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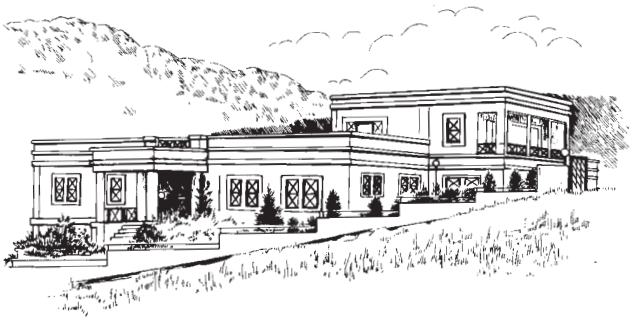

The J.M. Kaplan Fund Gives Grants to the INSTAP Study Center for East Crete

Thomas Brogan and Stephania Chlouveraki

In 2015, the INSTAP Study Center received four Kaplan Site Conservation Grants totaling $240,000 to promote and support site conservation studies and planning, field applications, on-the-job training programs, and a protection plan for the Bronze Age Palace of Sparta. This three-dimensional approach to the preservation of built heritage in Greece allows us to link the Study Center's primary mission (excavation, analysis, and publication) with the Kaplan Fund's focus on site preservation.

The first grant we received offered continuing support for the conservation of Bronze Age remains at Mochlos, Ayios Vasileios, and Gaidourofas, the development of conservation master plans and protocols, and the training of local personnel. During this phase of the program, we were already able to utilize the results of the condition survey and risk assessment completed last year that pointed out the emergency conservation tasks for each site. At Mochlos our team concentrated on the most endangered parts of the settlement. At Ayios Vasileios and Gaidourofas more attention was given to protecting the architecture exposed this summer and preparing and evaluating long-term conservation treatments at each site. Proper documentation is a fundamental part of this conservation process and should form an integral part of the planning and execution of any archaeological project. A second grant also provided funding to expropriate plots of land where the Bronze Age palace at Ayios Vasileios was discovered near Sparta. This purchase was a vital step forward for both the excavation and protection of the site.

Figure 1. T. Brogan introducing the archaeological site of Mochlos. Photo J. Morrison.

Our third Kaplan grant sponsored a large re-granting program, which offered Greek conservators a unique opportunity to receive start-up funds to develop and apply conservation master plans. The program targeted three types of projects, those that focused on the implementation of approved conservation programs, the preparation of condition surveys and scientific analyses for the development of master plans, and support for emergency rescue or preventive operations at recent excavations. Nine programs received funds in 2015. The Neolithic settlement of Strofilas and the Geometric settlement of Zagora on Andros and the Roman Villa in the National Garden of Athens received grants for the implementation of conservation works. Four more awards for site conservation studies were given to teams working on the Minoan remains at Koumasa, the Minoan villa at Sklavokambos, the Hellenistic site of Palaiopoli on Andros, and the Late Roman remains at Amyklaion near Sparta. Emergency conservation grants were awarded to teams preserving the Minoan houses at Chryssi and the "Roman Baths" in Rafina. A wide range of institutions have benefitted from these awards, including various departments of the Greek Ministry of Culture, the Universities of Athens, Sidney, and Heidelberg, the Department of Conservation of Antiquities and Works of Art of the Technological Educational Institution (TEI) of Athens, and the Archaeological Society of Athens.

The fourth Kaplan grant was awarded to support efforts by the Dept. of Conservation of Antiquities and Works of Art of TEI and the Conservation Directorate of the Ministry of Culture to host a pair of seminars to train or retrain conservators working on sites in Greece. The first three-week seminar took place in July and included one week of lectures and laboratory demonstrations by

Figure 2. D. Faulmann demonstrating past and present approaches to documenting architecture. Photo S. Chlouveraki.

Figure 4. On-the-job training focusing on a Neopalatial street at Mochlos. Photo S. Chlouveraki.

established scholars in the field of architectural conservation at TEI Athens and two weeks of fieldwork at Mochlos. The second seminar is scheduled for April 2016 and will focus on the conservation of mosaics at the Roman Villa at the National Gardens of Athens.

Figure 3. E. Nodarou presenting a lecture on the use of mudbrick in Minoan architecture to the participants of the seminar and the teams excavating Bronze Age Mochlos and Byzantine Loutres-Mochlos. Photo T. Brogan.

This summer, Prof. F. Matero delivered the seminar's opening lecture, which was followed by talks from Prof. P. Theoulakis, Prof. Y. Facorellis, Dr. S. Chlouveraki, Dr. A. Stefanis, and Dr. E. Toumbakari. On-the-job training was organized in collaboration with the INSTAP Study Center and included afternoon lectures, tours, and demonstrations by Prof. J. Soles, Dr. T.M. Brogan (Fig. 1), D. Faulmann (Fig. 2), Dr. J. Morrison, Dr. E. Nodarou (Fig. 3), and C. Kavousanos. A group of 10 trainees, including conservators, conservation students, and architects from several archaeological ephorates of Greece, took advantage of this opportunity to upgrade their qualifications in both theoretical and practical aspects of architectural conservation while participating in the conservation of the Minoan settlement at Mochlos (Fig. 4).

On behalf of all the award winners, seminar participants, and the INSTAP Study Center for East Crete, the authors would like to offer our sincerest thanks to the J.M. Kaplan Fund for stimulating and supporting this new collaborative effort to preserve heritage for future generations.

"Release the Drones!" New Adventures in Aerial Photography and Photogrammetry

Douglas Faulmann

This past summer, a colleague asked me to give her students a presentation on the mapping and drawing of archaeological sites using the latest technology. I was happy to do it, but because I am not an "academic," I was not too excited about standing in front of a screen and "lecturing." I decided to take the students on site and physically demonstrate how I map and draw architecture using the new tools at my disposal.

While preparing for this presentation, however, I realized that in the 25 years that I have been doing this job, the tools and techniques have changed drastically. With this in mind, and with the help of a

few of my Mochlos excavation friends, I dusted off my old equipment, and we set up a "living diorama," demonstrating how archaeological mapping and illustration has progressed through the years.

What does this have to do with the subject of this article? In 2015 INSTAP purchased a DJI Phantom 2+ remote-controlled quadcopter, commonly called a drone (Fig. 1). While unpacking this drone I thought that if anyone had told me 25 years ago that I would be flying one as part of my job I would have had a good laugh. I started mapping using the same techniques that Piet deJong would have used 100 years ago. The equipment I used was a theodolite (a surveying instrument with a telescope for measuring horizontal and vertical angles), a compass, two tape measures, and a plumb bob. One had to have a basic knowledge of trigonometry, good balance, and a steady hand, and that was about it. This technique served me well for many years, until a fellow architect told me that the future would involve a differential Global Positioning System (dGPS). I was already familiar with Electronic Distance Measuring devices (EDMs), which were basically electronic theodolites, but a dGPS?

The dGPS revolutionized the way sites were measured and mapped by using GPS technology to give the architect exact measurements (+/− 1 cm) without having to rely on "line of sight" equipment and measuring tapes for the triangulation of points (for more details on operating a dGPS, see Faulmann and Stamos 2009, "Differential GPS: A New Tool for the Kentro," *Kentro* 12, pp. 1–3). Two or more people are necessary to operate an EDM, whereas the dGPS can be operated by just one person. It has saved countless hours in the field and has streamlined the excavation process as well because the architect no longer needs to spend hours in a trench drawing, therefore keeping the archaeologists from doing their jobs.

