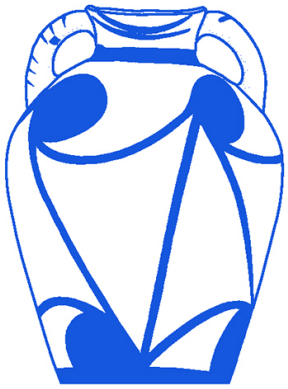
Alatzomouri Pefka

A Middle Minoan IIB Workshop Making Organic Dyes



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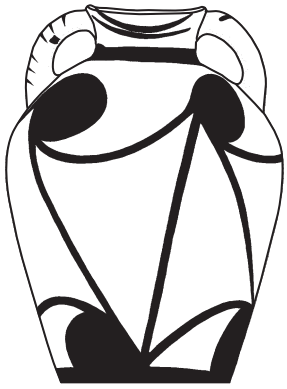

PREHISTORY MONOGRAPHS 62

Alatzomouri Pefka

A Middle Minoan IIB Workshop Making Organic Dyes

edited by

Vili Apostolakou, Thomas M. Brogan, and Philip P. Betancourt

with contributions from

Vili Apostolakou, Philip P. Betancourt, Thomas M. Brogan, Konstantinos Chalikias, Alison M. Crandall, Joanne Cutler,† Heidi M.C. Dierckx, Andrew Koh, Evi Margaritis, Floyd W. McCoy, Dimitra Mylona, Thomas Palaima, and Marie N. Pareja



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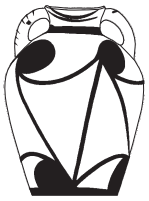

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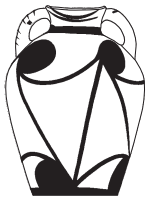

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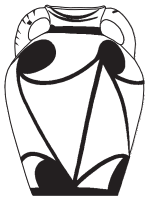
List of Abbreviations

ARCHEM	Archaeochemistry in the Eastern Mediterranean
ASCSA	American School of Classical Studies at Athens
cm	centimeter(s)
cm/sec	centimeters per second
CV	column volume
d.	diameter
dim.	dimension
EBA	Early Bronze Age
EDM	electronic distance measurement
EFT	elliptic Fourier transform
EM	Early Minoan
EPCA	Ephorate of Prehistoric and Classical Antiquities
est.	estimated
F. Time	final time (t_F)
FN	Final Neolithic
g	gram(s)
GC-MS	gas chromatography-mass spectrometry
GPR	ground-penetrating radar
h.	height
HM	Herakleion Museum
I. Time	initial time (t_I)
IGME	Institute for Geology and Mining Exploration
INSTAP	Institute for Aegean Prehistory
INSTAP SCEC	Institute for Aegean Prehistory Study Center for East Crete
km	kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
L.	length
LM	Late Minoan
m asl	meters above sea level
max.	maximum
MBA	Middle Bronze Age
min	minute(s)
min/sample	minute(s) per sample
ml	milliliter(s)
µl	microliter(s)
MM	Middle Minoan
mm	millimeter(s)
µm	micrometers

MNI	minimum number of individuals
mybp	million years before present
m/z	mass-to-charge ratio
NIST	National Institute of Standards and Technology
PAI	Pacheia Ammos Industrial Area
pres.	Preserved
PS	Pseira
rest.	restored
R. Time	retention time (t_R)
sec	second(s)
th.	thickness
THF	tetrahydrofuran
TIC	total ion current
UPLC-MS	ultra-performance liquid chromatography-mass spectrometry
w.	width
wt.	weight



1

Introduction

by

Vili Apostolakou, Thomas M. Brogan, and Philip P. Betancourt

East Crete was heavily inhabited during the Minoan period (Fig. 1). An especially large number of archaeological sites have been recorded in the region of the modern village of Pacheia Ammos at the eastern side of the Gulf of Mirabello. The area is near the northern terminus of the isthmus of Ierapetra (Fig. 2), at the narrowest part of the south Aegean island where the Gulf of Mirabello cuts into the landscape of the island from the north. The isthmus is a low area between mountain ranges that forms the only easy passage north and south across Crete. The landscape near the isthmus was already settled during the Neolithic period before 3000 B.C., and by the Middle Bronze Age (MBA; after about 2000 B.C.), it had over 20 villages and towns. The largest MBA site on the north coast of the isthmus was Gournia, located just west of the northern end of the north–south route across Crete (Hawes et al. [1908] 2014; Soles 1991; Watrous 2000, 2012a, Watrous et al. 2012).

A Middle Minoan (MM) IIB workshop for making natural dyes and using them to color fabrics was discovered in 2007 near Pacheia Ammos. It was located on a natural terrace above the town, not far from the modern national highway that traverses Crete's north coast from east to west (Fig. 3). The level area with the workshop is one of several terraces that rise above the village on its southwest side. The nearest modern building is a house built by pioneer archaeologist Richard Seager in 1909 on the same terrace as the dye workshop (Becker and Betancourt 1997, 89, 97–98). Except for some shallow depressions that would later be found to be rock-carved basins (Pl. 1A), little of the site was visible aboveground before the excavation began.

The archaeological site lies on one of the most picturesque of the level terraces on the northeast slope of the hill named Alatzomouri. The terrace is bounded on the north and south by stone retaining walls constructed to create level areas for agriculture and other purposes. These walls were probably built in the Ottoman period. The site is set back away from the main road, and this area is planted with pine trees (Pl. 1B).

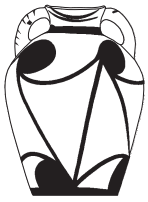
When archaeological work began on this terrace in May of 2007, several of the terraces were planted

with olives (*Olea europaea*). No olives grew on the archaeological site, but many olive trees were present both uphill and lower on the slopes of Alatzomouri. A large agave (*Agave americana*), a plant with large spiked leaves that was imported into Greece from Mexico and now grows wild in its adopted territory, grew on the next lower terrace. The terrace with the archaeological site and Seager's house is known locally as Pefka, a name that means "a stand of pines" (from *pefko* [πεύκο], pine tree). *Pinus brutia* (Turkish pine) is native to Crete, and it grows widely in East Crete. Other trees in the vicinity in 2007 included the fig tree (*Ficus carica*) and the juniper (*Juniperus oxycedrus*).

