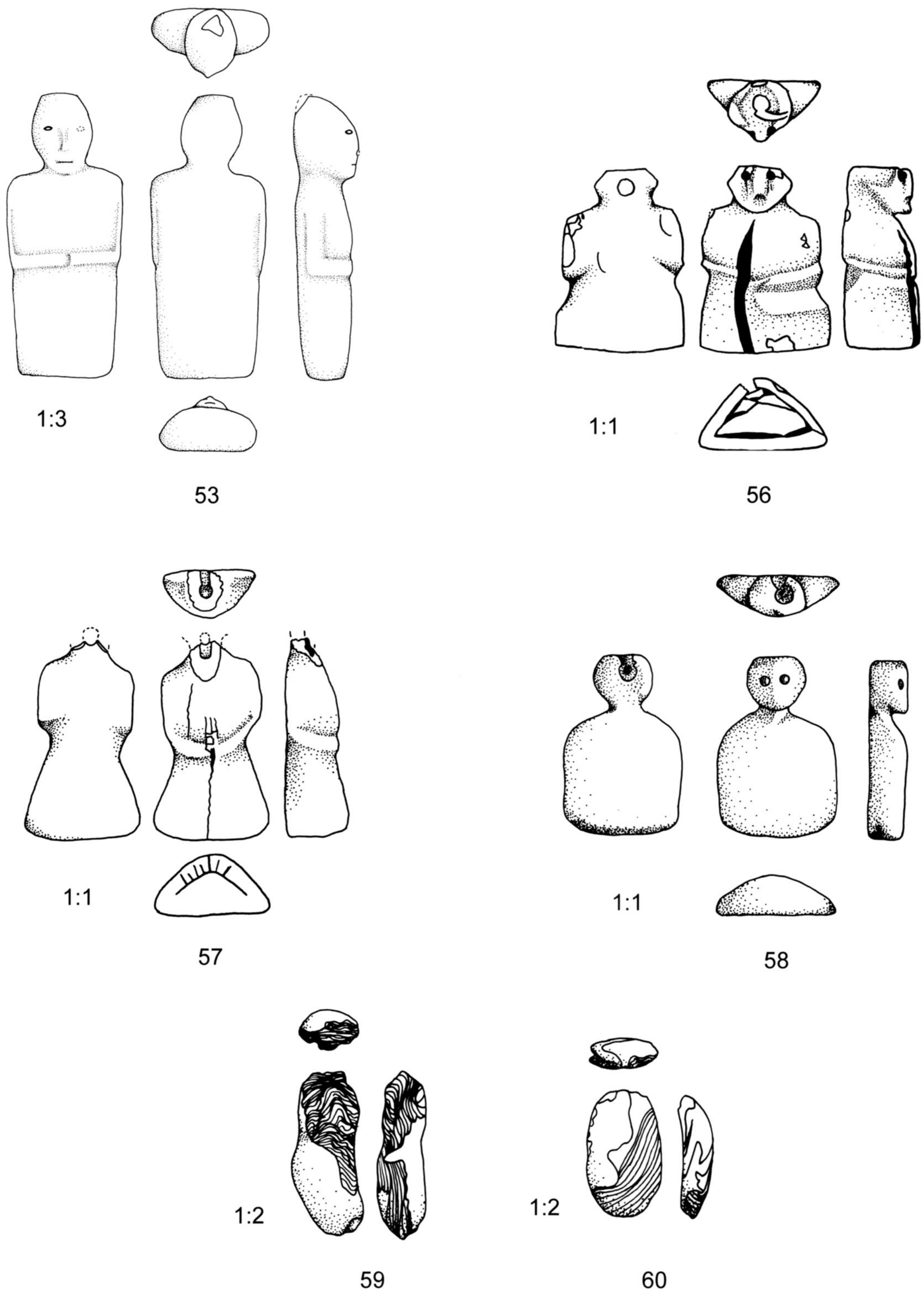
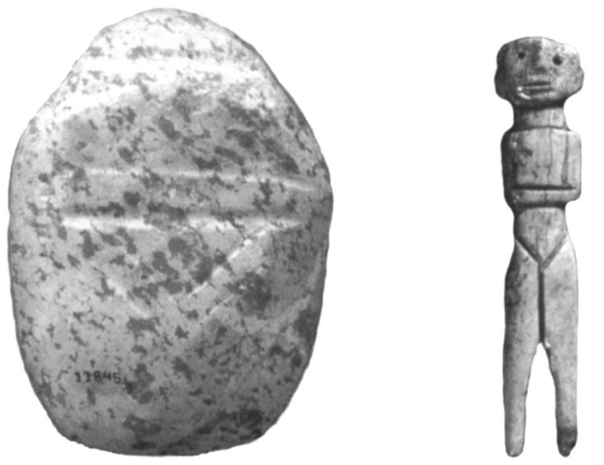


Figure 14. Figurines 53 and 56–60.
Scale as marked.



54 55

Figure 15. Figurines 54 (H. 9.8 cm) and 55 (H. 8.9 cm)

EM II by Krause in his extensive study of Early Minoan figurines.[94] These assertions may help to date **53** because its context is of no help in close dating (it comes from the mixed secondary deposit of the burial cave with pottery dating from Neolithic through Late Minoan).

A complete stone figurine made of green igneous rock (Fig. 15:**54**) was dubbed the Green Goddess after its excavation from the cave. One side of the sculpture is modeled in the shape of a scarab, while its belly is incised with lines indicating the head, upper body, folded arms, and pubic triangle of a female sculpture whose arm position recalls Cycladic folded-arm figurines. It is too morphologically different to be classified in Branigan's system. The Green Goddess, which has been previously published,[95] is a unique local Cretan figure that has some affinities with Cycladic folded-arm figurines but is carved in a very different style.

A complete figurine made from animal bone was incised with eyes, a flat nose, open mouth, and ears formed by angled cuts (Fig. 15:**55**). The back of the head has a cylindrical, vertical hollow due to the original marrow cavity in the bone. The incised arms join at the waist, while V-lines suggest the pelvic area, and additional lines mark the upper legs. An incised line signifies the bottom of the buttocks, and a vertical line differentiates the upper legs; the lower legs are completely separated. This figure should definitely be added to the four known Siva-type figurines as defined by Branigan.[96] The previously known examples are made of bone or ivory and are comparable in height to **55**. The separate legs of **55** are paralleled by those of figurine F14 from inside Tholos Tomb Gamma at Phourni, Archanes.[97] Figurine F14 comes from a stratified level where the majority of the pottery is dated to EM IIA.[98] The use of bone and the separate legs are distinctly non-Cycladic features.[99]

Beginning in EM III/MM IA, the human figures of Minoan Crete are clothed. At Hagios Charalambos, a small group of hippopotamus ivory figurine pendants were excavated, and they seem to have long garments. Two examples (Fig. 14:**56, 57**) are both flat on the back surface and use the obtuse angle of the triangular hippopotamus incisor to full effect as

94. Krause 1992, p. 310, nos. ID.138, 330, 332.
95. Betancourt 2003, p. 8.
96. Branigan 1972a, pp. 71–72, fig. 1:13; 1972b, p. 23, fig. 1:g.
97. Papadatos 2005, pp. 30, 32–33, fig. 22.
98. Papadatos 2005, p. 10.
99. Papadatos 2005, p. 30.

the front of the figures' bodies. Despite the missing head of one of the pendants (**57**), it can be determined that it was pierced through the back of the neck and probably through to the top of the head. The other example (**56**) has a small head with incised eyes, a hooked nose, and a mouth. It is also pierced through the neck and head. Both figures cross their arms over the middle of the body, while their torsos bluntly end in a straight line across the bottom of the tooth. Their legs are not carved, indicating that they are wearing long garments. These pendants are now quite brownish in color; they may have been burned, possibly in relation to a fumigation of the primary burial(?).

These clothed figural pendants should be grouped with an additional example called a "true hybrid" of the Trapeza, Siva, and Early Minoan types of figurines by Branigan.[100] He acknowledged that the lack of defined legs possibly indicates a full-length dress like that worn by Minoan female figurines with arms raised to the breasts.[101] The reference to a full-length dress in this case could be applied to the previously mentioned marble figurine (**53**) as well.

The cave at Hagios Charalambos also yielded a simplified hippopotamus ivory figural pendant (Fig. 14:**58**). This figurine also utilizes the flat side of the incisor as the back of the body and the obtuse angle as the front. The carved head was adorned with two eyes and placed on top of a short neck, which rises above rounded shoulders. The rest of the body was left in the rectilinear shape of the tooth and given a somewhat rounded base. Like its more detailed sisters, this example was also pierced at the back of the head. It should probably be classified as a subgroup of Branigan's "true hybrids." Perhaps it is also an unfinished example of the hybrid, because the arms and the rest of the facial features are not carved.