That major leap for archaeological kind happened only six years ago in East Crete, and since then archaeologists have lots of new tools, including laser scanners that create three-dimensional images of whatever is being excavated and software such as Agisoft Photoscan and ArcGIS that brings all this technology together to form incredible databases of information.

All of which brings us back again to the subject of this article, and to the latest, and by far the most fun tool in archaeology: the drone. But before I go into details about what the drone brings to this job, allow me to explain a bit of history on aerial photography in archaeology. The first aerial photographs of any kind were taken from a hot air balloon by a French photographer, Gaspard-Félix Tournachon, in 1858. Since then, kites, dirigibles, planes, and even pigeons have been used to create aerial photographs. Most of these techniques are expensive, as is the case with dirigibles using helium, or they need highly trained pilots, such as with airplanes. Because of these factors, it has always been costly and difficult to record archaeological sites from the air. There are well-known stories of the trouble and danger encountered by Wilson and Ellie Myers when they photographed sites on Crete using a dirigible and hydrogen gas!

Those days are thankfully gone. Drones have been around for a few years, but the technology has advanced to a point that even the most inexperienced remote control "pilot" can fly one. The reason for this is something called GPS-assisted flying. This means that the drone uses GPS satellites to both determine its location and stabilize its position even if the pilot is not working the controls. It also helps to control the flight so that maneuvers such as takeoffs and landings are smooth and error free. Our drone even has a feature that automatically returns the machine

Figure 1. Flying the drone at Mesorachi, west of Siteia. Photo K. Hall.

Figure 2. Geo-rectified orthographic photo of Mochlos. Photo D. Faulmann.

to the pilot if the machine has wandered out of contact or if the drone's remote control has been accidentally turned off.

How has the drone come to be such a huge leap in technology for archaeology and especially me, the architect? First there is the obvious: it makes aerial photography easy and inexpensive. The drone is equipped with a high-quality digital camera that is capable of taking high-resolution images, even at 30–50 m above the ground. The camera is controlled by a software application that can be downloaded to any smart phone, which gives one a live video feed of what the camera sees. The pictures are then taken using the photo icon on the app. Videos can also be recorded at high resolution if desired. Because the drone uses GPS to aid in flight, it can also imprint each photo with coordinate data, which is an important and essential tool for the architect who uses the photos to create geo-referenced, orthographic images that can be turned into accurate architectural plans.

This brings me lastly to photogrammetry, a photo processing technique that has been in use for several years in which a group of photos are stitched together to create a three-dimensional image of the subject. The only problem is that—up until recently—it was expensive and required very powerful computers to achieve decent results. Now several affordable software programs are available, and even a good quality laptop computer can run these programs adequately. In order to create more complex images, however, a bigger, more powerful computer is required. That said, photogrammetry is much more affordable now than just a few years ago.

Once a 3-D model is created using Photoscan, the software can then extract the accurate 2-D orthographic image that can be used to create architectural plans. If this process is performed correctly, these plans can be accurate to within 1–2 cm, which means that a lot of the work previously done in the field can now be completed back in the office, leaving the archaeologists more time to excavate without the interruption of the architect working in their trenches and accidentally knocking a few stones of the wall in the process.

Photographing a site with a conventional camera can achieve similar results, but using the drone ensures much more accurate pictures because they are embedded with GPS coordinates. Photoscan uses the coordinates to geo-reference the orthographic photo as well. Furthermore, using a dGPS to take additional measurements, which are even more accurate than the embedded measurements on the photos, assists the software to recalculate the data for an even more precise image. An architectural drawing of an average Minoan house of 80 m^2 that once took weeks to draw, now only takes a few days (Fig. 2).

I could go into much more detail about 3-D photogrammetry and its many uses in archaeology, as well as new uses for the drone, but I would need more space than this article is allowed. Suffice it to say that with all this new technology available, and an easy-to-fly drone at one's disposal, being an architect on an archaeological excavation just got a lot more fun. Looking back on the impressive technological revolutions in archaeology in the last 25 years, I can't wait to see what the next 25 years will have in store!

Training Future Conservators in the W.D.E. Coulson Conservation Laboratory

Kathy Hall

In the summertime, the addition of students and colleagues makes the W.D.E. Coulson Conservation Laboratory a lively and interesting place to work. This summer, five conservators together with four students conserved material from six different excavations. Matina Tzari and I worked with Anna Tsoupra and Zoi Chalatsi, both professional conservators based in Athens. Anna reconstructed many Gournia vessels, and Zoi worked with material from Gournia and Mochlos and completed a starch sampling project. Megan O'Connor, of Parks Canada, came to help with Gournia conservation. She is interested in training conservators,

Figure 1. C. D'Izarny-Gargas reconstructing a pithos from Malia. Photo K. Hall.

and she organized a workshop for the interns that entailed lifting mock-ups of fragile artifacts from an artificial trench.

The laboratory has a well-established internship program, having hosted at least 37 participants over the years, many from the Technological Educational Institution (TEI) of Athens as well as from graduate programs in the USA, UK, Canada, and Australia. The curriculum the interns follow during the academic year is fairly heavy in theory and materials science, so our internship program provides practical real-world experience in archaeological conservation for students or recent graduates. Interns are entirely self-funded and strongly motivated.

This year our conservation interns were Claire D'Izarny-Gargas, who is earning a Master's degree in Conservation Studies at University College London (Qatar), and Paige Schmidt, from the Master's Program in Art Conservation at SUNY Buffalo State. We love to host students with fresh ideas and time to experiment with interesting treatments.

This summer Claire investigated the corroded bezel of a copper-alloy ring from Mochlos. By x-raying the bezel, using the radiograph to guide further cleaning, x-raying the object again, and enhancing the image, she was able to discover an image of a griffin with outstretched wings. Claire also experimented with the laser cleaning of copper alloys at the Institute of Electronic Structure and Laser, which is part of the Foundation for Research and Technology–Hellas (IESL-FORTH) in Herakleion, and she also helped to mend a series of pithoi from Malia (Magasins Dessenne; Fig. 1). Furthermore, Claire gave an interesting informal lab talk on her previous life cleaning wall paintings at Karnak.

Paige investigated different mixtures of adhesives (mostly combinations of Butvar polyvinyl butyral resin and Paraloid resins) for reconstructing archaeological ceramics. She decided to incorporate this topic into her Master's thesis. Paige also performed experiments with time-lapse photography and reconstructing ceramics, and she assisted Matina, Zoi, and Anna in stabilizing an oven on-site at Petras.

Figure 2. A. Fostiropoulou conserving a vessel from Zakros. Photo K. Hall.

Figure 3. A. Gage cleaning a stone vessel fragment from Mochlos. Photo K. Hall.

The lab also hosted Arentona Fostiropoulou on a six-month placement from TEI Athens. She worked on ceramics from Gournia and Petras as well as earthquake-damaged vessels from the Siteia Archaeological Museum (Fig. 2).

We also accept pre-program interns, usually students in archaeology who want to apply to conservation programs (which usually have a prerequisite of some experience in a conservation lab). Professional conservators Kelly Caldwell, Cindy Lee Scott, and Katie Cook all began their conservation careers as pre-program interns in the W.D.E. Coulson Conservation Laboratory. This year, Andrew Gage, a student from Elmira College, and Dane Clark, from Johns Hopkins University, served as our pre-program interns (Fig. 3).

We miss our interns and our conservator colleagues and thank them all for their hard work this summer.