Several other plants were present. Many pistachio shrubs (*Pistacia lentiscus*) grew nearby, along with several flowers (the pale violet geranium *Geranium molle*, the wild chrysanthemum *Chrysanthemum coronarium*, the acanthus *Acanthus spinosus*, and the attractive *Cistus creticus* with its five-petalled red flowers). The cactus *Opuntia ficus-barbarica* and many clumps of thyme (*Thymus capitatus*) were also present. A large caper plant with its white and violet blossoms (*Capparis spinosa*) greeted visitors who approached the small grove of pines by turning off the paved highway onto the dirt track that led 20 m to the archaeological site. In this idyllic setting, the 24th Ephorate of Prehistoric and Classical Antiquities (EPCA) uncovered one of the most important sites for the early history of dyeing ever found in Minoan Crete.

The site was discovered when a bulldozer unearthed a Minoan burial and the upper part of a small cave called a rock shelter in 2007 (Apostolakou 2008; Apostolakou, Betancourt, and Brogan 2007–2008, 35; 2010, 150; Apostolakou, Brogan, and Betancourt, eds., 2017). Subsequent investigation in the general area revealed several depressions in the modern ground surface, and they were investigated to see if they were additional tombs. When the character of the site became clear (Fig. 3), it was excavated under the direction of the director of the Ephorate, Vili Apostolakou. The work began in 2007, and it was completed in 2008. Several preliminary reports have been published (Apostolakou 2008; Apostolakou, Betancourt, and Brogan 2010, 150; Apostolakou, Brogan, and Betancourt 2012; Betancourt et al. 2014; Betancourt 2015; Crandall et al. 2015; Apostolakou et al. 2016; Betancourt, Brogan, and Apostolatou 2016; Koh et al. 2016; Pareja et al. 2016).

This workshop was producing organic dyes from several materials. Red was made from madder and *Echium* (viper's bugloss). Yellow was made from weld. Purple was produced from the mollusk (*Hexaplex truculus*) whose common names are murex and purple shellfish.



2

Excavation at Pefka

by

Vili Apostolakou, Thomas M. Brogan, Konstantinos Chalikias, and Philip P. Betancourt

The site of Pefka, located on the hill of Alatzomouri near the village of Pacheia Ammos in northeast Crete, was discovered in 2007. It was found as a result of the surface examination of the landscape near a Bronze Age burial and a nearby rock shelter uncovered by a bulldozer on the edge of the highway west of the village (Apostolakou, Betancourt, and Brogan 2007–2008; 2010, 150; Apostolakou 2008; Apostolakou, Brogan, and Betancourt, eds., 2017). Before its excavation, the site consisted of a series of depressions in the ground that looked like tombs. The depressed areas were not tombs but rather artificial basins carved out of the soft limestone bedrock as the main feature for a workshop making organic dyes (Fig. 3; Pl. 1A). The pottery shows that the site was destroyed at the end of MM IIB.

Pefka is the only excavated workshop with rock-cut basins known from Middle Minoan Crete. It is of great importance for the history of Bronze Age technology as well as for the light it sheds on what was clearly a major Minoan industry. The evidence provides information both for the making of dyes and for the broader issue of the economic foundation for Minoan trade in fabrics during the period of the Old Palaces (Militello 2007).

Personnel

The excavations were conducted in 2007 and 2008 under the direction of Vili Apostolakou, who was then the Director of the 24th EPCA for East Crete. The Field Supervisor was Konstantinos Chalikias. Assistant Field Supervisor was Susan C. Ferrence, Director of the INSTAP (Institute for Aegean Prehistory) Academic Press. Alekos Nikakis, Chief Conservator for the Ephorate, provided technical supervision for the project, assisted by Assistant Conservator Nearchos Nikakis and several workmen. Additional technical assistance was provided by Thomas M. Brogan and personnel from the INSTAP Study Center for East Crete (INSTAP SCEC), and by Philip P. Betancourt of the Tyler School of

Art and Architecture of Temple University in Philadelphia. Ground-penetrating radar (GPR) was conducted by Antonia Stamos. Site photographs were made by Philip P. Betancourt, Thomas M. Brogan, and the trench supervisors. Topographic mapping was accomplished by Andrew Insua and Miriam Clinton, who were then graduate students at the University of Pennsylvania (2007, 2008). Trench supervisors included Rachael Fowler (2008), Heather C. Hicks (2007), Allyson McCreery (2008), Judith L. Papit (2007, 2008), Ariel L. Pearce (2007, 2008), and Sarah E. Peterson (2008), then graduate students at Temple University, and Miriam Clinton (2008) and Nurith Goshen (2008), then graduate students at the University of Pennsylvania. Floyd W. McCoy, Professor of Geology at the University of Hawaii, studied the geology.

Post-excavation study was conducted in the INSTAP SCEC in Pacheia Ammos between 2007 and 2014. Conservation was conducted by Chief Conservator Stefania Chlouveraki with the assistance of Matina Tzari. Chronis Papanikolopoulos made the object photographs and the aerial photography. The water separation machine (for water sieving) was operated by Matina Papadaki. Drawings of objects and computer processing of the images were undertaken by a series of staff members including Doug Faulmann, Konstantinos Chalikias, Lily Bonga, Philip P. Betancourt, Susan C. Ferrence, Nurith Goshen, and Andrew Insua. Recording of cataloged objects using a database (Access 2007) was supervised by Registrar Mary A. Betancourt with the assistance of Jeanine Beckman (2009), Lily Bonga (2009–2012), Florence S.C. Hsu (2011–2013), Rachael Fowler (2008, 2009), Allyson McCreery (2008, 2009), Rebecca Mullin (2009), and Marie N. Pareja (2012, 2013). Objects were accessioned and numbered sequentially on the object and on the records, and the objects were described and measured. Names of colors followed the Munsell system (Kollmorgen Instruments Corporation 1992). The preliminary records were checked by specialists and then copied onto the database. Stone objects were cataloged, drawn, and studied by Heidi M.C. Dierckx. Further computer processing was conducted at the Digital Archaeological Laboratory in the Tyler School of Art and Architecture at Temple University by Judith L. Papit, Florence S.C. Hsu, Marie N. Pareja, and Amie Gluckman.