Lastly, two aniconic, abstracted, rounded, and modeled figurines were made of *Spondylus gaederopus* shell (Fig. 14:**59**, **60**). Figurine **59** exhibits slight definition between the two bulbous parts of the figure in an attempt to define the head in relation to the rest of the body. These figures could be classified under Branigan's Schematic type, particularly the Lebena variety, which Branigan suggests is indigenous to Crete.[102] Other parallels in shape and material can be found at Trapeza[103] and Malia.[104] The Pseira cemetery survey yielded a marble example of a schematic figurine with two rounded parts divided by a waist.[105] This type of shell was used to carve pestles and a duck figurine at Hagia Irini on Keos.[106] They were found in period III deposits,[107] which correspond to the end of EB II and contain new Anatolianizing shapes.[108]

The figurines found at Hagios Charalambos were probably fashioned on Crete because they all exhibit a hybridization or mixture of ideas that could only have taken place there. The Green Goddess clearly demonstrates the amalgamation of Egyptian and Cycladic traditions. The hippopotamus tooth pendants and the larger marble figure pay homage to the folded-arm figurines of the Cyclades and the neighboring Trapeza type of figure, both of which have defined legs, but the blunt base of the Hagios Charalambos marble figure and pendants signifies the wearing of a dress, which is strictly a Cretan trait. Perhaps only the aniconic shell idols have their immediate

100. Branigan 1972b, p. 23, fig. 1:h.

101. Xanthoudides 1924, pls. 4:135, 21, 28:128, 129; Banti 1930–1931, p. 191, fig. 58:g, o, v; HM 114, 123.

102. Branigan 1972a, p. 60, fig. 1:2.

103. Pendlebury, Pendlebury, and Money-Coutts 1935–1936, p. 122, nos. 6, 7, fig. 25, pl. 18.

104. Detournay, Poursat, and Vandenabeele 1970, p. 101, figs. 133–138; Pelon 1970, pp. 47–48, 139, nos. 91, 270, 271, pl. 14:3a (no. 271).

105. Betancourt and Davaras 2002, p. 83, fig. 11, no. 221.

106. Krzyszkowska 1999, p. 157, pl. 99, nos. SF234–SF237.

107. *Keos* IX.1, pp. 196–198, 221–222.

108. *Keos* IX.1, p. 229.

antecedents outside of Crete, but enough parallels exist on Crete to surmise that they were domestically sculpted.

The figurines from Hagios Charalambos fit into a specific group of burial accoutrements that has a tradition across central and eastern Crete during the Early to Middle Bronze Age. Many objects from the cave at Hagios Charalambos have parallels from the neighboring Trapeza cave in Lasithi, and also from the tholoi of south-central Crete, with fewer similarities to objects from the caves and rock shelters along the north coast near Malia and the house tombs of Mochlos in East Crete.

The presence of hippopotamus tooth artifacts in the cave furnishes a date of EM III–MM I for the objects made in this material. Although only two definitive remains of hippopotamus ivory were identified from the Aegean Bronze Age prior to 1984, research by Krzyszkowska subsequently identified many more artifacts made from the material,[109] and Sbonias has developed a good chronology for the seals made of this type of ivory.[110] His middle phase of EM III/early MM IA, a time leading up to the foundation of the first palaces in Crete, saw the preeminence of hippopotamus ivory use in a new tradition of cylinder seals carved on one or both ends. The Hagios Charalambos pieces can be placed within this tradition.

From these general indications, three groups of figurines can be suggested for the Hagios Charalambos cave. Phase I, from the Early Bronze Age, includes the two nude female figurines inspired by the Spedos type of Cycladic folded-arm figurine (Fig. 15:**54**, **55**). Phase II, dated between EM III and MM IA, contains three small, female, ivory figurines and a female marble figure, three of which have arms that meet across the body; all have blunted bottoms, which indicate that each figure is wearing a garment (Fig. 14:**53**, **56–58**). The small, bulbous, aniconic, amorphous, fossil shell figurines (Fig. 14:**59**, **60**) can be placed in MM I–II by the parallels from Malia.

Catalogue

53 Female figurine, complete — Fig. 14

HNM 11,844. Room 1 (Davaras 1989a, p. 388). H. 12.8, W. at shoulders 5.1, W. of head 2.5 cm. Marble (white, with a patina that is pink, 7.5YR 7/4). Rectangular body; oval head with features in low relief; hands meet at center of waist; abstract lower body.

Cf. Xanthoudides 1924, pl. 4, no. 130 (Koumasa); Banti 1930–1931, p. 191, fig. 58:g (Hagia Triada).

EM III–MM IA.

54 Female figurine, complete — Fig. 15

HNM 11,845. Room 2 (Davaras 1989a, p. 388). H. 9.8, max. W. 6.8, max. Th. 3.3 cm. Igneous rock, pale greenish gray with dark gray (5Y 4/1) phenocrysts. Smooth, rounded form with a scarablike shape; rounded side has incised line for neck and incised line dividing the wings; flat side has incised lines delineating details of a schematic figurine, including neck, arms folded across body, and pubic triangle.

EM II–III.

109. Krzyszkowska 1984, p. 125.

110. Sbonias 1995; 2000, pp. 278–279.

55 Female figurine, complete Fig. 15

HNM 13,067. Room 4, upper units (1983 season). H. 8.9, W. of head 1.7 cm. Animal bone. Nude female figurine with frontal stance with slightly separated legs and arms that are bent at the elbow and join across the front, at the waist; incised details of eyes, ears, arms, and pubic triangle.

The Siva type, to which this figure belongs, is a local Cretan class of nude female figurine (Branigan 1972a, 1972b). Cf. Banti 1930–1931, p. 189, fig. 58:n (Hagia Triada); Branigan 1972a, pp. 71–72, fig. 1:13; 1972b, p. 23, fig. 1:g (Siva).

EM II.

56 Female figurine, complete Fig. 14

HNM 13,909. Room 7, washed in from room 5 (unit HCH 03-7-1). H. 2.7, W. 1.7 cm. Hippopotamus ivory. Rectangular body with slight waist and arms bent at the elbows, with the hands meeting at the center of the waist; head with ridge for nose and incised eyes; flat back; pierced from top of head to back of head for use as a pendant.

Burned; ancient vertical crack at front of figure.

Cf. Xanthoudides 1924, pl. 4, nos. 128, 129 (Koumasa, stone); pl. 15, no. 230 (Platanos, ivory); Banti 1930–1931, p. 191, fig. 58:v (Hagia Triada).

EM III–MM IA.

57 Female figurine, head missing Fig. 14

HNM 13,908. Room 7, washed in from room 5 (unit HCH 03-7-2). P.H. 2.8, W. 1.7, Th. 0.8 cm. Hippopotamus ivory. Rectangular body with slight waist and arms bent at the elbows, with the hands meeting at the center of the front of the body, at the waist; head missing; flat back; pierced from top of head to back of head for use as a pendant.

The break at the neck is ancient.

EM III–MM IA.

58 Female(?) figurine, complete Fig. 14

HNM 13,912. Room 5, area 1, level 3 (unit HCH 02-3-1-3). H. 2.6, max. W. 1.4 cm. Hippopotamus ivory. Featureless body with rounded shoulders; short neck; almost circular head with incised eyes; flat back; pierced from top of head to back of head for use a pendant.

The back of the head was broken in antiquity, rendering the object useless as a pendant.

EM III–MM IA.

59 Figurine, almost complete Fig. 14

HNM 11,898. Rooms 1–3 (1982 season). H. 5.1, max. W. 2.2, max. Th. 1.5 cm. Shell: fossil *Spondylus gaederopus* (spiny oyster), lower valve (worked). Smooth, rounded form with two sections separated by a waist ("fiddle-shaped" figurine). Surface very eroded.

MM I–II(?).

60 Figurine, complete Fig. 14

HNM 13,861. Rooms 1–4 (1976–1983 seasons). H. 4.0, W. 2.5, Th. 0.9 cm. Shell: fossil *Spondylus gaederopus* (spiny oyster), lower valve (worked). Amorphous figurine; rounded, elliptical form.

MM I–II(?).

THE NERITID SHELLS

David S. Reese and Philip P. Betancourt

A number of marine shells come from the cave at Hagios Charalambos. Some of them are unmodified, and they must have been gathered from the distant sea as food or as symbolic items, while others are pierced for stringing or suspension as ornaments or beads. Among the latter are four examples of the neritid shell (Fig. 16), a marine mollusk with attractive coloration. These are the first neritid shells reported fom Crete.

The neritid shell, a type of gastropod, belongs to a family with many species. Several examples come from the Indo-Pacific region, but the shell is not native to Crete. The only Mediterranean species have habitats in the southeastern Mediterranean.[111] It is also possible that the examples from the Cretan cave originated in the Red Sea or elsewhere. Neritid shells have variable color patterns, including very attractive red to black irregular markings on a pale background. They can grow up to 25 mm in length. The shells excavated from the cave have a maximum length of 20 mm, and they have had their color bleached away with age. The examples from the cave come from rooms 3 and 4, both well away from the cave's original entrance. The four shells are all holed for use as beads or ornaments. The date of their importation into Crete has a terminus ante quem of MM IIB, the final date for the main deposit of pottery within the ossuary.

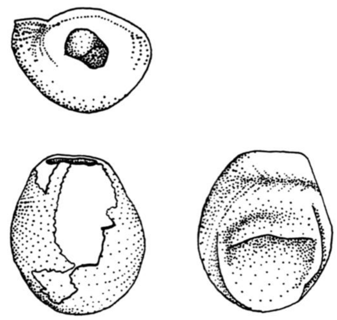


Figure 16. *Nerita* shell bead 64. Scale 1:1

Catalogue

61 *Nerita,* worn, ground apex (only preserved in a small area)

HNM 13,859 alpha. Room 3 or 4 (1983 season). L. 18.25, W. 14.25, hole 5.75 × 4.5 mm.

62 *Nerita,* holed at apex (possibly ground down but not worn), recent hole on body

HNM 13,859 delta. Room 3 or 4 (1983 season). L. 16.25, W. 15, apex hole 6.25, body hole 5.25 × 4.75 mm.

63 *Nerita,* ground down and holed at apex, encrusted

HCH 04-393. Room 4 (1983 season). L. 19.5, W. 17, ground-down area 10.25 × 8, hole 5.75 × 4.25 mm.

64 *Nerita,* ground down and holed at apex — Fig. 16

HCH 04-283. Room 3, cleaning (unit HCH 02-1-cleaning). L. 20, W. 17.25, ground-down area 10.25 × 7.75, hole 6.75 × 5.75 mm.