Public Outreach at the Study Center

Eleanor Huffman

The Study Center has developed a comprehensive program to share new discoveries from the Greek past with the wider scholarly community and also the local and foreign lay audience. This past year, our efforts included several talks hosted at the Study Center and the Old *Teleneio* (customs house) in Pacheia Ammos. The lectures included: "Mycenaean Crete: Religion, State Authority, and Royal Symbolism. New Evidence from Crete" by Dr. Athanasia Kanta; "Archaeological Work at Gournia, 2008–2014" by Prof. L. Vance Watrous; "Zakros VI: The Reoccupation of the Minoan Settlement of Kato Zakros after the Destruction at the End of the Late Minoan IB Period" by Michalis Zoitopoulos (who will receive his Ph.D. this winter); and a double lecture included "A Voyage to the Islands: Prehistoric Telos" by Dr. Irene Nikolakopoulou and "Building Beta at Akrotiri, Thera" by Fragoula Georma, Dr. Irene Nikolakopoulou, and Ioannis Bitis.

We also provided tours of the Study Center for 16 Greek elementary and middle schools (Figs. 1, 2), several universities, and the American School of Classical Studies at Athens. For the first time, we gave tours to a middle school class from Herakleion and a group of Russian elementary students who are being educated with the Life School integrated method. The goal of the tours for young students is to teach them the basic tenets of archaeology and to show them the various jobs undertaken by the members of our projects. The students and their teachers are often surprised by the variety of specialists involved in archeological work and the huge amount of material that must be processed. The students then have the opportunity to participate in activities: drawing or coloring on photocopies of vessel illustrations or reconstructions; sorting mock heavy flotation residue for seeds, bones, shells, ceramics, and the like; modeling clay or plasticine based on photos of ancient figurines; and conserving a broken pot. For several of the middle school groups, we also lead tours through the archaeological site of Gournia.

Figure 1. Elementary school students sort mock residue samples in the rear courtyard of the Study Center. Photo E. Huffman

Figure 2. Middle school students show the results of their activities in the rear courtyard of the Study Center. Photo E. Huffman.

Past efforts at outreach include the installation of informative signs placed at several archaeological sites in the area of the Study Center and assistance in translating the labels for the museum displays in Siteia, Ierapetra, and Neapolis. Our next sign projects will focus on the sites of Azoria, Kavousi, and Chryssi.

Congratulations!

In a special ceremony at the Embassy of Greece in Washington, D.C., on Wednesday, June 3rd 2015, Dr. Malcolm Hewitt Wiener was awarded with the Gold Cross of the Order of Honor by the Hellenic Republic for his contribution to the study of Aegean Prehistory. On behalf of the President of the Hellenic Republic, Dr. Wiener was given this honor by the Ambassador of Greece to the United States, Mr. Christos Panagopoulos, who praised his vision and generosity. Dr. Wiener, expressing his gratitude for the recognition, spoke warmly about the importance of studying those first complex societies of the western world, and referred to the quantum leaps made possible by the use of innovative scientific applications.

Dr. Wiener's extensive publications on the Eastern Mediterranean world in the Bronze Age include the emergence, florescence, and collapse of Minoan Crete and Mycenaean Greece; their relationship to the civilizations of the Near East and Egypt; and the chronology of the ancient world via comparisons of radiocarbon, tree-ring, ice-core, and astronomical dates in relation to the ancient texts, inscriptions, and stratigraphy of the artifacts. His recent publications have examined the interaction of human agency including warfare with climate change and pandemics in the collapse of civilizations.

In 1982, he founded the Institute for Aegean Prehistory (INSTAP), one of the largest institutions in the world in this field of research, which continues to fund excavations in the Aegean and fellowships for scholars. Some of Dr. Wiener's awards include honorary doctorates from the University of Sheffield, the Eberhard-Karl University Tübingen, the University of Athens, the University of Cincinnati, University College London, Dickinson College, the University of Arizona, and the Ring of Honor of the German Academy in Mainz.

Dr. M.H. Wiener and Amb. C. Panagopoulos at the Greek embassy in Washington, D.C.

Dr. Wiener was born in Tsingtao, China. He is married to Carolyn Talbot Seely, and they have four children, all present at the ceremony. He is a graduate of Harvard College and the Harvard Law School. He served as an Ensign/Lt. in the United States Navy, as well as an advisor to the U.S. Department of State on the International Convention on Illicit Traffic in Antiquities. He was also the founder and CEO of related investment firms between 1971 and 1987.

Excavation of the Pre- and Protopalatial Cemetery at Petras, Siteia 2015

Metaxia Tsipopoulou

The archaeological sites at Petras occupy two neighboring hills ca. two km to the east of the modern town of Siteia in northeastern Crete. The year 2015 marked the 30th anniversary of archaeological research in the area.

Results include the excavation of two locations: a Minoan palace (1900–1450 B.C.), which housed the best-preserved archive of the Cretan Hieroglyphic script, in a primary deposit, and also Linear A tablets; parts of settlements dated from the Final Neolithic period (3300–3000 B.C.) to Late Minoan IIIC (1200–1100 B.C.); and a cemetery dated to the Middle Byzantine period (11th–13th centuries A.D.). Since 2005, an extensive unplundered cemetery dated to the Pre- and Protopalatial periods (Early Minoan IB–Middle Minoan IIB, 2500–1800 B.C.) has been under excavation.

The monumental complexes at Petras and the changes in the occupation of the various sites between the two hills over time testify to a remarkable historical continuity. The first habitation started on Hill II (or Kephala) where a settlement of Final

Figure 1. The Petras cemetery, from the southwest. Photo M. Tsipopoulou.

Figure 2. House Tomb 2, from the west. Photo Ch. Papanikolopoulos.

Figure 3. House Tombs 4 and 3, from the northeast. Photo Ch. Papanikolopoulos.

Figure 4. Pottery from the Petras cemetery. Photo Ch. Papanikolopoulos.

Neolithic IV and EM I (3300–2650 B.C.) was founded. During EM II, the settlement was moved to Hill I, while on Hill II the cemetery was established. The settlement on Hill I eventually became palatial in character, and it was occupied until 1200 B.C. Following its abandonment, the inhabitants returned to the place of their ancestors to establish a new settlement on the plateau of the ancient cemetery, avoiding—and respecting—the tombs, with a single, significant exception, namely a large megaroid building and its accompanying complex.

The Petras cemetery, one of the largest in Crete in these periods, is comprised of house tombs, each of which occupy up to ca. 80 or 100 m^2 and have up to 10 rooms (Fig. 1). To date, 14 house tombs and a burial rock shelter have been excavated. A particularly interesting feature of the Petras cemetery is the spatial organization that includes corridors between the tombs and two extensive open ceremonial areas, measuring ca. 150 and 300 m^2, respectively.

Each house tomb has a different plan (Figs. 2, 3). The burials are collective, and each tomb probably served an extended family. With very few exceptions, these entombments are secondary burials. Defleshing happened in another area (not yet identified) and, subsequently, some bones were selected (mostly skulls and long bones) and moved into the rooms of the house tombs. Not all rooms have doors, suggesting that in some cases the roofs were opened in order for the bones to be deposited. Many cases of semi-articulated body parts indicate that it was not unusual for bodies to be moved into the house tombs before the defleshing was completed. It is quite probable that the grave goods were offered at the time of the secondary depositions. In all tombs the grave goods are quite rich, and in many cases exceptional works of art have been collected, including items in different classes: decorated pottery (Fig. 4); stone vases of very fine quality; figurines with polychrome (Kamares) decoration; many pieces of jewelry made of gold, silver, bronze, and semi-precious

Figure 5. Stone vases, gold jewelry, bronze tweezers and razor, and seals from the Petras cemetery. Photo Ch. Papanikolopoulos.