Site Location

The Pefka workshop is located on the northeast slope of the hill of Alatzomouri, overlooking the village of Pacheia Ammos and the shore of the Gulf of Mirabello. The site is on a slight slope that inclines toward the northeast, which is one of several terraces on Alatzomouri. It is approached from a narrow road that leads east from the Greek national highway toward the house once owned by Richard Seager. The site is situated at the north of the road, within a small grove of pines (Pl. 1B). The sea is about a half kilometer away (Pl. 2A).

This region was a heavily populated part of Crete during the Bronze Age. The nearest archaeological site is a Late Minoan (LM) III chamber tomb excavated by Stylianos Alexiou situated ca. 60 m east of the earlier workshop (Alexiou 1954). Other LM III tombs were excavated by Harriet Boyd Hawes at unknown locations on the same part of the hill (Hawes et al. [1908] 2014, 45–46), and several other chamber tombs are located across the main highway. A rock shelter filled with Early Minoan (EM) III pottery and a nearby burial were found at a location near the main highway (Apostolakou, Betancourt, and Brogan 2007–2008, 35; Apostolakou, Brogan, and Betancourt, eds., 2017).

The dye workshop cannot be associated with certainty with any specific nearby settlement, but several possibilities exist. The cemetery of Pacheia Ammos, excavated by Seager on the beach at the village (Seager 1916), may belong to a sizeable unexcavated community on the hill of Alatzomouri at the settlement called Survey Site 17 in the intensive surface survey around Gournia (Watrous 2012b, 111, no. 17, tables 2–5, map 2:transects 165–168, 179, 180, 13, 14, 17, 20–21, 23, 24). Another village, called Pera Alatzomouri, was located at Survey Site 10 in the Gournia survey. All of these sites, including the dyeing workshop, used pottery made with Mirabello Fabric (for references and discussion, see p. 76). A seal found at the workshop was probably manufactured at Malia, so a more distant association of some type cannot be excluded (see this vol., Ch. 5). The workshop itself is not within any community. It must have been isolated within the countryside, and it was closer to places chosen for burials than to habitation locations.

The most likely possibility, however, is that the workshop belonged to the large town of Gournia located about 1 km to the west (Hawes et al. [1908] 2014; Betancourt and Silverman 1991; Soles 1991; Watrous and Blitzer 1999; Watrous 2000; 2012b; Watrous and Heimroth 2011; Watrous et al. 2012). Gournia was a major center during the MBA, and its pottery workshops provided a substantial amount of the ceramics used across the entire region. Economically, Gournia must have had a number of industrial enterprises to support it, and the large scale of the dye workshop would have required a major support system to provide the wool as raw material and to use the dyed materials as a part of a major effort to produce textiles.

The site is named after the grove of modern pine trees that surround it (*pefka* [πεύκα] is the modern Greek word for a stand of pines). The excavated archaeological location is small (5 x <25 m). It consists of a row of seven rock-cut basins in a line with two other basins nearby to the north (Fig. 3; Pl. 1A). Along with the basins are some small cuttings in bedrock that would have functioned as mortars, and a few small sections of walls. Large piles of stones nearby (Pl. 2B) were formed when local residents tore down Italian military storage sheds after World War II (the building blocks for the sheds would have come from the Minoan walls associated with the workshop).

Excavation

The site was excavated during two seasons of work. In 2007, field work was conducted from May 24 through June 29. In 2008, the team worked from May 26 to June 25. Most of the workshop area was revealed in 2007 when Trenches A1000, A3000, A4000, and A5000 were excavated (Fig. 3), and all of the basins cut into bedrock were uncovered during this season. The work in 2008 showed the limits of the area with the rock-cut cavities, excavated the lower part of the deep well or cistern, and uncovered other details.

Trenches were marked on the ground with stakes and string, and excavation proceeded in successive passes, with each pass either 5 or 10 cm deep. Each pass was regarded as a unit, and the passes were numbered sequentially within each trench. Features were excavated separately from the rest of the trench, with separate locus numbers. Stone tools, significant sherds, groups of sherds, and other finds were assigned object numbers as they were found. These numbers were retained with the objects, and they were recorded in the database of cataloged objects for later study. Pottery sherds to be processed for potential analysis for organic residues were identified at the time of excavation and marked appropriately. They were processed to remove residues in the INSTAP SCEC conservation laboratory by Kathy Hall, and each sherd was then returned to its object.

The sediment in the workshop was uniform throughout the site. It consisted of a pale-colored marly soil with high calcium content. It was dry and powdery, and it contained many small natural stones of pebble and cobble size. Most of the stones were natural to the hillside, and they had broken from the underlying bedrock. A large amount of the soil had eroded onto the natural terrace from higher parts of the hill at the south. In the Munsell system (Kollmorgen Instruments Corporation 1992), the soil's dry color was brown (10YR 5/3) to pale brown (10YR 6/3). The wet color was dark yellowish brown (10YR 3/4) to dark brown (10YR 4/3).

Accurate elevations above sea level for publication purposes were measured on the bedrock during the excavation. They were recorded with a Topcon electronic distance measurement (EDM) surveying instrument. Initial processing and map preparation was accomplished by Andrew Insua.