111. For Cyprus, see Tornaritis 1987, pp. 42–43; for Libya, see Giannuzzi-Savelli et al. 1997, pp. 38–39.

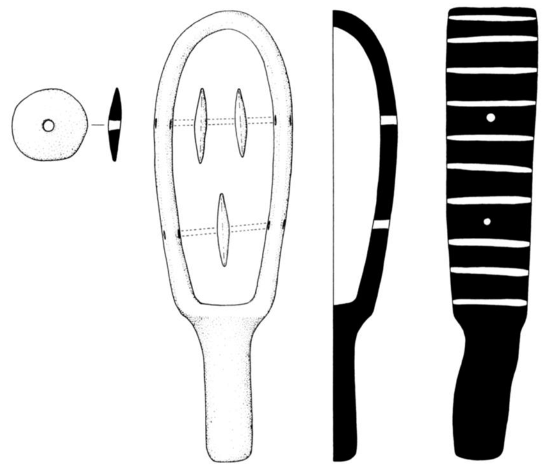


Figure 17. Sistrum. Scale 1:3

THE SISTRA

Philip P. Betancourt and James D. Muhly

Six examples of the ancient percussion instrument called the sistrum were found in the cave (Fig. 17). One instrument was intact except that its disks were nearby, and the others were mended from scattered fragments. The dispersed nature of the fragments for five of the instruments (including pieces of the same sistrum found in different rooms) indicates that the objects were used with the primary burials, not in a ceremony associated with the secondary deposition in this cave.

All of the sistra were made of a pale-colored clay, and they were similar in design. Each example consisted of a vertical handle supporting an oval loop with horizontal rods of perishable material to hold circular clay disks. All six sistra were imported into Lasithi from some other part of Crete, because the local clay fabric is very different from the clay used for these instruments (the local fabric contains phyllite fragments and fires to a red color). Horizontal white lines decorate the outside edges of the loops.

A preliminary report on the sistra from Hagios Charalambos has already been published, and the reader is referred to that publication for parallels and discussion, including the occurrence of the sistrum as a Linear A sign.[112] The sistrum is well known from examples found in Anatolia and Egypt as well as in Crete. It was held in the hand and shaken to create a rattling sound to accompany singing or chanting, and a good example of an instrument in use is illustrated on the well-known rhyton from Hagia Triada.[113] The best evidence for the date of the examples from Hagios Charalambos is a similar sistrum found in a MM IA context in a tomb at Archanes.[114]

Because most surviving sistra are made of metal, one can question whether the clay examples from Hagios Charalambos and Archanes were actual instruments that were used to provide music accompanying Minoan burial rituals, or instead were models with only symbolic significance. Experiments with a ceramic replica show that a satisfactory clacking sound is produced by such a design in clay, so a use in rituals is probably to be preferred.

112. Betancourt and Muhly 2006.
113. For the finest published photograph, see Dimopoulou-Rethemiotaki 2005, p. 188.
114. Sakellarakis and Sapouna-Sakellaraki 1997, pp. 351–356, figs. 321–323.

THE HUMAN REMAINS

Photeini J. P. McGeorge

The aim of this preliminary report is to give an outline of work in progress on the human remains from the Hagios Charalambos cave, a large and unusually well preserved collection of mainly Early Minoan to Middle Minoan date. The cranial series reveals a remarkable number of head traumas—contradicting a long-held view that the Minoans were innocent pacifists—and three examples of trephination (surgical removal of a portion of the skull), which are highlighted here because they are the earliest and technically most sophisticated examples of this kind of cranial surgery so far encountered in Greece.

The cave ossuary was used for the secondary burial of human skeletal remains that are dated by associated pottery and other artifacts, presented above. The finds range in date from the Final Neolithic to the Late Minoan period, but the bulk of the pottery dates to EM III–MM IIB, which may indicate that there was a peak in the growth of the population of the area at this time. The few LM sherds found in the upper rooms are probably not associated with the deposition of the bones. The secondary nature of the deposition is proved both by the disarticulated condition of the bones and by the fact that some bones were carefully placed in a lattice arrangement (see above, Fig. 5), which is without parallel at this period. In the lower levels of room 5, the bones were mixed with soil. All of the soil deposit was water-sieved, primarily with the aim of retrieving small bones and teeth; the sieving took over a year to complete but was repaid not only with bone material, but with many interesting small finds such as beads, gold foil, and a prismatic seal.

Burial Treatment

Burial customs in EM Crete are diverse and may reflect variations in religious beliefs. The custom of inhumation burial in caves (sometimes also used for habitation), in rock shelters, or in natural rock fissures is known from the Neolithic and Early Minoan periods, while secondary burial—usually in built ossuaries—is known at numerous Minoan sites.[115]

At Hagios Charalambos there is no evidence that primary burial took place in the cave. The burials are all secondary. No discrete burials were recognized during excavation. Although cases of articulated vertebrae were noted, this situation indicates the incomplete decomposition of some skeletons at the time of secondary burial. Also, some instances of fused vertebrae caused by pathologies were encountered (Fig. 18). Apart from these cases, there is a very slim possibility of identifying bones belonging to a single individual among the vast quantities of commingled bone material. One exception, for self-evident reasons, was the post-excavation identification of the lower limb bones (femurs and tibias) of a pituitary dwarf. With few exceptions, each bone has to be treated as a separate individual.

It is hypothesized that the human remains were transferred to the cave in MM IIB, on one or possibly two occasions separated by a brief interval of time. Not only adults, but also infants and children of all ages are included

115. For example, see Dawkins 1900–1901; Duckworth 1902–1903; van Effenterre 1948; van Effenterre and van Effenterre 1963.

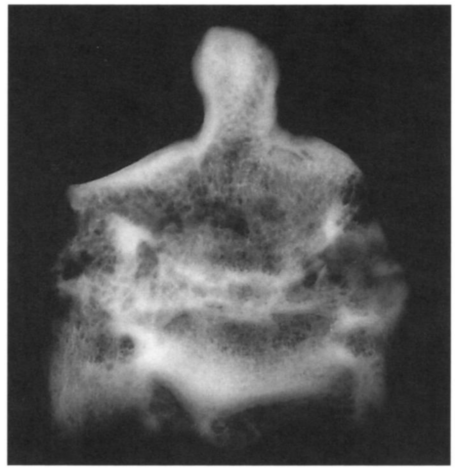


Figure 18. Example of fused cervical vertebrae 2–4

in the assemblage. The transport of the skeletal material to the cave and its arrangement in several rooms was a large-scale undertaking requiring a great deal of labor, organization, and team coordination. Meticulous care must have gone into the enterprise since all parts of the human anatomy, including even first-, second-, and third-row phalanges of fingers and toes as well as sesamoid and hyoid bones, are represented in the corpus of material excavated.

Broken clay larnakes and grave goods were mingled with the human remains. The artifacts and pottery included a large number of drinking vessels and jugs (see above) and many animal bones, showing that provision of food and drink for the dead was a part of the burial ceremonies.

Stones intrusive to the context of the cave suggested to the excavators the probable origin of the burials from built tombs. Some bones appear to have been in contact with fire and are lightly burned, which is consistent with the known use of fire for fumigation in Early Minoan tombs.[116]

State of Preservation

The bones are generally very well preserved because of low temperatures in the cave even at the height of summer (see Appendix, below). With only minor temperature fluctuations, the cave acted as a natural refrigerator and contributed to unprecedented standards of preservation for human bones of this date. Teams of researchers from Seattle and Oxford have succeeded in obtaining DNA samples. Preliminary feedback from Seattle indicates that "the Hagios Charalambos population carries only 'European' haplogroups and that the difference from present day European and Cretan populations in the frequency of certain haplogroups is statistically significant."[117]

116. For example, burned bones covered by a layer of sand have been noted in Early Bronze Age tholos tombs in the Mesara on Crete, specifically at Lebena Tholos Tomb IIa (see Platon 1959, p. 371; Alexiou and Warren 2004, pp. 12, 16, where the bones and the lintel are reported to have been burned to fumigate them).

117. J. R. Hughey (pers. comm.). We are awaiting more detailed results.

Cleaning, Curation, and Study

Over 300 crates of bone material were retrieved. The preservation of the bone ranges from virtually complete to utterly fragmentary. The skeletal material was cleaned in the laboratory using water and soft brushes and wooden tools after preliminary cleaning on site (see Appendix). The cleaning procedure was completed in the winter of 2005/2006. The largest assemblage in the collection comes from room 5 (Fig. 4). This room was divided for the purposes of excavation into five areas, and the excavation of each area proceeded by level (surface, below surface, and levels 1–5). After cleaning, the bones from each area and level were individually labeled with paper labels indicating their provenance and date of excavation. The bones have been stored in thermal boxes in a specially designed climate-controlled room.

The skeletal remains were sorted by anatomical element and searched for joins. As the study progressed, numerous joins were found between bones excavated at different levels and even between bones excavated in different rooms, for instance rooms 3 and 5, or rooms 5 and 7, indicating that the bones had been broken and separated either at the time of the original deposition, during transport to the cave, or during later disturbance by subsequent visitors. Other possible causes for some of the mixing might include earthquake tremors or rock falls within the cave, water washing through the cave, or burrowing animals whose bones were found mingled with the human bones. The material is now stored by skeletal part (skulls, femurs, tibias, and so forth) to facilitate study and seriation.

As noted above, each bone was treated as a separate individual and identified: sexed where possible on the basis of size, presence/absence of muscular development, and rugose appearance; and aged after consideration of developmental criteria (such as dental eruption, suture synostosis, epiphyseal fusion, and morphology of pubic symphysis and auricular surface) and of dental wear and pathology.[118] Each bone was numbered, measured, studied, described and recorded, and photographed or X-rayed as necessary, and the information was stored in an Access database designed for this project.[119] Over 11,000 entire or fragmentary bones have been identified so far.