Figure 6. Larnax from House Tomb 2. Photo Y. Papadatos.

Figure 7. Clay wine-press used as a burial container, House Tomb 3. Photo M. Tsipopoulou.

Figure 8. Human remains in House Tomb 3. Photo M. Tsipopoulou.

stones; bronze implements for personal adornment; as well as an impressive number of seals made of hippopotamus ivory and hard stones, such as carnelian and jasper, many of them with hieroglyphic inscriptions (Fig. 5). The tombs also contained three larnakes (Fig. 6), a burial pithos, and a large wine-press also used as a burial container (Fig. 7). The quantity of the skeletal remains is impressive. Its study is already producing very important results (Fig. 8).

The two ceremonial areas (Figs. 9, 10) contained a plethora of ceramic finds: cult vessels of various types, almost all with painted decoration and many with plastic decoration depicting plants, animals, and human forms, as well as vases for serving and consuming food and drink in a variety of types, including lamps, suggesting that there were nocturnal ceremonies as well. Offerings in these areas were ritually broken after their use, and often the fragments were scattered.

It is very interesting to note that in the LM IIIC period (12th century B.C.), a large rectangular megaroid building was

Figure 9. Ceremonial Area 1, from the northeast. Photo Ch. Papanikolopoulos.

constructed partially on top of the earlier (MM IB, ca. 2000 B.C.) House Tomb 1. For its construction, many ashlar blocks were used, especially on the west side facing Hill I where the settlement and the palace were situated. These blocks were transported from the palace or some important houses of the settlement and reused (Fig. 11). The Rectangular Megaroid Building was connected to a complex comprised of a square platform and peribolos wall to the east and a retaining wall to the west and north. The use of this complex was probably ritual even though no concrete evidence about its use came to light. Near the entrance of the rectangular building a large pit was excavated (partially on top of House Tomb 5), and it was found to be full of LM IIIC pottery, especially serving and drinking vessels. Another similar pit, with the same type of pottery and a very large amount of shells, was excavated to the northeast of the Rectangular Megaroid Building. In the area between the building and the platform, two open-air cooking installations were excavated: a hearth and an oven.

Figure 10. Ceremonial Area 2, from the south. Photo Ch. Papanikolopoulos.

The 10th excavation campaign at the Pre- and Protopalatial cemetery of Petras was held from July 13th to August 12th, 2015, under the direction of the author and funded by the Institute for Aegean Prehistory. The season produced important new finds. Two new Protopalatial house tombs were identified at the northern part of the cemetery and partially excavated (MM II, 1900–1800 B.C.), each comprising several rooms (Fig. 12). An EM II (2400–2200 B.C.) house tomb was also uncovered and found to be preserved in a fragmentary state. This is probably the earliest tomb, and it was excavated in the southern part of the cemetery. All of the newly excavated tombs contained secondary burials. Grave goods included gold bands and jewelry and seals made of hippopotamus ivory, carnelian, rock crystal, and hard limestone. Several of the seals are carved with hieroglyphic inscriptions. We also discovered a unique bronze or silver signet ring.

Figure 11. Late Minoan III Rectangular Megaroid Building and MM I House Tomb 1, from the west. Photo Ch. Papanikolopoulos.

Figure 12. House Tombs 7 and 8 and part of Ceremonial Area 2, from the east. Photo Ch. Papanikolopoulos.

Furthermore, the excavation of EM III/MM IA (2200–2050 B.C.) House Tomb 3, which started in 2013, was almost completed. The process was very slow because of the large quantity of skeletal material. Grave goods included a gold band, some pottery, and a small duck made of bone, probably a pin head imported from somewhere in the eastern Mediterranean region.

This year the excavation of another significant area within the cemetery was completed, namely the Protopalatial Ceremonial Area 2 at the northern part of the cemetery (ca. 300 m^2). It produced more important finds such as vases with plastic decoration and parts of figurines. An unexpected new discovery in the

Figure 13. Stratigraphical trench in the Rectangular Megaroid Building, from the northwest. Photo M. Tsipopoulou.

area was EM IIB pottery (including Vasiliki Ware) in cavities of the bedrock, indicating a very early occupation of this space that was probably nonfunerary in character.

Also, stratigraphical trenches were dug into the LM IIIC Rectangular Megaroid Building in an attempt to define its relationship with the MM IB House Tomb 1. Part of the original LM IIIC paved floor was cleaned, and very well-constructed column bases came to light (Fig. 13). To the same Late Bronze Age period belonged parts of two large buildings at the southernmost and northernmost areas of the cemetery, the latter being a storage area containing four or five pithoi (Fig. 14). For the construction of these buildings, ashlar blocks were transported from the palace, or other important buildings of the settlement on Hill I were used.

The Petras cemetery is studied by an international interdisciplinary group of scholars (Fig. 15), including: Philip Betancourt and Miriam Clinton (architecture); Heidi Dierckx (stone tools); Philip Betancourt, Susan Ferrence, and James Muhly (metal objects and jewelry); Alessandra Giumlia-Mair (XRF analyses of metals); Valassia Issakidou (animal bones); Olga Krzyszkowska (seals); Evi Margaritis (palaeobotany); Eleni Nodarou (petrographic analyses of pottery); Maria Relaki and Christina Tsoraki (stone vases); David Rupp (LM IIIC Rectangular Megaroid Building and accompanying complex); Anna Simandiraki-Grimshaw (figurines and plastic vases); Tatiana Theodoropoulou (shells); Sevi Triantaphyllou, Ria Kiorpe, and Effie Nikita (skeletal human remains); and Metaxia Tsipopoulou (project director and pottery specialist).

In February 2015, the Second International Petras Symposium was organized in Athens, entitled "The Petras Cemetery in Context," with the participation of all the above researchers and also of other scholars who excavate and/or study material of the same periods in East Crete, especially with a focus on funerary culture (Fig. 16). These included Tom Brogan (metal disks, possible balance pans from the Petras cemetery), Gerald Cadogan (Myrtos-Pyrgos),

Figure 14. LM IIIC storage area with pithoi, from the northwest. Photo M. Tsipopoulou.

Figure 15. The 2015 Petras excavation team. Photo G. Kostopoulou.

Figure 16. The participants at the Second International Petras Symposium, Athens, February 2015. Photo D. Rupp.

Carl Knappett (East Cretan networks in the Middle Bronze Age), Yiannis Papadatos (mortuary practices, cultural diversity, and social organization in Prepalatial East Crete), Lefteris Platon and Maria Tsiboukaki (Zakros), Ilse Schoep (Sissi), and Giorgos Vavouranakis (ritual areas in cemeteries in East Crete).

For the Petras bibliography in general see: www.petras-excavations.gr/en/home/bibliography.

Gournia 2015: Progress toward Publication

L. Vance Watrous

During June and July of 2015, some 30 members of the Gournia Excavation Project worked at the INSTAP Study Center for East Crete, preparing their various areas of the site and archaeological materials for publication. A summary of our work and results follows.