Trench A1100

The excavation began with a rectangular trench measuring 5 m northeast to southwest by 12 m northwest to southeast, called Trench A1100 (Figs. 3, 4). It was oriented with the visible depressions rather than the compass directions. The elevation at this part of the site varied from 33.96 to 34.09 meters above sea level (m asl). A 2 m extension at the eastern end of the generally northern

side allowed the excavation of what would be excavated as Loci A1102, A1114, A1112, and A1122. Each excavated unit within the trench was given a different number, and these numbers were used both as excavation units and as locus numbers for the vats and wall sections uncovered during the excavation.

The excavation began with 5-cm deep passes. The removal of the upper 5 cm of soil across the trench removed vegetation and topsoil. The soil was brown near the surface and pale brown below the surface. The difference in color came from included modern vegetation near the surface, and no floor or man-made stratigraphy was present anywhere. The second pass revealed a large circular basin (Basin 1, Locus A1101; Pls. 2C, 3A), a channel (Channel 1, Locus A1115; Pl. 3A), and a rectangular basin (Basin 4, Locus A1118; Pl. 3A), all of which were carved into the limestone bedrock. The soil contained a few sherds and a loomweight (**673**) as well as numerous small natural pebbles. The carved vats were numbered individually and excavated separately.

Finds

Ceramic vessel
MM IIB: one shallow bowl (**16**)
Textile tool
One discoid loomweight (**673**)
Marine invertebrates
Four *Buccinulum corneum*, two *Patella* sp., one *Monodonta* sp. (fragmented).
Drain section
MM IIB: one fragment of a drain section (**672**)

Unit A1101: Basin 1

A circular rock-cut basin measuring 2.1 x 2.0 m in size and called Locus A1101 was excavated in two passes, each ca. 10 cm deep (Fig. 4; Pl. 3A). No stratification was present inside the unit, and no primary deposit was found. The excavation found a piece of obsidian, one stone tool, and a few pottery sherds including a piece of a tripod offering stand (**490**), with the objects mixed at random within the pale brown soil.

Finds

Ceramic vessels
MM IIB: one bowl sherd (**29**), straight-sided cup sherds (**83**, **85**, **91**–**93**), one carinated cup sherd (**188**), one miscellaneous cup sherd (**213**), one kantharos with undulating rim sherd (**221**), one miscellaneous jar sherd (**249**), two miniature vessel sherds (**323**, **326**), two closed vessel sherds (**374**, **375**), one cooking dish sherd (**460**), one tripod offering stand sherd (**490**)
Chipped stone tool
MM IIB: one prismatic blade (**582**)
Marine invertebrates
One *Hexaplex trunculus*, one fragmented *Monodonta* sp., four *Patella* sp., one *Fasciolaria lignaria*, one *Hinia incrassata*

Unit A1102: Basin 2

A rectangular basin (Basin 2) measuring 3.29 x 4.21 m in size was situated east of A1101 (Figs. 5, 6; Pl. 3B). It was filled with soil and stones with a few sherds (esp. on the south side), including part of a tripod cooking bowl (**510**). Some bones and shells were also collected from the soil in the rock-cut vat. The deposit was just below modern ground level, and the excavation found many roots from pine trees as well as from other vegetation. At the southwestern corner, a channel (Channel 1) began at the corner of Basin 4 (Pl. 3A) and terminated at the edge of the rectangular vat. It would have conveyed liquid into the deep basin. When the trench was uncovered to bedrock in its northern part, it was seen to have a deeper cavity at the southern side (Pl. 4A). This cavity was eventually revealed as a deep well or cistern. It was excavated partly in 2007 as Loci A1002, A1006, A1112, A1114, and A1119–A1121, and the work was completed in 2008 as Locus A1112. The excavation proceeded in a series of passes beginning at the collar of the well, with each pass 5–10 cm deep. The well was filled with soil, stones, and pottery, with many mendable ceramic pieces. The most important pottery from the site came from this well (see discussion below [Locus A1112]).

As the excavation progressed, it became obvious that the site was covered by a uniform level of thin soil that had mainly washed in from higher up the hill after the Bronze Age, and that the workshop included a number of carved cavities. The vats called Basin 3 (Pl. 4B) and Basin 4 (Pl. 5A) were found near the first two cuttings in bedrock, to the west and southwest of the larger cavities. They were excavated under different locus numbers, and the finds were labeled separately. The channel that would have emptied liquid into Basin 2 began at the east corner of Basin 4 (Pls. 5A–6B).

Finds

Ceramic vessels
MM IIB: one basin sherd (**40**), three straight-sided cup sherds (**94**–**96**), two jug sherds (**277**, **294**), one pithos sherd (**337**), four closed vessel sherds (**376**–**379**), one jar with tripod legs sherd (**439**), one tray sherd (**507**), one tripod bowl sherd (**510**), one tripod cooking pot sherd (**545**)
Ground stone tool
MM IIB: one whetstone (**591**)

Unit A1103: Fallen Stones

The excavation continued at the eastern end of Trench A1100. Locus A1103 was a group of stones situated south of the eastern corner of the large rectangular vat called Basin 2. Several features were present near this location (Figs. 6–8; Pls. 6A, 6B). South of the large rectangular vat was another one of the smaller rectangular basins called Locus A1104 (Basin 5; Pl. 7A). The small lens of stones at the west called Locus A1103 had fallen from what remained of two walls, called A1107 and A1108 (Figs. 7, 8; Pls. 6A, 6B, 7B). A few pottery sherds and some shells were present here.

Finds

Ceramic vessels
EM III: one shallow bowl sherd (**2**)
MM IIB: one basin or jar sherd (**39**), one semiglobular cup (**164**), one flat lid sherd (**453**), one tripod cooking pot sherd (**559**)
Marine invertebrates
22 *Patella* sp., two *Buccinulum corneum*

Unit A1104: Basin 5

A rectangular cutting in the bedrock (Basin 5) measuring 0.97 x 1.08 m in size was located south of A1102. It was excavated as Locus A1104 (Figs. 5, 6; Pl. 7A). The soil in it was removed in 10-cm passes. Sherds and some shells were found mixed with the soil and stones inside the carved cavity. The pale brown soil was uniform in color and consistency, and no stratigraphy was present.