Preliminary Observations on the Population

Minimum Number of Individuals

Long bone counts suggest that the minimum number of individuals (MNI) represented in the material studied so far (excluding much material from the excavations of Davaras) is in the region of 400. Femurs, which are relatively dense bones, are better preserved than other bones and give the highest estimates, while arm bones, which are more prone to loss or destruction, provide an estimate that is under half that of the femurs. It is predicted, however, that short, dense bones such as the tarsals, which survive extremely well, may eventually give a higher, more accurate MNI.

Stature

Trotter and Gleser's stature formulas[120] have been applied to some of the measurements of complete long bones in order to provide stature estimates (Table 3). The difference between male and female stature, which is within the 5%–8% range, appears normal.

118. Buikstra and Ubelaker 1994.
119. The database was designed by Susan B. Nalezyty.
120. Trotter and Gleser 1958.

TABLE 3. STATURE ESTIMATES FOR INDIVIDUALS FROM HAGIOS CHARALAMBOS

Bone	*Males*	*Est. Stature (cm)*	*Females*	*Est. Stature (cm)*
Tibia	16	166.607	11	154.540
Femur	44	162.448	24	149.632
Humerus	12	164.824	10	153.512
Radius	8	167.646	2	159.329
Ulna	3	169.425	1	151.914
Total/Average	83	166.190	48	153.785

TABLE 4. STATURE ESTIMATES FOR INDIVIDUALS FROM ARMENOI

Bone	*Males*	*Est. Stature (cm)*	*Females*	*Est. Stature (cm)*
Tibia	68	168.5	46	156.7
Femur	82	165.3	54	152.7
Humerus	67	168.2	45	152.6
Radius	54	168.2	36	156.1
Ulna	38	171.6	30	156.7
Total/Average	309	168.36	211	154.96

The largest available sample for comparison, using the same formulas, is that of the LM IIIA–B population at Armenoi, shown in Table 4. On average, the Hagios Charalambos males appear to be shorter than the males from Armenoi by about 2 cm, while females are about 1.1 cm shorter.

Traumas

The remains provide evidence for many healed fractures of arms, legs, collarbones, ribs, and other bones. Some of these fractures may be accidental, while others may be due to deliberate injury. There are at least 16 cases of cranial trauma. Some of these cases are certainly deliberate injuries. The majority of cases (11) involve men. Many injuries are on the frontal (9) or on the left parietal (6), consistent with an instinctive rightward turn of the head to avoid a missile or to avoid a blow from a right-handed assailant. As noted above, three trephinations were identified, including two that bear traces of what might be scoring of the surgeon's knife delineating the injured area.

One case of head trauma involves a woman with a fractured frontal bone (no. 8121). Five fragments, the result of postmortem damage to the frontal bone, have been found and joined so far to form this partial skull (Fig. 19). The woman sustained a blow to the left side of the forehead above the orbit, inflicted perhaps by a blunt instrument, causing distortion of the shape of the frontal bone and fracturing of the bone adjacent to the area that sustained the blow. The fracture line follows a course from a point on the lateral third of the coronal suture on the left side of the frontal bone, descends to a point above the left orbit/sinus, and from there continues a more or less horizontal course terminating on the

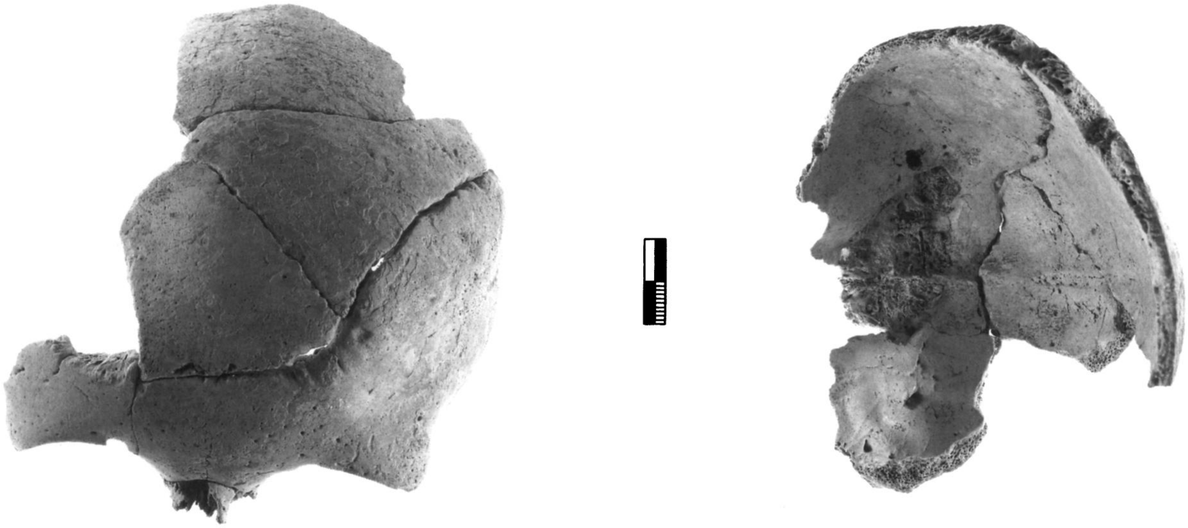


Figure 19. Skull 8121. Fractured frontal bone *(left)* and lytic area in the sinuses *(right)*.

right side of the frontal bone (see Fig. 19, left). The jagged edges of the fracture had partially healed, showing that the woman had survived the attack at least for a time. One can see a lytic area in the sinuses (Fig. 19, right), which suggests an infection that may or may not be related to the trauma. The woman may have succumbed to the complications of this infection, because pus in the brain cavity could have caused meningitis and encephalitis, leading to death.

Another adult female (no. 1032) has two shallow depressions/traumas on the left side of the frontal bone (Fig. 20). One is elliptical; the shape implies a blow at close range with an offensive weapon that probably had a handle. There is limited osteitis (bone reaction) within the circular depressions.

A third female (no. 1033) has a deep trauma on the midline of the frontal bone, caused by a pointed object (a sharp stone, perhaps, or an arrow or possibly a lance hurled from a distance). There is osteitis around the perforation on the external surface (Fig. 21), but no bone reaction on the internal surface.

One male (no. 8065) has an incision or cut mark over the midline of the forehead below the hairline, caused by the tip of a blade, which probably only perforated the external surface of the bone (Fig. 22). There is limited osteitis of the surrounding bone tissue and no reaction on the internal surface. The patient did not die from this wound. The wound may have been caused by a knife, the tip of a dagger or sword, or possibly even an arrowhead that caught him obliquely from his left side. Presumably, he was not wearing protective headgear.

A middle-aged man (no. 8050) has a slight depression over the right eye with osteitis on the external surface of the bone (Fig. 23) and a depression over the right sinus area that an X-ray showed to be enlarged. He evidently survived this incident. Another male (no. 8136) has a trauma on the frontal bone, illustrated in Figure 24.

A spectacular case of frontal trauma, illustrated in Figure 25, is a depression fracture[121] of a male's cranium (no. 6000). A deep circular depressed

121. For a classification of fractures and use of the terms "depressed" or "depression" fractures, see Ortner 2003.

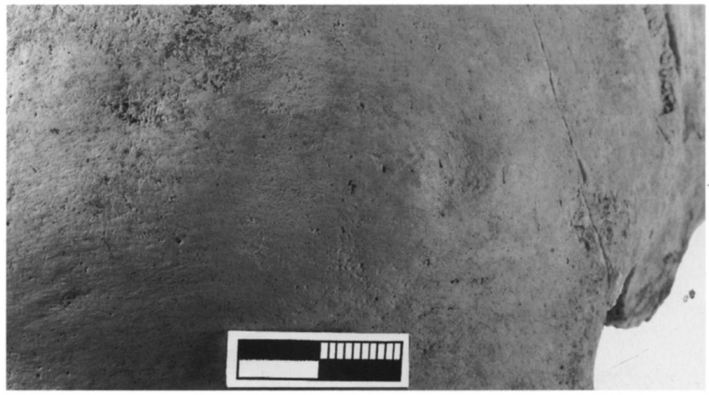


Figure 20. Skull 1032. Trauma caused by blunt object.

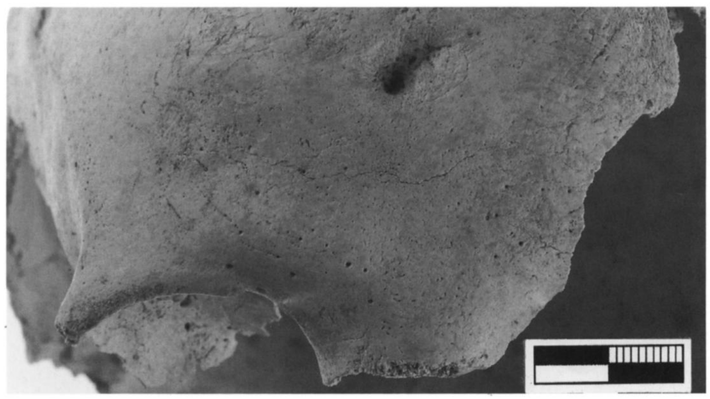


Figure 21. Skull 1033. Trauma caused by pointed object.