Architectural work on site included: refining the new plan of the settlement, creating architectural phase maps of all blocks, finishing the masonry map of the site, and producing a digital model of the site's architecture. Based on masonry style, certain walls at Gournia can probably be dated to the Protopalatial period, including the north and east walls of a Middle Minoan II palace (Fig. 1, shown in green). Study of the botanical material and the dense scatters of conical cups from the Central Court indicates that people gathered there to eat and drink. Work in the area of the Metal Workshop produced secure Late Minoan IA and LM IB dates for the furnace's operation and a final LM IA date for the destruction of the furnace and associated rooms. Over 150 fragments of crucibles, molds, and metal have been identified. Use of the area continued into the LM IIIA and IIIB periods.

In the area of the palace, extensive restudy of the associated pottery allowed us to date several important constructions in and under the Neopalatial palace: the large diagonal retaining wall, cobbled court, pebble stratum, and "Room A" now all can be dated securely to early Protopalatial (MM IB). In the area of the Kiln Complex and House Aa, inventoried pottery was selected for publication. Pottery deposits were studied, re-dated, and interpreted. The stratigraphic matrices for the 11 kilns were completed: they date to LM IA (Fig. 2). House Aa, whose final floor dates to MM IIB, produced a potter's wheel, indicating the resident there produced pottery in the MM II period.

Metallurgical and other studies were carried out in 2015 as well. Seventy new crucible or mold fragments were accessioned and cataloged, and 249 uncatalogued metallurgical fragments (127 molds and 84 crucibles) were entered into a database. A typology of molds and crucibles was created. Half of the Gournia loomweights and spindle whorls were measured and cataloged this year. All soil samples from 2010–2014 have now been floated, and residue from the palace area has now been sorted. The processing, identifying, cataloging, and databasing of the 2014 faunal material is complete. All of the Gournia faunal remains recovered from 2010–2014 are now cataloged and entered into a database.

Archaeobotanical work focused on the sorting and identification of 477 samples. In addition, work on the residues was also done, dividing all the organic remains found into different

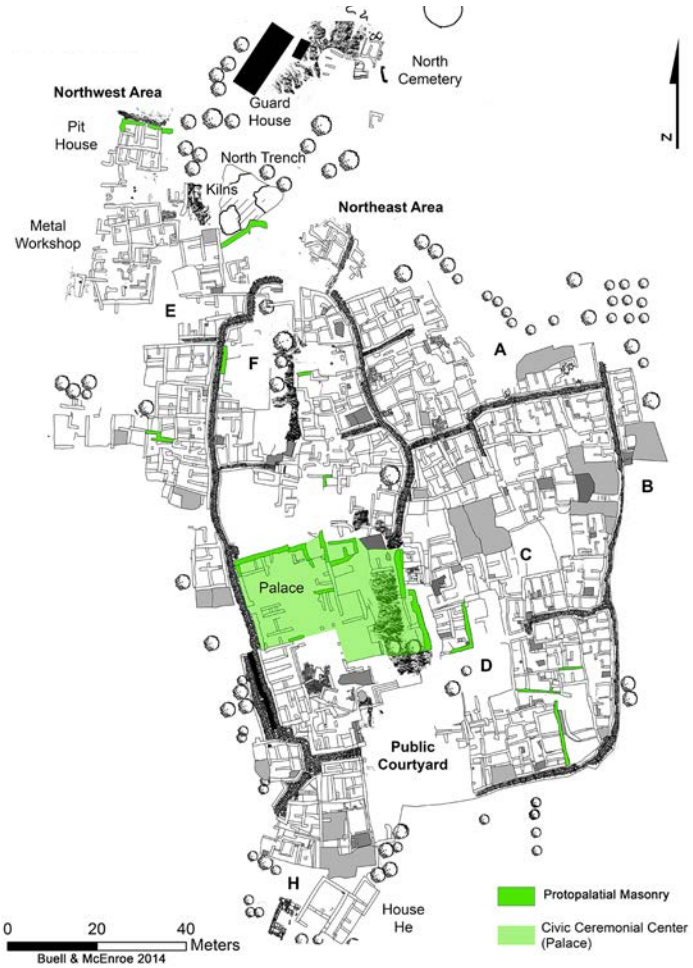

Figure 1. Plan of the town of Gournia showing Protopalatial architecture in green. Plan J. McEnroe and D.M. Buell.

Figure 2. Late Minoan I pottery kilns, looking south. Photo J. Spiller.

categories. The southwest wing of the palace revealed olives and almonds, while cereals were recovered at the palace court; the central wing of the palace again produced fruit remains such as olives, figs, and grapes.

In recent years, we have seen the publication of our project in "The Harbor Complex at Gournia," *AJA* 116 (2012), pp. 521–542, and in the May/June 2015 issue of *Archaeology* magazine ("The Minoans of Crete" by J. Lobell, pp. 28–35). Our preliminary report, "Excavations at Gournia, 2010–2012," has just appeared in *Hesperia* 84 (2015), pp. 397–465. A report on the MM II palace—titled "Where Was the Protopalatial Palace at Gournia?"—was presented by D. Matthew Buell and John McEnroe at the 116th Annual Meeting of the Archaeological Institute of America, which was held January 8–11, 2015, in New Orleans, LA. With the advice of Stefie Chlouveraki and Klio Zervaki (24th Ephorate), we have set in place a two-year plan for the conservation of the site.

The Friends of the INSTAP Study Center for East Crete Need Donations for the 2016 Seager Fellowship

The Richard Seager Doctoral Fellowship was established in 2009 with the goal of enabling candidates to use the facilities of the INSTAP Study Center to bring recipients' dissertations closer to completion. Since then, seven awards have been granted, including two in 2015, resulting in numerous articles and three finished dissertations. With your help we can reach our goal of $4,000 and provide this fellowship to a qualified applicant for 2016. If you would like to help fund the 2016 fellowship, please send a check to the attention of Elizabeth Shank and payable to the INSTAP Study Center for East Crete at our Philadelphia office (see p. 28). Please write "Seager Fellowship" in the memo portion of your check. If you would like to make a donation in Euros through direct deposit, please contact Eleanor Huffman (eleanorhuffman@instapstudycenter.net).

View of the island of Pseira, looking northwest, in December of 2011. Photo J. Morrison.

Petrographic Analysis of Late Bronze Age Ceramics from Block Nu at Malia, East Crete

Florence Liard

As the recipient of the 2013 Richard Seager Fellowship, I had the opportunity to spend three months at the W.A. McDonald Laboratory of Petrography at the INSTAP Study Center for East Crete while working on a petrographic study of Late Bronze Age ceramics from Malia, in northeast Crete. During my research time, I was able to complete the analytical chapters of my Ph.D. dissertation, *Pottery Production and Consumption Practices in the Plain of Malia during the Final Palatial and Postpalatial Periods of the Late Bronze Age (1450–1200 BC)*. I submitted my text in January 2015 and successfully defended my Ph.D. on April 1st of the same year at the Université Catholique de Louvain, Belgium. I am currently a Ph.D. researcher at the National Fund for Scientific Research and the Université Catholique de Louvain, Belgium (2011–2015).

Archaeological Context under Study

After the destruction of its centralized palatial organization at the end of the Neopalatial period, the Bronze Age site of Malia was far from vanishing. Excavations at Block Nu were conducted by the French School in Athens between 1988 and 1993, and they revealed traces of domestic occupation that extends from the Protopalatial, if not earlier, to the end of the Postpalatial period (Driessen 2010, with references). Block Nu thus provided me with the opportunity to examine the typological, stylistic, and technological characteristics of a specific pottery assemblage from the Final Palatial and Postpalatial periods of the Late Bronze Age, a time when Cretan communities endured a series of unprecedented disruptions in their social organization, administrative system, cultural references, and trade networks that opened the way to the formation of the Greek Early Iron Age (EIA) (Driessen and Farnoux 2000; see also Langohr 2009, 11–36).