Finds

Marine invertebrates
One fragmented *Hexaplex trunculus*, three *Buccinulum corneum*, two sea urchin spines

Unit A1105: Fallen Stones

The stones that had fallen to the west of wall A1108 were excavated with this locus (Figs. 7, 8; Pl. 7B). All of the stones were unworked and natural. Pottery sherds, several murex shells (*Hexaplex trunculus*; formerly called *Murex trunculus* or murex shells in the literature; also called purple shells or purple shellfish), and a few other shell species were present among them.

Finds

Ceramic vessel
MM IIB: one cover sherd (part of **443**)
Marine invertebrates
24 whole and one fragmented *Hexaplex trunculus*, 13 *Patella* sp. and one *Patella aspera*, one *Monodonta* sp., one body fragment of *Tonna galea*, three *Buccinulum corneum*

Unit A1106: Basin 2 and the Well/Cistern

A 10 cm pass in Trench A1100 extended across what would later be revealed as the western corner of Basin 2 and the well or cistern (under Locus A1102). It recovered a large number of ceramic sherds, murex shells, and many stones (Fig. 6). The concentration of finds was at the top of the well and its collar. As in other units, the soil was pale brown in color (5YR 6/4). Channel 1 (A1115) was cleared with this series of passes (Pls. 3A, 5A, 5B). The passes collected a large number of sherds, and subsequent mending resulted in some interesting pottery including an almost complete oval-mouthed amphora (**308**) and a triple vessel (**348**). The triple vessel was completed by adding fragments from the well or cistern (Locus A1112.35), providing a solid link between the pottery near the deep cutting and the locus as a whole. The vessel consisted of three small jars, one of them with a bridged spout, which were joined at the center with no opening between the two unspouted vessels but separate openings to the spouted one. The unusual vessel was covered with dark slip and decorated with white dots. Pieces of a cylindrical stand (**441**), a vessel often associated in Minoan Crete with cult ceremonies (Cadogan 1973; Gesell 1976), came from this same unit. Part of a miniature tripod in fine fabric (**496**), a tripod with lug feet (**513**), and pieces of

tripod offering stands in coarse fabrics (**482**, **491**) also came from here, suggesting that this spot was near an area where ceremonies were held within the workshop.

Finds

Ceramic vessels
- Final Neolithic (FN) IV–EM I: one open vessel sherd (**1**)
- MM IIB: four basin sherds (**41**, **47**, **48**, part of **49**), one basin with scoring inside sherd (**53**), seven straight-sided cup sherds (**99**, **100**, **103–105**, **107**, **108**), one straight-sided or conical cup sherd (**135**), nine carinated cup sherds (part of **170**, **192**, **193**, **195**, **203–206**, **209**), two hole-mouthed jars (parts of **230** and **231**), three bridge-spouted jar sherds (**240**, **242**, **243**), six miscellaneous jar sherds (**244**, **245**, **250**, parts of **258** and **259**, **263**), eight jugs and jug sherds (part of **270**, **275**, **278**, **279**, **290**, **292**, **295**, **296**), one jug with wide mouth (part of **302**), one carinated jug sherd (**304**), three oval-mouthed amphorae (**308**, part of **309**, **312**), four miniature vessel sherds (**322**, **324**, **325**, **327**), two pithos sherds (**340**, **341**), one tripod jar (part of **347**), one triple jar (part of **348**), one pyxis (part of **350**), 17 closed vessel sherds (**351**, **381–387**, **391**, **392**, **397–402**, **436**), one cylindrical stand (**441**), two cover sherds (part of **443**, **445**), one flat lid sherd (**452**), two tripod offering stand sherds (**482**, **491**), one tripod kalathos (part of **493**), one miniature tripod sherd (part of **496**), one tripod tray sherd (**498**), one tripod bowl sherd (**509**), one tripod brazier sherd (**513**), five tripod cooking pot sherds (**535**, **543**, **556–558**)

Marine invertebrates
- One whole and 40 fragmented *Hexaplex trunculus*, one *Monodonta* sp., two *Patella* sp., one *Charonia* sp. body fragment

Drain section
- MM IIB: one fragment of a drain section (**663**)

Unit A1107: Wall Section

Locus A1107 was assigned to the east–west short fragment of wall (Fig. 7). Neither end of the wall was a terminal end. The soil was similar to what was in the rest of the trench, and little else was found. The stones were all unworked.

Unit A1108: Wall Section

Locus A1108 was assigned to the north–south fragment of wall (Fig. 7). This wall butted against wall A1107 at its southern end. The soil at the wall was similar to what was nearby. The stones were all unworked.

Unit A1109: Wall Section

This unit excavated the south side of Locus A1101 (the circular basin). The soil was very soft. Little was found aside from the side of the basin (Fig. 7; Pl. 3A). The stones were all unworked.

Unit A1112: Well/Cistern

A well or cistern over 8.5 m deep was inside Basin 2. It had a collar around it that would have facilitated the draining of water into the deep cylindrical cutting that was the cavity itself. Material was removed from this feature, including its collar, as a part of several loci (A1102, A1106, A1112, A1114, A1119–A1122). Under the collar, the well or cistern was excavated as Locus A1112 (Figs. 6, 8, 9; Pl. 4A). The material in the upper levels was a part of the deposit in the feature itself, indicating that when the workshop was destroyed the deep cutting was filled with debris that was also heaped up on top of it.

Passes were recorded consecutively at 5 to 10 cm intervals to see if any stratigraphy was present, but the subsequent mending of the pottery indicated many joins between levels, proving that the deep cavity was filled in a single episode. In all, 76 passes were removed from the feature (recorded as A1112.1–A1112.76). The elevation at the modern surface was 33.76 m asl, and the bottom of the well was at 25.05 m asl, so its depth was 8.71 m.