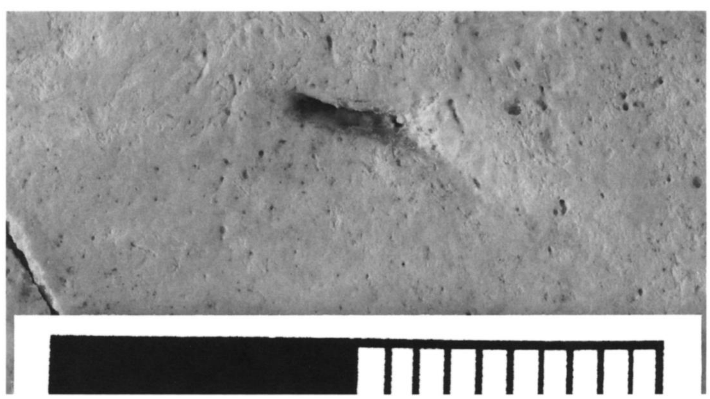


Figure 22. Skull 8065. Trauma probably caused by a bladed weapon.

fracture can be seen on the right frontal bone (20 mm in diameter, just behind the frontal boss). The internal cranial table has been correspondingly displaced inward, apparently without splintering. (The broken section of bone visible in Figure 25 is postmortem, as can be seen from the arrangement of the trabeculae between the inner and outer table.) This person seems to have survived his injury, but may well have suffered from symptoms such as concussion, blurred vision, or headaches. Death could have been due to unrelated causes.

The most impressive case of frontal trauma is a shallow circular depression on the right side of a frontal bone of a young adult male (no. 8083),

Figure 23. Skull 8050. Trauma above right eye.

Figure 24. Skull 8136. Circular lesion.

Figure 25. Skull 6000. Circular depression.

Figure 26. Skull 8083. Frontal trephination. General view and detail.

with a trephination beside it (Fig. 26). Part of the frontal bone is missing, so we do not have the complete outline of the trephination, but the hole has a diameter of over 10 mm. Its smooth, beveled edges show a remarkable surgical technique; the patient survived long after the operation and does not seem to have suffered any infection. Patients must have developed a resistance to infections, producing their own antibodies enabling them to survive. Whether or not the operation produced the desired results, alleviating the symptoms of the trauma, it must be considered successful in the sense that the patient survived a difficult and dangerous operation requiring audacity and skill on the part of the surgeon. One wonders whether the patient enjoyed a special social status and where and by whom such operations were performed.

The logic of doctors of that time was obviously quite different from today when technology allows one to look inside a patient without using a scalpel. The patient's life was at risk before treatment if action was not taken immediately. Hippocrates (or works ascribed to him in the Hippocratic Corpus) describes the approach for dealing with head traumas.[122] It was a three-day procedure. On the first day the wound was cleaned and then closed. If necessary, a poultice of finely ground barley flour mixed

122. See especially Hippoc., *Περὶ τῶν ἐν κεφαλῇ τρωμάτων*.

with boiled water might be applied. In general, the necessity of keeping the wound as dry as possible and avoiding bandaging and gauzes is stressed because covering the wound increased the possibility of infection. If pus appeared it was only a matter of time before the patient's demise: a week in summer, two weeks in winter.

The following day the surgeon would open the wound and probe to see whether the wound was over a suture. He might use a dye compounded of copper dust and water, which he would spread over the bone and leave for a day. If the color remained the next day, then it would indicate where the bone was fissured. In this case, in order to deal with the hematoma, the surgeon might then decide to proceed with trephination using a bow drill that needed to be wetted from time to time to prevent overheating. The bone would be drilled up to a point. It was important not to perforate the meningeal laminae. The surgeon would leave the flap of bone in place, allowing it to dry out and exfoliate or peel away by itself, rather like a dead nail. The wound continued to be kept dry and bandaging avoided.

Figure 27. Mycenae, Grave Γ-51. Bone roundel found in situ. Angel 1973, pl. 249, upper left

An excellent illustration of precisely the procedure described by Hippocrates is provided by an example from Mycenae, Grave Γ-51, where the two semicircular halves of the roundel were found in situ (Fig. 27).[123] Unfortunately, that high-status patient did not survive the operation. The patient from Hagios Charalambos, who must have received a high standard of care, was more fortunate. There is no trace of infection, suggesting survival long after the operation and death from unrelated causes.

On another skull, that of a mature male (no. AX15/13), evidence for multiple traumas can be seen. Two separate depressions, one deeper than the other, were observed above the corner of the left orbit. On the left frontal, about 2 cm from the bregma, is a small circular lesion (8.1 mm diameter). There is an irregular bone surface on the anterior right parietal behind the coronal suture (see Fig. 28). A blow or blows must have come from above. This area of the right parietal bone is displaced inward, and the internal surface of the bone is anomalous. Judging from the bone reaction on both the external and internal surfaces of the cranium, the head wound probably became infected.

There are several cases of parietal traumas. One mature male (no. 1027) has a circular depression (8.3 mm in diameter) on the left parietal boss (Fig. 29). Another mature male (no. 8084) has a shallow elliptical depression (maximum diameter 16.5 mm, minimum diameter 9.5 mm) near the left parietal boss with dense osteitis on the surface within the depression (Fig. 30). The blow that caused this trauma could have been delivered from behind as the person fled his attacker. The thin, fragile, warped cranium of a child (no. 8123) has a trephination anterior to the left parietal boss (Fig. 31), with a maximum diameter of 8.5 mm. It has smooth edges, which shows that it had partly healed. There is a postmortem break across the trephination. As the cranium is incomplete, it is possible that a trauma preceded and necessitated this surgery.

Another case, a young adult male with open sutures (no. AX16), has a trans-sutural perimortem fracture (Fig. 32). The broken fragments are still attached to the skull. Hippocrates' prognosis for such cases was bleak. He stated that when sutures are open, patients have no chance of survival

123. See Angel 1973, pp. 380–381, pls. 244, 249.

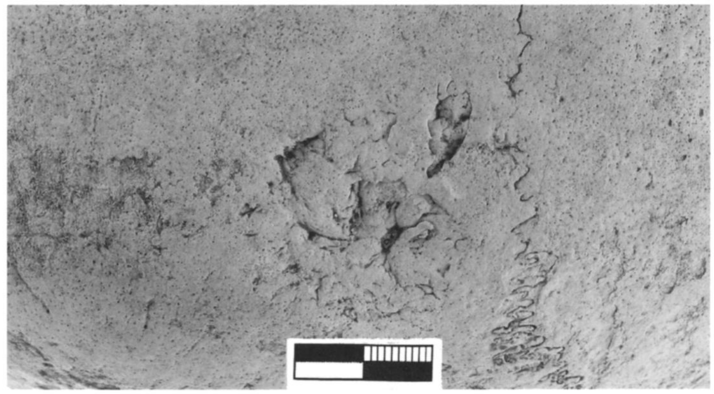


Figure 28. Skull AX15/13. Inflammatory changes (due to infection?).

Figure 29. Skull 1027. Circular depression.

Figure 30. Skull 8084. Elliptical depression.

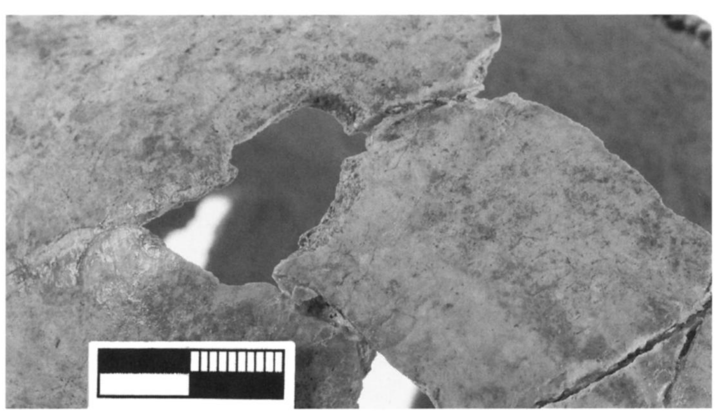


Figure 31. Skull 8123. Trephination.

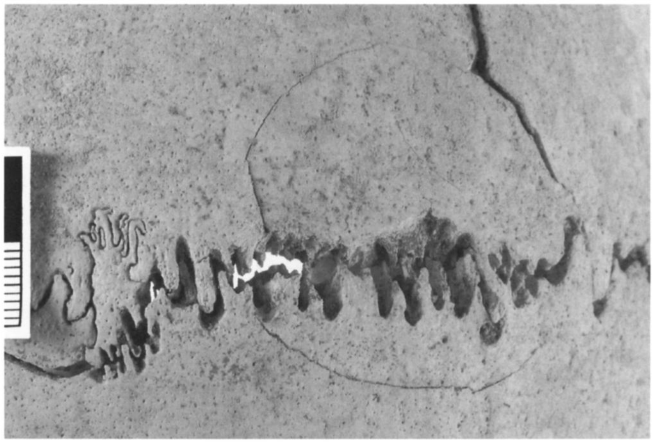


Figure 32. Skull AX16. Trans-sutural perimortem fracture.

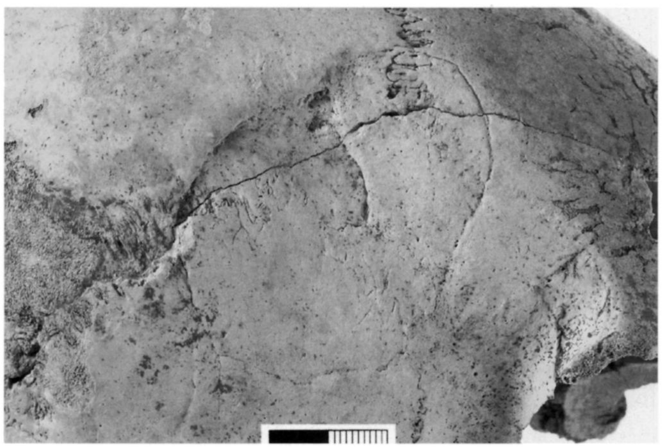


Figure 33. Skull AX 14/18. Right temporal fracture.

due to the impossibility of limiting infection and damage to the meninges (see Hippoc., *Περὶ τῶν ἐν κεφαλῇ τρωμάτων*, esp. 2, 12).