The potential of this site for studying networks of influences and trade is reinforced by the fact that it is strategically located near the crossroads of important maritime and land routes connecting East Crete, North-Central Crete, and possibly other settlements of the Aegean region (Driessen 2009). The diversity in fabric categories, typological shapes, and decorative styles of the ceramics is particularly outstanding and raises important questions concerning pottery production and consumption practices at Malia after Late Minoan (LM) IB.

In several areas of the habitation, closed deposits contained fragments of fine diagnostic pottery of LM IB to LM II–IIIA:2 (early) phases (Farnoux 1997). Some of the deposits also included fragments of coarse domestic vessels, which gave an insight into the characteristics of plain utilitarian wares of this period. In total, ca. 250 sherds are dated from this period.

Throughout two main Postpalatial phases of occupation, namely LM IIIA:2/B and LM IIIB, Block Nu developed into a large building complex with three aisles organized around the sides of a pebble-paved court before it was finally destroyed at the end of LM IIIB (Driessen 2010). Some 300 items of Postpalatial pottery have been discovered in the habitation and restored, and more than 8,000 fragmentary vessels came from three pits bordering the habitation zone (Driessen and Farnoux 1994; Driessen, Farnoux, and Langohr 2008).

General Methodology and Analytical Results

My petrographic sampling of the ceramics followed a detailed macroscopic analysis of the assemblages. It is representative of the typological functions, surface treatments, and decorative patterns in each fabric group. Sixty Final Palatial samples and 113 Postpalatial samples were selected for study. Thin sections were manufactured at the Fitch Laboratory of the British School at Athens and were examined under a LEICA DMLP polarizing microscope at the INSTAP Study Center in Fall 2013.

The analysis identified 15 fabric groups according to their mineral composition, textural characteristics, and microstructure. The distinction between imported and non-imported products was made after comparison with the mineral composition and textural characteristics of geological materials collected in the region of Malia—that is, in the alluvial basin of Sissi, in the surroundings of the Bronze Age settlement at Malia, and in the clay-rich formations of Chersonissos-Abelia, located 7 km to the west of Malia. As a result, two coarse red fabrics and their semi-fine variations are identified as local productions using the clay resources in the alluvial basin of Sissi; one coarse fabric is made of calcareous clays from Chersonissos-Abelia and is considered a Maliote production. In the current state of research, 10 fabric groups are classified as imports; while most of these

are assumed to come from various regions of Crete, two fabric groups might be from the Mycenaean mainland.

Discussion of Some Analytical Results

The comparative research I carried out on the petrographic collections housed at the INSTAP Study Center for East Crete was twofold: (1) I wanted to discuss in detail the provenance of various imported groups at Malia; (2) I had to investigate the question of similarities in the technology of manufacture of local and imported groups, respectively, thereby exploring the possibility of technological affinities among potters' communities from various regions of the island at the end of the Late Bronze Age (LBA).

I conducted petrographic comparisons with various collections from East Crete, North-Central Crete, and northwestern Crete. I benefitted from the helpful advice of Dr. Eleni Nodarou on my petrographic observations as well as from the excellent library resources at the center. Results from this comparative work emphasize some distinctive patterns in the pottery production activity and exchange networks at Malia during the Final Palatial and Postpalatial periods.

Trade Networks

The most clear-cut pattern concerns imports from East Crete at Malia. These are reported from various production sites during the Final Palatial and Postpalatial periods, respectively. Imports from the Gulf of Mirabello, particularly storage jars, stirrup jars, and amphorae, prove to be more popular at Malia during the Neopalatial and Final Palatial periods; a very small number of samples are reported among Postpalatial contexts but they could be holdovers. Three fabric subgroups have been established with reference to the collections held at the INSTAP Study Center, and they might correspond to various workshops distributed throughout the northern part of the Isthmus of Ierapetra (Nodarou and Moody 2014). During the Postpalatial period, transport and storage jars were imported from Mochlos, and supposedly from the broader area of Palaikastro.

In several other cases, petrographic analysis has been less conclusive regarding the provenance of the vessels. A coarse red fabric with quartzite, muscovite-micaschist inclusions, and white mica laths is distinctive among the Final Palatial and Postpalatial assemblages; its clay is slightly fossiliferous and ranges from optically inactive to moderately active in cross-polarized light (XPL, x25). A calcareous, highly fossiliferous counterpart is also identified and is related to the previous one in terms of the mineralogy of its non-plastics. While in the first case the coarse inclusions may naturally occur in the red alluvial clay, in the calcareous fabric the distribution of the silicoclastic fragments (particularly the micaschists) leave no doubt as to their intentional addition to the clay base. Convincing similarities have been found with red as well as calcareous clay-rich sediments collected in the region of Chania (Moody 1987, 5–11, 177–178; Nodarou 2011a, 24–25). Further comparative work undertaken at the INSTAP Study Center reveals that both fabrics also coexist among ceramic vessels and wasters sampled on the site of Chamalevri, in northwestern Crete, where pottery production activity is recognized after LM IB (Nodarou 2011b). The same situation is encountered at LBA/EIA Knossos where these fabrics are identified as possible imports from the Cyclades (Boileau and Whitley 2010, groups 4 and 7, 233–235), but more recent evidence obtained from ceramic assemblages neighboring Mount Juktas indicates the occurrence of such mineralogies in this region, too (pers. obs.). Lastly, one should note that while Late Minoan III stirrup jars in the same red ware have been discovered in various regions of the Mediterranean and are identified as Chaniote products (Day 2011, group 1, 42–44), calcareous counterparts might have various provenances, namely from western and Central Crete (Day 2011, group 4, 46–48).

Two coarse fabric groups and their fine variations have been characterized as Pediada products, and they appear mostly during the Postpalatial period. More analytical work is necessary to define whether they may be more specifically identified as productions from the Messara. Based on the current state of research, I will show that several compositional characteristics of these fabrics as well as the paste preparation techniques—that is, sieving of a calcareous base clay and tempering with coarse alluvial sand—match descriptions published for Pre- and Neopalatial assemblages from the Messara (see Wilson and Day 1994; Buxeda, Kilikoglou, and Day 2001; Belfiore et al. 2007). The extent of these petrographic features, raw material selection, and technical practices among pottery assemblages from Central Crete and throughout the island remains to be clarified, however, and a detailed analysis of the temper mineralogy will no doubt contribute to refining the provenance ascription of the ceramics at interregional as well as micro-regional scales in future work.

Local Pottery Production Activity

Through my comparative work with various thin section collections of Cretan ceramic materials, I was able to define some Maliote specificities in the use of red clays for pottery production during the end of the Late Bronze Age.