Fragments of pottery had been dumped on the surface at the mouth of the cutting, and the deposit continued down into the vertical cavity all the way to the bottom. The finds were deposited in a generally random order, with a few concentrations of specific classes. The dry soil color was pale brown to very pale brown (10YR 7/4), which was similar to the soil elsewhere on the site. Aside from differences attributed to moisture content, no substantive soil color changes were observed in the deposit. Murex shells, stone tools, and many pieces of pottery were present in the fill. Objects were often only partly preserved, and many were represented by single sherds. Pieces like jug **272** (mended from fragments in Loci A1112.1, A1112.10.3, A1112.13.2, A1112.14.2, and A1112.17.2) and tripod cooking pot **531** (mended from fragments found in Loci A1112.8.1, A1112.12.1, A1112.14.2, A1112.15.1, A1112.17.1, A1112.17.2, and A1112.18.1)

illustrate the unified character of the well or cistern's contents.

Many of the finest items from the site came from this deposit. A Kamares Ware semiglobular cup imported from the Mesara and decorated with flowers and rosettes came from Locus A1112.9.1 (**167**). An oval-mouthed amphora (**314**) of East Cretan manufacture came from Locus A1112.13.1. The most attractive lamp from the site (**220**) was found in Loci A1112.16.1 and A1112.17.2. Several almost complete vases were discovered as a concentration of pottery in Locus A1112.18, including cups **61**, **62**, and the very attractive piece with a scalloped rim **211**, as well as tripod cooking pots **525**, **527**, and **528** and a pithos with decoration of dark drips (**328**); the pithos contained small fragments of murex shells. The unusual object with crossed handles on the interior and also on the bottom of the base (**679**) came from Locus A1112.35. A whetstone (**652**) came from Locus A1112.26, and another one (**653**) was in A1112.43. In Locus A1112.35, the excavation found two nonjoining pieces from a ceremonial vessel that seems to have consisted of a clay container with several miniature tripod bowls attached on its rim (**494**). An abrading stone made of pumice (**628**) was collected from Locus A1112.30.

An especially large concentration of pottery was in Loci A1112.35, A1112.36, and A1112.37. Among the almost complete pieces were shallow bowls **9**, **11**, **12**, and **17**, bowl **23**, carinated cup **180**, tripod kalathos **492**, tripod cooking pots **515**, **517**, and **538**, rhyton **440**, and jugs **268** and **269**. A broken stone weight (**660**) was also from this unit. A prism seal (**580**) came from Locus A1112.52. The seal provides a link with the site of Malia (see this vol., Ch. 5).

Many pieces of tripod offering stands and tripod kalathoi came from the well, especially from its lower levels (**470**, **472–474**, **476**, **477**, **479–481**, **483–486**, **488**, **489**, **492**, **493**). This class of object consisted of a shallow tripod bowl with one handle with small circular imitations of cups inside it. All the examples were heavily burned in their interiors, and all of them were broken. Hot fires had been lit inside them, such as from burning oil over something organic that was placed inside the bowl. Apparently, objects from a ceremonial area in addition to industrial objects had been thrown into the well when the workshop went out of use.

Finds

Ceramic vessels

EM IIA: one offering table (**6**)

EM III–MM I: three rounded cups and sherds (**3–5**), one Barbotine Ware closed vessel sherd (**7**)

MM IIB: one plate sherd (**8**), 10 shallow bowls and sherds (**9–15**, **17–19**), three tall conical cups (**20–22**), 10 bowls/basins and sherds (**23**, **24**, **26–28**, **30**, **31**, **35**, **36**, **50**), one crucible-like bowl (**32**), nine basins and sherds (**33**, **34**, **37**, **38**, **42–46**), four fragmentary basins with scoring inside (part of **51**, **52**, **54**, **55**), 57 straight-sided cups and sherds (**56–63**, **65**, **68–82**, **84**, **86–89**, **97**, **98**, **101**, **102**, **106**, **109**, **112–116**, **124–126**, **128–131**, **133**), 18 straight-sided or conical cup sherds (**64**, **66**, **67**, **90**, **110**, **111**, **134**, **136–141**, **147–150**), four cylindrical cup sherds (**151–153**, **159**), one rounded cup (**161**), four semiglobular cups (**162**, **163**, **165**, **166**), one semiglobular cup with indentations in the side (**167**), 27 carinated cups and sherds (**168**, **169**, part of **170**, **171–176**, **178–183**, **185**, **186**, **189**, **191**, **194**, **196–198**, **201**, **207**, **208**), one cup with low carination (**210**), one carinated cup with scalloped rim (**211**), one carinated cup with spout (**212**), six miscellaneous cup sherds (**214–219**), one oval lamp (**220**), one kantharos with undulating rim (**222**), one carinated kantharos with molded decoration (**223**), one tall carinated vessel (**224**), two open vessels sherds (**225**, **226**), nine hole-mouthed jars and sherds (**228**, **229**, parts of **230** and **231**, **232–236**), three bridge-spouted jars (**237**, **238**, **241**), 15 miscellaneous jar sherds (**246–248**, **251–256**, parts of **258** and **259**, **260–262**, **266**), 20 jugs and jug sherds (**267–269**, **271–273**, part of **274**, **276**, **280–286**, **289**, **291**, **293**, **297**, **298**), four jugs with wide mouths (**299–301**, part of **302**), 10 amphorae and amphora sherds (**307**, part of **309** and **310**, **311**, **313–316**, **318**, **319**), one miniature vessel sherd (**321**), 15 pithoi and pithos sherds (**328–336**, **338**, **339**, **342–345**), one triple jar (part of **348**), one pyxis (**349**), 57 closed vessel sherds (**353–373**, **380**, **388–390**, **393–396**, **403–407**, **409–422**, **426–431**, **433**, **435**, **437**), one rhyton (**440**), one pyxis-like vessel (**442**), seven cover sherds (**444**, **446–451**), four flat lid sherds (**454–456**, **458**), one cooking dish and seven sherds (**459**, **461**, **462**, **464–468**), 19 tripod offering stands and sherds (**469**, **470**, part of **471**, **472–481**, **483–489**), two tripod kalathoi (**492**, part of **493**), one kernos with two miniature tripods (**494**), one four-legged offering stand sherd (**495**), one miniature tripod sherd (part of **496**), eight tray and tripod tray sherds (**497**, **499**, **501–506**), one tripod bowl or tray (**508**), two sherds of tripod bowls with tiny feet (**511**, **512**), one tripod cup sherd (**514**), 50 tripod cooking pots and sherds (**515**, part of **516**,