A middle-aged male (no. AX 14/18) shows evidence of having sustained a severe head wound. A right temporal-parietal fracture caused by a severe trauma to the right side of the head, which had displaced the bone inward, had healed (Fig. 33). The inward displacement of the fractured bone would have caused pressure on the brain and possible spasms of limbs on the left side of the body. The displacement can be seen very clearly in an X-ray (Fig. 34). In ancient times doctors did not have such means at their disposal, but Hippocrates knew that traumas to this area of the temporal bone cause spasms and he advised against trephination in such cases. It is probably no coincidence that there is no evidence of attempted trephination on this specimen. The area of the wound seems to be encircled by a line, possibly scored by the surgeon with a knife when tending the wound.

The most unusual case found was that of a man with three traumas on the left side of the cranium (no. 1012): one is on the left parietal and two are on the left frontal bone (Fig. 35). There are several possible explanations for these wounds. All three wounds may have been inflicted by an attacker (or attackers) who delivered three separate blows. One on the frontal bone, near the temporal line/crest, seems to have been inflicted by a sharp pointed instrument with a stem, square in section (Fig. 36), which

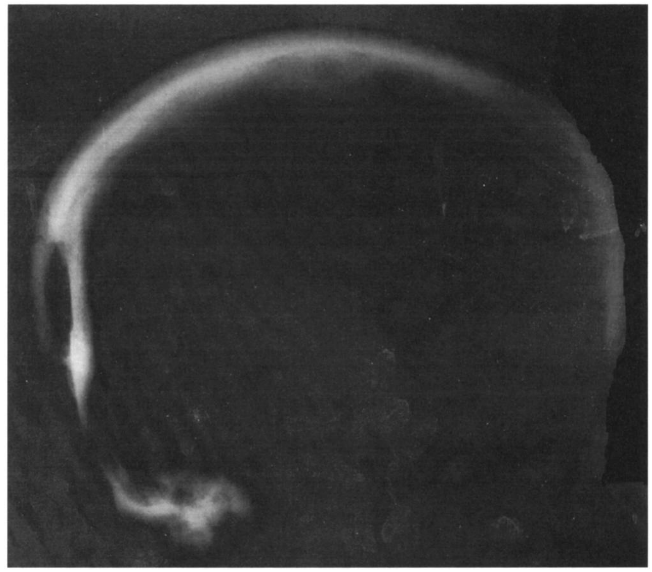


Figure 34. Skull AX 14/18. Radiograph showing inward displacement of bone.

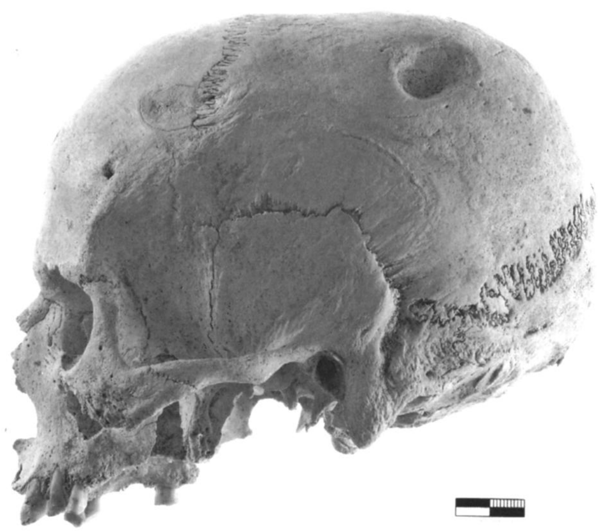


Figure 35. Skull 1012. Multiple head traumas.

pierced the external surface of the bone. The other is a shallow depression fracture on the frontal bone, 27 mm in maximum diameter and 1 mm deep, at the junction with the coronal suture (Fig. 37), which could have been caused by a rock falling or being thrown from above, or by a sling-stone. A deep depression fracture on the parietal, anterior to the parietal boss, 27.3 mm in maximum diameter and 19 mm deep, that displaced the bone inward (Figs. 38, 39) could have been sustained in hand-to-hand fighting, caused by a very forceful blow with a blunt weapon, or alternatively, by a sling-stone launched from a distance.

All three wounds have porotic lesions and show a similar state of healing at the time of death, which indicates that they were probably all sustained on the same occasion and that the man survived these injuries. The fact that there are multiple wounds on the left side of the skull suggests that they are unlikely to have been accidental and must have been caused by deliberate attack.

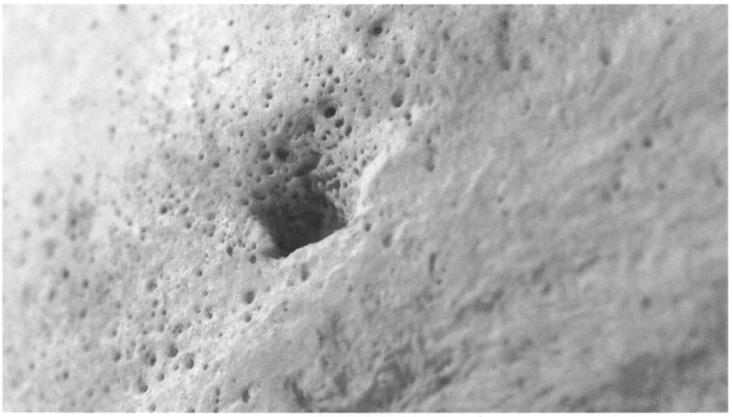


Figure 36. Skull 1012. Trauma caused by a pointed instrument.

Figure 37. Skull 1012. Shallow depression on frontal bone.

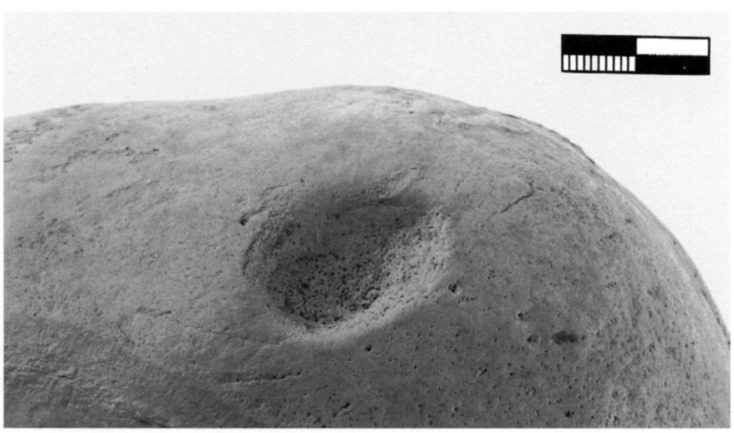


Figure 38. Skull 1012. Deep depression on left parietal.

Apart from the external flesh and bone lesions, these wounds would have caused endocranial problems, such as a hemorrhage or hematoma. Having survived this attack, the man would have had serious general and focal symptoms such as headaches and sensory disturbances (e.g., epilepsy) for which perhaps a cure by trephination was attempted. The anterior partially healed perforation seen in Figure 36 might be the result of an aborted trephination, a surgical attempt to provide a cure for the patient's problems. This explanation seems more feasible when considered in the light of other cases of trephination, two of which have already been mentioned.

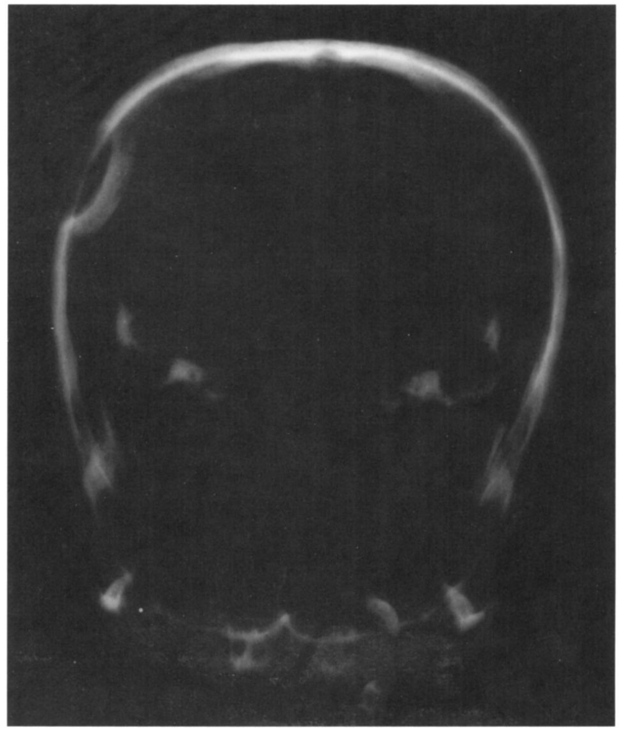


Figure 39. Skull 1012. Radiograph showing inward displacement of bone.

The third trephination patient was a male (no. 8124), a large part of whose skull had been removed (Figs. 40–43). The close-up view in Figure 40 appears to show the point of a weapon's impact: a blow or several blows probably shattered the left parietal, causing inward displacement of the fractured bone. The extensive shattering necessitated the removal of a large section of the cranial table (Fig. 40, top). Rotating the bone through 90 degrees, one can see cut marks and the relatively smooth, remodeled edge of the bone.