The use of a calc/mica-rich material to enhance the plasticity of a red alluvial clay with silicoclastic inclusions (i.e., quartzite, biotite/muscovite-schist; Fig. 1) proved to be a Maliote specificity, whereas the use of a calcareous plastic sediment as a tempering medium was most popular in Bronze Age Crete as well as among more modern-day traditional potters' communities (Blitzer 1984; Day 2004). Experimental tests undertaken on the collected geological material indicate that this calc/mica-rich material must have been obtained by crushing and then hydrating a phyllitic rock that crops out in the heights of the Anavlochos

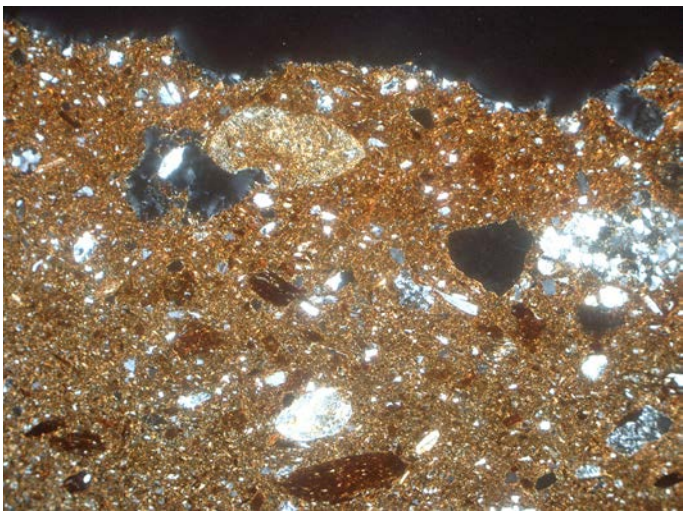

Figure 1. Coarse red fabric with calc/mica-rich clay pellets, quartzite, and biotite/muscovite-schist inclusions (sample no. FPM/38, XPL; field of view 4.4 mm). Photo F. Liard.

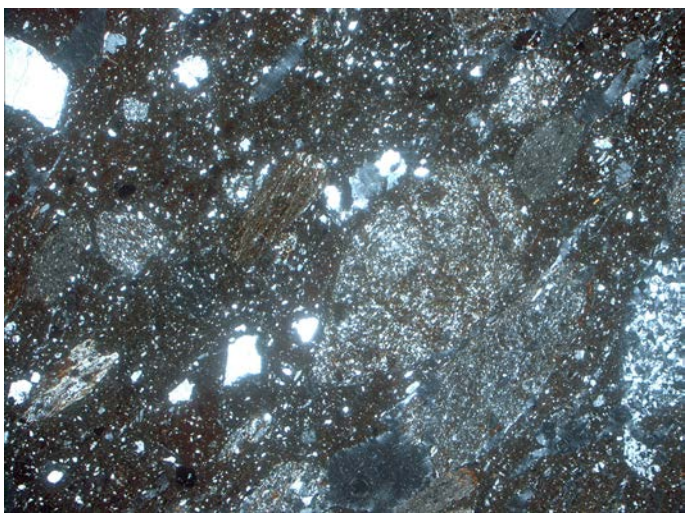

Figure 2. Coarse red fabric with phyllite alluviums (sample no. PPM/Nu36, XPL; field of view 4.4 mm). Photo F. Liard.

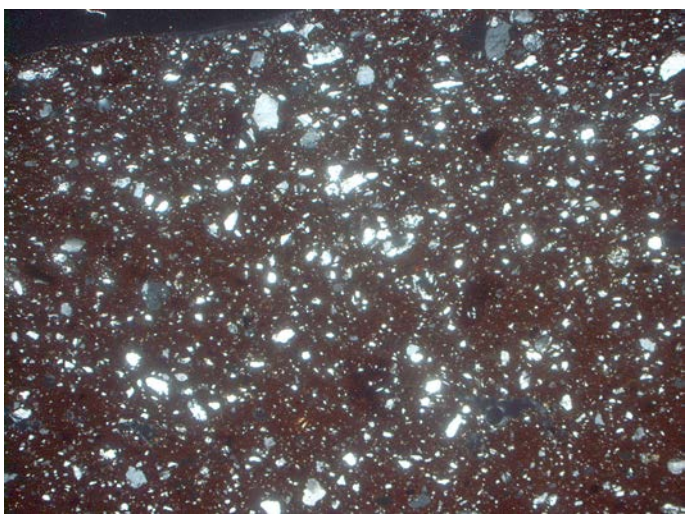

Figure 3. Red fabric with alluvial-rich sand (sample no. FPM/56, XPL; field of view 4.4 mm). Photo F. Liard.

hill, directly southeast of Sissi. The red clay was extracted from alluvial terraces in the basin of Sissi. This fabric was intended for domestic wares such as storage jars and cooking assemblages throughout the period under study, and the reproduction of this tempering practice at Malia most probably goes back to the Middle Bronze Age (pers. obs. after Poursat and Knappett 2005).

Another coarse red fabric is made of a Sissi red alluvial clay that has been refined and tempered with coarse phyllite alluviums (Fig. 2). It is rather rare, and it is only encountered during the Postpalatial period at Malia Block Nu. Details of texture as well as mineralogy indicate that raw material selections as well as processing methods of the clay are slightly different from the red fabric presented above. It replicates a paste preparation recipe as well as ceramic typologies—stirrup jars and storage jars—that are identified at Mochlos, in East Crete, after the LM IB period (Nodarou 2010, 5–6, fabric 1a). This practice follows or is concomitant with an import activity of finished products in coarse red fabric from the area of Mochlos, thereby suggesting the introduction of a manufacturing tradition at Malia through regular contacts between both communities.

The use of an alluvial red clay with mature silicate-rich sand (of probable marine origin) is reported in the region of Malia for the production of a range of drinking cups (Fig. 3). This practice is encountered elsewhere in northeastern and eastern Crete at the end of the Bronze Age (see Day 1995; Nodarou 2007, 80; 2010, 11, fabric 10) but also at Malia during the Middle Bronze Age (Poursat and Knappett 2005, 17–18, fabric C1). On petrographic grounds, it remains very difficult to define which samples are imported and which samples are local to Malia due to the lack of aplastic components that are diagnostic in terms of provenance. The occurrence and textural characteristics of red clay pellets in the ceramic fabrics might be more helpful in this respect, but this hypothesis has to be further investigated through chemical analysis of the ceramic sherds and clays.

Conclusions

My comparative analysis carried out at the INSTAP Study Center formed an important part of my doctoral research. The Richard Seager Fellowship enabled me to explore further the provenance ascription of Late Bronze Age ceramics at Malia and its methodological limitations. My time at the center helped to foster my awareness of local specificities in pottery technology at Malia as well as the apparent complexity that arises from mineral and textural similarities among ceramic pastes produced in various regions of Crete. Both of these phenomena suggest that some regular contact, learning, and technological transfer existed among various potters' communities throughout the island, and these communities seemed to coexist with the persistence of specific technological practices at the local scale. This supports the idea of various levels of socio-cultural interaction that is also emphasized in the typo-stylistic analysis of the material culture

in post–LM IB Crete. It allows one to reappraise this question from a new perspective, focusing on the production of a material support for the expression of a culture, rather than on the aesthetic standards themselves.

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Stratigraphic Excavations at Azoria in 2015

Donald C. Haggis and Margaret S. Mook

One of the most perplexing problems that we face at Azoria is understanding the Early Iron Age (EIA) history of the site—that is, the nature of occupation and activity between the abandonment of the Late Minoan (LM) IIIC settlement until the establishment of the Archaic city at the end of the 7th century. Excavations over the past two seasons have sought to answer basic questions of the form, extent, and chronology of Early Iron Age settlement. Our goal is to understand the development of the site in periods leading up to the Archaic urban transition.