517–520, part of **521**, **522–534**, **536–542**, **544**, **546–549**, **553–555**, **560–574**), two heating stand fragments (**577**, **578**)

Stone vessels
MM IIB: two stone vessels (**677**, **678**).

Textile tools
MM IIB: three discoid loomweights (**674–676**)

Chipped stone tool
MM IIB: one prismatic blade (**583**)

Ground stone tools
MM IIB: 23 pounders (**594**, **595**, **597–600**, **603**, **605**, **608–611**, **614**, **615**, **620–623**, **626**, **627**, **633**, **634**, **639**), seven hammer stones, (**596**, **607**, **612**, **617**, **618**, **629**, **630**), seven pounder-abraders (**601**, **602**, **624**, **625**, **631**, **632**, **635**), two grinders (**604**, **619**), seven abraders (**606**, **613**, **616**, **628**, **636–638**), one pestle (**640**), one polisher (**641**), one pounding platform (**642**), three querns (**643–645**), eight whetstones and one possible whetstone (**646–654**), six stone weights (**655–660**), one mace head (**661**)

Marine invertebrates
469 fragmented and 68 whole *Hexaplex trunculus* (total 537), 22 *Patella* sp., 20 sea urchin spines and test fragments, 19 fragmented *Monodonta* sp., 17 *Buccinulum corneum*, six *Columbella rustica*, seven *Pisania* sp., five *Charonia* sp. body fragments, four *Spondylus gaederopus*, four *Cerithium vulgatum*, three *Fasciolaria lignaria*, two Verniculidae, one *Gibbula* sp., one *Sepia officinalis*, one *Pinna nobilis* fragment, one *Cyclope donovani*, one *Tonna galea* fragment

Mammal remains
62 unidentifiable mammal bone fragments, 50 ovicaprid, three pig

Drain sections
MM IIB: nine fragments of drain sections (**662**, **664–671**)

Suspension device
MM IIB: one suspension device (**679**)

Unit A1113

Locus A1113 was at the north of Trench A1100 (Fig. 3). The soil was soft and pale brown. Some natural stones were present, but fewer ceramic sherds were found in comparison with the southern part of the trench. One sherd was cataloged.

Finds

Ceramic vessel
MM IIB: one jug (part of **274**)

Unit A1114: Basin 2 and Well/Cistern

This designation was used to clear the upper part of the elliptical collar around the mouth of the well and the area north of it inside Basin 2 (Fig. 6). The soil was excavated in five successive horizontal passes, but no stratigraphy was present. All the objects were fragmentary except for some of the shells.

Finds

Ceramic vessel
MM IIB: one jug (part of **274**)

Marine invertebrates
Two complete and two fragmentary *Patella* sp., one fragmentary *Hexaplex trunculus*

Unit A1115: Channel 1

This locus consisted of the soil from inside a channel 1.83 m long that ran downhill from the east corner of A1118 (Basin 4) to the west corner of Basin 2 (Locus A1112; Fig. 8; Pls. 3A, 5A–6B). The channel was filled with pale brown soil and a few small stones.

Finds

Ceramic vessel
MM IIB: one jug (part of **274**), part of one tripod offering stand (**471**)

Unit A1117: Mortar 1

Locus A1117 (Mortar 1) was a small artificial cavity 0.35 m in diameter and 0.40 m deep in the limestone. It was probably used as a mortar. It was carved into the bedrock north of A1104 (Basin 5) and south of the rectangular basin (A1102) with the well or cistern in it (Pl. 8A). It was filled with soil, and only a couple of shells (including one murex), a carinated cup (**184**), and part of a jug (**274**) were found there. The finds were not in situ, and they were probably washed into the small depression after the workshop went out of use. The loose soil inside the mortar was similar to the soil around it.

Finds

Ceramic vessel
MM IIB: one carinated cup (**184**), one jug (part of **274**)

Marine invertebrates
One *Patella* sp., one *Hexaplex trunculus*

Unit A1118: Basin 4

Locus A1118 was a rectangular vat measuring 1.0 x 1.21 m in size and carved into the limestone bedrock east of the small fragments of walls (Figs. 3, 8; Pl. 5A). The soil inside it was removed in five successive passes, each ca. 5 cm deep. The pale brown soil was similar to what was present elsewhere on the site. It contained a few sherds, some shells, and three burned stones, one of which was a stone weight (**593**).

Finds

Ground stone tool
MM IIB: one stone weight (**593**)
Marine invertebrates
Three *Patella* sp.

Unit A1119: Collar of the Well/Cistern

Two successive passes were excavated in the southeast and the northwest sides of the collar around the mouth of the well or cistern below Locus A1114 (Fig. 6). Sherds, two shells (including a burned fragment of a triton), and a fragment of a stone tool (**585**) were recovered.