Remodeling had begun to seal the trabeculae (see Fig. 41). This edge of bone had evidently been sawn through in a later phase of surgery, perhaps intended to tidy up after the initial surgical removal of the parietal area. The bone had healed extremely well judging from the amazingly neat, smooth edges of the bone around the part that had been removed. These otherwise smooth edges of the trephination have three incisions at right angles and a fourth incision along the healed edge that must be cut marks from the surgeon's knife (Fig. 42). The changes on the internal surface of the parietal bone (Fig. 43) show there was irritation from infection that led to the creation of new bone tissue.

The differences between Minoan and modern society in nutrition, hygiene, medicine, and technology are vast. What were minor accidents by modern standards would have cost lives in the past, particularly in the world before penicillin. Hippocrates records that when wounds were neglected, what often followed was infection, fever, and death (*Περὶ τῶν ἐν κεφαλῇ τρωμάτων* 19). An illustration of this point is the story passed down by Herodotos (3.37) of the death of Kambyses from a self-inflicted wound to his thigh caused by the tip of his sword, which accidentally became unsheathed as he mounted his horse. He died from an infection three weeks later.

Figure 40. Skull 8124. Two views: area of skull surgically removed *(top)* and detail showing area of impact *(bottom)*.

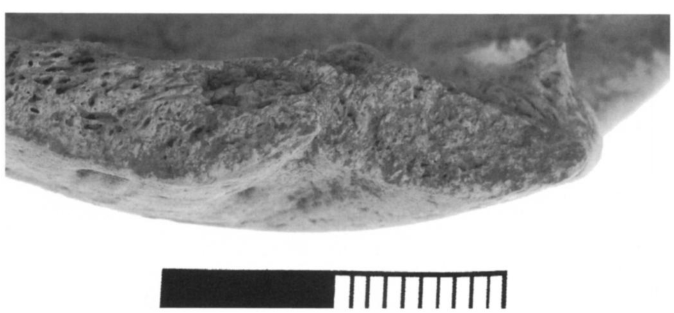


Figure 41. Skull 8124. Sawn section of cranial table with partially sealed trabeculae.

Figure 42. Skull 8124. Incision marks from the surgeon's knife.

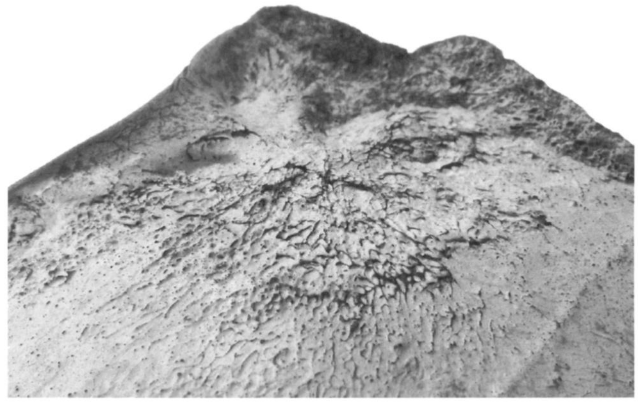


Figure 43. Skull 8124. New bone tissue on the internal surface.

The site of Hagios Charalambos makes one marvel at the evidence for cranial surgery performed by the Minoans and at the proof of patient survival. The Minoans probably used drugs such as opium. They had obviously developed an efficient protocol for cranial surgery and patient aftercare. By any standards, these are impressive medical achievements. Patients must have developed their own antibodies that enabled them to survive infection; hence the smooth beveled edges of the trephination of skull 8083, which are beautifully healed (Fig. 26, above).

Trephination

Trephinations are usually found in conjunction with head injuries, the desired effect being to relieve pressure built up from increased fluid, a natural response to trauma. As described above, there are a remarkable number of head injuries and at least three trephinations at Hagios Charalambos. Some injuries are certainly the result of deliberate, not accidental, trauma. The casualties are mostly men, and the traumas are most often on the left side of the head, consistent with attack by a right-handed adversary. Some circular depressions may have been caused by sling-stones, which are deadly weapons—illustrated in Assyrian reliefs, on the silver rhyton from Mycenae, and so on down to the Bayeux Tapestry—that usually have a low profile in the archaeological record. It is quite probable, then, that war was the catalyst in antiquity for the acquisition and development of surgical techniques and medical care.

Trephination has a long history and a wide geographical distribution throughout the world.[124] The earliest known trephinations date to the Neolithic period. Ortner's observation that "the expertise of the technique used in ancient Greece [ca. 500 B.C.] suggests even greater antiquity for trephination as a treatment for skull trauma" is certainly correct.[125] In fact, several trephinations have already been recorded from later Bronze Age sites in Greece besides Mycenae: Achaea Klauss[126] in the Peloponnese and Phourni, Archanes,[127] on Crete, and also from Iron Age Kavousi[128] on Crete. But Hagios Charalambos predates these sites.

Hagios Charalambos has given us the earliest evidence for brain surgery in Greece. The examples show a high level of sophistication and medical specialization in a period that, according to general consensus, is

124. For summaries, see Aufderheide and Rodriguez-Martin 1998, pp. 31–34; Ortner 2003, pp. 169–172. The authors also define types of trephination and techniques.

125. Ortner 2003, p. 171.

126. Paschalides and McGeorge, forthcoming.

127. Poulianos 1971, pp. 252–254; neither the nature nor the date of this trephination is clear since no illustration or find context is given.

128. Maria Liston (pers. comm.).

characterized by increased occupational specialization. Votive limbs and figurines have been found at peak sanctuaries and elsewhere, including this cave, and the practice may have had a connection with healing.

There is obviously a long continuity between prehistoric Aegean medicine and the medicine of Classical Greece. It is clear that the foundations of Hippocratic medicine were already laid in the early 2nd millennium B.C., and indeed probably earlier. Beside the ample evidence for reduction and immobilization of fractured limbs that could not have healed otherwise and for tooth extractions in the Middle Minoan period,[129] the trephinations from Hagios Charalambos are unequivocal proof that the Minoans had advanced in the field of clinical medicine as they had in every other area of technology, culture, and social life. Their knowledge was passed down from generation to generation and ultimately codified in the Hippocratic treatises of the Classical and Hellenistic periods.[130]

DISCUSSION AND CONCLUSIONS

Philip P. Betancourt

The Hagios Charalambos cave is a natural cavern in the Lasithi plain in east-central Crete. The site is an extreme case of the not uncommon Minoan practice of collecting, sorting, and moving both human bones and burial goods from a primary location to one or more secondary locations.[131] The bones and artifacts were first placed in primary burials at some other location, and they were moved to the cavern at some point in MM IIB. The evidence for secondary burial is definite. The cave was prepared by building two terrace walls in room 5, and a grid of long bones was laid over parts of the floor of this room (Fig. 5), clearly proving that the disarticulated bones in this cavern were not disturbed primary burials. The objects were placed inside several of the rooms of the cave during MM IIB, which is the final date for the bulk of the ceramics. The process of deposition resulted in MM IIB sherds scattered all the way from bedrock to the upper surfaces of the deposits, where groups of human skulls were used to complete the deposition. Human skulls were found on the upper surfaces of the depositions in rooms 1–4, the room 4/5 entrance, and room 5. The other rooms were not used by the Minoans. The process of deposition broke some of the human bones and pieces of pottery. Broken skulls and other human bones as well as broken vases were mended by the conservators by joining fragments found in different rooms and in different levels within rooms.

The best parallel for the situation at this ossuary is the cave at Trapeza, located at the eastern side of Lasithi across the plain from the Hagios Charalambos cave. It was excavated in a single season in 1935 and published promptly.[132] The cave contained a pure Neolithic stratum on bedrock, but the rest of the deposit consisted of completely unstratified and disarticulated bones in addition to burial goods. The Neolithic level was surely nonfunerary, as suggested by the excavators. The latest date for the pottery in the upper, mixed level was MM IIB. Although the excavators thought the cave had been used for primary burials that had been disturbed by looters, it is more likely that it was another ossuary used for secondary burial

129. McGeorge 1988.

130. Hippocratic medicine continued to be practiced and embellished for centuries until the Byzantine period, when it was passed to the Persians and later to the Arabs, whence it was transmitted back again to medieval Europe by Avicenna, or Ibn Sina to use his Arabic name, and taught in the newly established universities. Greek medicine also was transmitted into the syllabi of the universities of Samarkand and Tashkent and thence to India in the 13th century by refugees fleeing Genghis Khan (Nizami 1966). Greek or Unani medicine, based on the Hippocratic theory of the four humors, is one of the alternative forms of medicine that continue to be practiced in India to this very day (Dalrymple 1993, p. 270).

131. For a detailed review of the evidence, see Branigan 1987.

132. Pendlebury, Pendlebury, and Money-Coutts 1935–1936.

because the nature of the material, including many complete vases as well as bronzes, seals, and figurines, suggests that too little looting had occurred to account for the complete lack of stratigraphy in the upper level. The many parallels for individual artifacts noted in this report clearly demonstrate that the two caves contained artifacts from some of the same production centers.

Although the Neolithic sherds found outside the Hagios Charalambos cave may have been deposited by people who used the cavern for nonfunerary purposes (no human bones were associated with them), the Neolithic pieces from inside the cave were not complete vases or large fragments from a deep layer as was found at Trapeza, but small nonjoining sherds found scattered at random within the deposit of human bones. Apparently the movement of the bones and other items to this ossuary resulted in the inclusion of a small number of objects from Neolithic burials as well as the later ones. The pottery suggests that the chronological range for the original burials was FN to MM IIB, with most of the material from EM III to MM I. The small number of LM I–III objects (fewer than five sherds and possibly one or two metal objects) is probably to be accounted for by later visits to the cave before its mouth was completely sealed at the end of the Bronze Age.