Finds

Ceramic vessels
MM IIB: three straight-sided cup sherds (**117**–**119**), two straight-sided or conical cup sherds (**142**, **143**), one cylindrical cup sherd (**154**), one carinated cup and two carinated cup sherds (part of **187**, **199**, **200**), one hole-mouthed jar (part of **230**), one oval-mouthed amphora (part of **309**), one closed vessel sherd (part of **350**), one tripod cooking pot (part of **516**)
Ground stone tool
MM IIB: one pounder-abrader (**585**)
Marine invertebrates
One *Charonia* sp. (three joining body fragments) burned, one *Hexaplex trunculus*

Unit A1120: Collar of the Well/Cistern

Three successive passes in the collar around the deep cylindrical cutting below Loci A1114 and A1119 removed pale brown soil and collected sherds, broken murex shells, a fragment of a triton shell, stone tools, and a burned stone (Fig. 6). A few small natural stones were distributed throughout the soil. Some interesting ceramic pieces were included among the sherds, including part of a cup with the crossed lines called the "tartan motif" on the bottom of the base (**157**), and an almost complete cylindrical cup decorated with meandering white bands (**158**). A whetstone (**592**) was among the tools that were recovered.

Finds

Ceramic vessels
MM IIB: one bowl sherd (**25**), one basin with scoring inside sherd (part of **51**), six straight-sided cup sherds (**120**–**123**, **127**, **132**), three straight-sided or conical cup sherds (**144**–**146**), five cylindrical cup sherds (**155**–**158**, **160**), one carinated cup and two carinated cup sherds (part of **187**, **190**, **202**), one semiglobular cup/jug sherd (**227**), one hole-mouthed jar (part of **231**), one bridge-spouted jar (**239**), three miscellaneous jar sherds (**257**, **264**, **265**), three jugs and jug sherds (part of **270**, **287**, **288**), three carinated jug sherds (**303**, **305**, **306**), one oval-mouthed amphora (part of **309**), one miniature jug (**320**), one tripod jug (**346**), one tripod jar (part of **347**), one triple jar (part of **348**), one pyxis (part of **350**), six closed vessel sherds (**352**, **423**–**425**, **432**), one flat lid sherd (**457**), one tripod kalathos (part of **493**), seven tripod cooking pots and sherds (part of **516**, part of **521**, **550**–**552**, **575**, **576**)
Ground stone tools
MM IIB: one pounder-abrader (**586**), one abrader (**587**), one whetstone (**592**)
Marine invertebrates
33 fragmented *Hexaplex trunculus*, one *Monodonta* sp., one Serpulidae (sea worm)

Unit A1121: Collar of the Well/Cistern

This locus cleared the northwest side of the collar around the well or cistern in two passes below Loci A1114, A1119, and A1120 (Fig. 6). The soil, which was soft and pale brown, was similar to the sediment elsewhere on the site. A few natural stones were present in the soil.

Finds

Ceramic vessel
MM IIB: one oval-mouthed amphora (**317**)

Unit A1122: Basin 2

Two passes north of the well or cistern cleared the pale brown soil from the lower parts of the rectangular basin below Locus A1114 (Fig. 6; Pl. 3B). A few sherds, a stone tool, and many natural stones that had eroded from the limestone

bedrock were in the soil. This large rectangular cutting in the bedrock was around and north of the well or cistern. The sherds were not cataloged.

Finds

Marine invertebrates
Two fragmented *Hexaplex trunculus*, one *Patella* sp., one *Columbella rustica* (a few small fossilized shells were part of the sediment)

Unit A1123: Basin 3

Excavation at the western side of Trench A1100 removed pale brown soil and exposed another carved rectangular vat 1.2 x 1.3 m in size, designated A1123 (Figs. 3, 10; Pl. 4B). It was designated Basin 3. A tree was growing inside the basin, and its roots had damaged the inside of the vat. The soil was very disturbed by the tree roots, and only a few sherds were present.

Finds

Ceramic vessel
MM IIB: one closed vessel sherd (**408**)

Unit A1124: Trench Extension

The original Trench A1100 was extended to the northwest into an area designated Locus A1124 (Fig. 3). The dimensions of the area were 1.5 x 2.5 m. The soil was similar to what was present in the adjoining trench. Clearing the new extension to bedrock produced only a few more sherds, a shell, and a possible whetstone (**590**).

Finds

Ground stone tool
MM IIB: one possible whetstone (**590**)
Marine invertebrates
One fragmented *Hexaplex trunculus*

Unit A1125: in the Well/Cistern

This unit was part of Pass A1112.6 inside the well or cistern (Fig. 9). Three shallow passes with this numerical designation yielded soil from near the base of the collar at the feature's mouth. A few sherds were discovered.

Finds

Marine invertebrates
One fragmentary *Hexaplex trunculus*

Unit A1126: Trench Extension

Locus A1126 enlarged Locus A1124 by extending it to the northwest of Trench A1100 (Figs. 3, 11). The entire trench was now 2.5 x 3.0 m in size. Locus A1126 was designed to discover if other vats were located northwest of those that had already been unearthed. The soil was very shallow, and it was removed to bedrock in four successive 5-cm deep passes. No stratigraphy was present, and only a few sherds and stone tools were present at random within the soil. No stratigraphy or floor surface were found. No manmade features were present, and the bedrock was all natural limestone. Nothing was cataloged.

Unit A1127: Natural Depression

In order to discover if the workshop extended this far to the west, an excavation unit removed the soil from an uneven natural depression in Trench A1126 at the end of the excavation season in 2007 (Fig. 3). The soft soil was similar to what was in the rest of the excavation. No new manmade features were found.

Finds

Marine invertebrates
One *Patella* sp., one *Monodonta* sp., one *Pisania maculosa*

Trench A2000

Trench A2000 was a 3 x 3 m trench situated at the southeast corner of Trench A1100 (Fig. 12; Pls. 6B, 8B, 9A). It included almost all of Basin 6 (excavated as Locus A2010; see below). The soil was pale brown and powdery with a few natural stones that had broken from the bedrock. Few finds came from this trench, and its main result was the removal of loose soil from inside the basin and from the area around it. One Hellenistic sherd was collected (**579**).

Finds

Ceramic vessel
Hellenistic: one open vessel (**579**)
Chipped stone tool
MM IIB: one prismatic blade (**581**)