The objects in the cavern come from a community whose location has not been securely identified. An intensive survey of the Lasithi plain by Watrous discovered LM I sherds on the hill just north of the site,[133] and it is possible that this was the location of the FN–MM IIB settlement as well, but one cannot be sure. The relative abundance of vessels and sherds from different periods suggests that the habitation represented by the finds began as a modest-sized community in FN to EM IIB and increased in size in EM III to MM I.

Some very important groups of objects come from this cave. The six clay sistra are the largest group of musical instruments known from Minoan Crete. The figurines include variations of known types as well as completely new forms. Fine objects like the gold and silver jewelry and the silver seal ring with the floral decoration indicate the Lasithi plain had some elite citizens among the population. The tiny obsidian geometrics (comprising the largest corpus known) include a new class of this little-known type of Minoan microlith. Petrography performed for this project identifies the dark burnished stand (**16**) as a product of the Lasithi plain or the Pediada; the type's wide distribution in burial contexts in EM IIA (at the end of the period of the Pyrgos ware chalice) suggests it may be the successor of the communal chalice in group funerary ceremonies. The large assemblage of human bones will continue to yield information about the Minoan people before the movement of populations around the Aegean during the Late Bronze Age. The traumas and the advanced surgical techniques used to alleviate them that are presented in this report provide new evidence for the history of ancient medicine.

The individuals buried here were always in contact with other parts of Crete. They received both objects and influences from various parts of the island as well as from overseas. Contact with the Cyclades is suggested by a Cycladic type of obsidian blade (**32**) and by the nude female figurines

133. Watrous 1982, p. 65.

with frontal stance. A number of artifacts from EM III to MM I suggest contacts with the eastern Mediterranean (items discussed above include hippopotamus ivory, neritid shells, the form of the sistrum, and possibly some of the metals). Most of the local pottery from this period imitates the East Cretan White-on-Dark ware that has been found on the north coast between Malia and Palaikastro, while the EM III–MM I figurines and seals have parallels from the Mesara. In MM II, the pottery is more closely allied with Malia, reinforcing the possibility that a Malia state includes the Lasithi plain by this period.

The deposition ended in MM IIB except for just a few sherds and possibly a few pieces of jewelry. By the end of the Bronze Age, the cave was closed, and no post-Minoan items were found in the cavern. Erosion covered the entrance completely until it was found by accident in 1976.

APPENDIX
HANDLING AND CARE OF EXCAVATED OSSEOUS MATERIAL

The preservation of skeletal material and other organic finds is largely dependent on the burial environment, the excavation, and post-excavation treatment and maintenance. Due to the alkaline nature of limestone cave deposits, the environment does not become acidic, so the preservation of bone and other organic material is favored. Another advantage of a cave environment is the long-term stability of temperature and relative humidity, which are the major environmental parameters that influence the preservation of organics. However, improper handling during excavation or study as well as inappropriate storage conditions can cause substantial and rapid damage. Therefore, preventive measures need to be taken in order to minimize the shock that may occur when excavated material is exposed to a new environment or to maintain the finds in their burial condition until they can be transferred to a laboratory.

First Aid and On-Site Handling

First aid and preventive conservation measures were among the main concerns in planning for the Hagios Charalambos excavation project in 2002–2003. Judging from the findings of Davaras's earlier excavations at the cave, we expected to find large amounts of bone and ceramics in relatively good condition, as well as a considerable number of ivory artifacts. Sealstones and jewelry were also expected, but to a lesser extent.

Knowing the burial environment and the type of soil in the cave, we were able to foresee the need to preserve bone, ivory, and other osseous materials, and we could choose the appropriate methodology and acquire the equipment needed for first aid, packing, and transportation. Because the cave was used as an ossuary where a secondary deposit of human bones and artifacts was placed during MM IIB, the bones had been exposed to a different environment during initial burial, which affected their preservation before their long exposure in the environment of the cave. For this reason, the bone was expected to show diverse weathering features.

As anticipated, the bone was found in good condition, but it was quite moist. The clay soil of the cave, which was found to be slightly alkaline (tested with Ph indicator strips), favored the preservation of organics.

Preservation of organics was also favored by the stability of the environmental parameters in the cave. Relative humidity (RH) and temperature (T) measurements were taken immediately after the opening of the cave. Humidity indicator cards were placed in five different locations in the cave: at the modern entrance, in rooms 3–5, and in the room 4/5 entrance. Digital data loggers that recorded RH and T values every 30 minutes were additionally installed in rooms 3 and 5 to monitor environmental changes during excavation.

All humidity indicator cards soon turned pink, indicating a relative humidity of 100% in all rooms. In the following days, room 3 started drying slowly, especially in the area near the entrance. After 10 days of excavation, the card near the entrance of the cave in room 3 indicated about 70%–75% RH, while the card in the center of room 3 indicated 80%–85%. Room 4 also dried slightly down to 90%, while room 5 remained at 100% RH until the end of excavation.

The data downloaded from the loggers showed daily fluctuations of RH in room 3 from 70% to 100% and smaller fluctuations from 85% to 100% in room 5. It was observed that in room 3, RH decreased significantly (by 25%) during the day as sunlight was coming in, and then increased again in the afternoon, reaching 100% during the night. In room 5 a fluctuation of 5%–15% in the RH was observed during working hours on working days. It is apparent that these fluctuations were due to the heat of the light sources that were used during excavation. The T values ranged from 13°C to 18°C with daily fluctuations of less than 5°C.

It is widely known that when bone, ivory, or any other organic material is found wet, it should be dried slowly and evenly away from direct sources of heat, even sunlight. Wet bone is usually quite soft and can easily be damaged by hard tools such as metallic trowels and spatulas, but it hardens considerably as it dries.

At Hagios Charalambos bones and soil were collected in small plastic buckets and then transferred to a tent that was installed outside the cave to provide shade for the finds and the people who were processing them. All material was excavated and handled with examination gloves in order to avoid any contamination that might affect analysis. Due to the high clay content, the soil in the cave becomes quite hard as it dries and is therefore more difficult to remove. For this reason, the bones were cleaned with wooden tools to remove most of the clay soil while it was still wet and soft (muddy). In general, one should not pack and transfer fragile bones with heavy lumps of soil on them.

The soil that was cleared out of the cave was also searched by hand and then stored in thick polyethylene bags that were transferred to the INSTAP Study Center for further examination in a water separation system. As the amount of bone collected from the burial deposit during a working day increased and often exceeded the amount that could be processed in the tent, the buckets with the finds were kept in the room just inside the cave entrance, which was slightly drier but still offered environmental stability.

All the bones were disarticulated and mixed in antiquity. In order to minimize abrasion during storage and transportation, they were bagged in paper bags and in small groups according to their size and shape. Bones from the skull, spinal column, ribs, and extremities were usually bagged separately. Long bones were generally bagged in groups of two or three. Since the bags were only half full, they also served as padding between the bones. The bags were placed in styrofoam boxes in a horizontal position, with the larger and heavier ones placed at the bottom of the box. Styrofoam boxes were chosen because they are quite light and soft and can buffer the exposure of the bone to the outside environment. Skulls were padded more carefully, wrapped in acid-free tissue and then in bubble wrap. They were then placed in styrofoam boxes and packed lightly with crumpled acid-free tissue. Loose teeth were collected separately in paper boxes.

Bone was dried out slowly without direct exposure to sources of heat, including sunlight; drying bone in this manner provides good conditions for its preservation. For this purpose, a separate room was rented in Psychro and devoted to bone storage. The boxes were transferred to the storage room, where they were left open in order to start drying the bones in a stable environment.

Our careful on-site processing of the material resulted in the identification of 11 ivory items, including the figurine pendants, two small handles, and seals described above; most of these were picked from buckets of mud mixed with bone. The identification of these objects on site was crucial for their future preservation, as ivory cannot be left to dry in the same way as bone.

The ivory objects were stored in small transparent plastic boxes lined with acid-free paper. Wet cotton-wool swabs and a humidity indicator card that could be viewed without opening the box were placed in the corners of the box. Relative humidity in the box was maintained at a level above 90% until the ivory was transferred to the laboratory, where it was dried in baths of solvents and then consolidated. Preexisting crack lines did not seem to develop any further during drying, although some flaking occurred in three objects. One ivory object that had initially been misidentified as bone began to split while drying. Fortunately, the splitting was noticed immediately, and the object was repacked and stabilized in order to prevent further damage.

In general, our policy was to avoid any treatment that would involve the use of consolidants or adhesives on site unless absolutely necessary. Given careful planning and cautious conservation, we were able to recover the maximum amount of information from the cave while preventing further damage to the artifacts and bones.

Conservation and Storage

Natural resins, gums, and waxes were used as consolidants until the 1940s when they were replaced by vinyl polymers such as polyvinyl acetate (PVAc). Beginning in the 1960s, various man-made polymers were applied, but they did not show long-term stability, while in the last two decades acrylic polymers and copolymers (mainly Paraloid B72) have been used with satisfactory results. The use of resins as consolidants can increase strength but does not reduce the hygroscopic nature of bone. On the other hand, preventive measures can be very effective in protecting hygroscopic bone from large fluctuations in the moisture content of its ambient environment. Human and animal bone, ivory, and antler artifacts can all be treated the same way.

With future analytical study in mind, we chose to stabilize the storage environment rather than consolidate the bone itself, which would have been time-consuming and still not have solved the problems relating to the hygroscopic nature of the material. A special room in the INSTAP Study Center storage area was devoted to organics. It is a cool room with relative humidity between 45% and 55% and a temperature that does not exceed 21°C. Daily fluctuations in both T and RH are avoided, and bone is always kept away from direct heat and light. Isothermal boxes used for packing offer environmental stability when bone is transferred or taken out of the storage room for study.

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