The startling discovery of the Protoarchaic Building (EIA–Orientalizing Building) on the southwest slope in 2006, and its recent excavation in 2013 and 2014, presented us with stratigraphic and functional problems (Fig. 1). First, the building appears to be a free-standing structure of 8th- and 7th-century date—occupation phases span over a century of use—incorporating and oriented to the LM IIIC–Protogeometric (PG) tholos tomb. Juxtaposed to the tomb is a large hall with a central hearth with associated debris and dump deposits suggesting large-scale drinking, dining, and hearth-pyre sacrifices (Fig. 1). Other rooms in the building were clearly devoted to food processing and ceramic production. The building is thus not domestic in character, and while it may form part of a larger complex, we have no evidence of a contiguous settlement of houses. Protogeometric and Geometric pottery is found in the building and elsewhere on the site—within Archaic foundation deposits and recycled into 6th-century use contexts—but we have yet to recover a continuous stratified sequence of PG–Late Geometric (LG) occupation that characterizes the development of the contemporary settlement of the Kastro (located on the peak to the south of Azoria). Although we acknowledge that this settlement gap might be a condition of rebuilding in both LG and earlier 7th-century phases, recent excavation is demonstrating recurring stratigraphic patterns that may relate to how the site was used in the Early Iron Age.

Thus, we began our work in 2015 with the hypothesis of an Early Iron Age gap in occupation—the abandonment of the site as a settlement in LM IIIC, but with continued use of the location as a cemetery as evinced by the tholos tomb in trench B3700, which has distinct LM IIIC and PG use phases (Figs. 1, 2). We could also reconstruct a return to the site by the latter part of the 8th century, but the character and function of this rebuilding phase remained a problem. In efforts to explore these stratigraphic discontinuities and the early history of the site, we returned to two areas that might provide answers: the upper west slope of the peak, in the area of the LM IIIC bench sanctuary, and the lower southwest slope in the area of the Protoarchaic building and the LM IIIC–PG tholos tomb.

B5000: Late Minoan IIIC Wall

In 2015, we expanded excavation in trench B5000, a location immediately south and east of the LM IIIC–PG tholos tomb (Fig. 2). We had just begun to expose a large LM IIIC wall in this trench in 2014. In 2015, we targeted the area of an Archaic street between spine walls. In the sounding, we penetrated the late 7th-century street packing and cobble fill, exposing the full extent of the LM IIIC wall, which is preserved to about 5.0 m

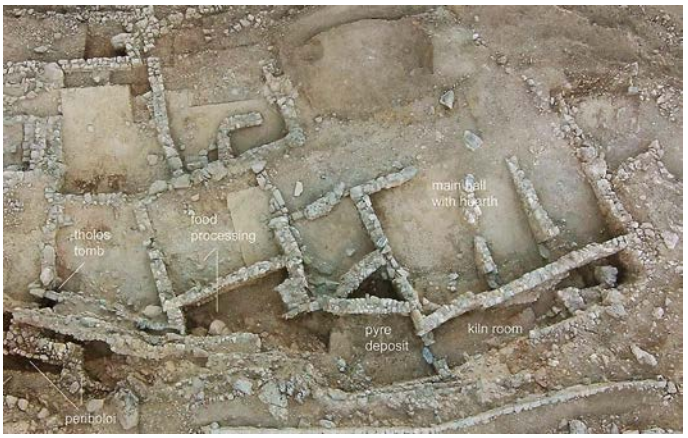

Figure 1. Aerial view of the Protoarchaic Building (EIA–Orientalizing Building). Photo D. Faulmann.

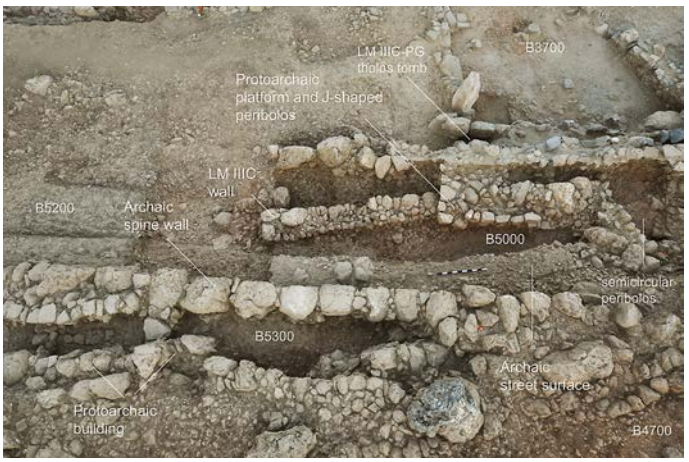

Figure 2. Aerial view of southwest terraces (B5000, B5300). Photo D. Haggis.

in length. A floor surface is well preserved along the east side of the wall, and a layer of occupation debris along the west side produced, among other finds, a fragmentary terracotta plaque, an object normally associated with LM IIIC bench sanctuaries (Fig. 3). Similar to the construction in the LM IIIC building in trench B800, the wall is made of large dolomite boulders in its foundations and second course, with smaller field stones used in the upper extant courses. The south end of the wall has no corner or return to the east to contain the floor surface, but two boulders projecting to the west at the wall's southern end could indicate a room on the west side.

Figure 3. Late Minoan IIIC plaque (15-0407) from Locus B5318.9. Photo Ch. Papanikolopoulos.

It appears that the construction of the Archaic spine wall and cobble fill layer may have disturbed the wall's southern end and largely obliterated a surface to the west. Furthermore, two displaced boulders, roughly in line with the wall, were discovered a little beyond the southern end, suggesting a continuation of the wall to the south where the construction of the Archaic street and the lower spine wall may have destroyed this and other LM IIIC buildings.

Given that a floor surface is preserved along the full extent of the east side of the LM IIIC wall, we can say that a room or rooms were clearly associated with the construction, and that it continued farther to the south where the sherd material is LM IIIC but the wall is no longer extant. The wall's northern end appears to have been constructed to abut the outer southeastern corner of the LM IIIC–PG tholos tomb. That is, as preserved, the wall seems to stop at the tomb's southern side, which has a regular built facade about five courses high that forms the south face of a wide rectangular platform on which sits a J-shaped peribolos recovered in 2014 (Fig. 2). The platform is an early 7th-century construction built over the LM IIIC wall and directly above the tholos tomb, using the wall as part of its foundations.

The LM IIIC wall would have originally extended up to and behind the tholos tomb along its east side. The later platform obscures the wall at its northern end, where it terminates in another curved feature—a semicircular enclosure or peribolos about 1.5 m wide, formed from a shallow two-course high row of dolomite fieldstones (Fig. 2). As in the case of the J-shaped feature, this semicircular construction had no identifiable associated surface. Below the rocky fill supporting the semicircular peribolos there was a well-preserved LM IIIC floor surface with a large fragment of an LM IIIC krater (Fig. 4). The krater

Figure 4. Late Minoan IIIC krater (15-0184) from Locus B5013. Photos Ch. Papanikolopoulos.

Figure 5. Late Minoan IIIC dipped cup or deep bowl (15-0306) from Locus B4702.3. Photos Ch. Papanikolopoulos.

is decorated with multiple loops pendant from the rim band, a central cross-hatched panel, and a horizontal loop with filling ornaments preserved to the right of the panel. Upslope and to the east, in trench B4700, another patch of LM IIIC floor yielded a well-preserved cup or deep bowl (Fig. 5) and provides additional evidence for other rooms to the east along this terrace.

B5300 and B5200: Protoarchaic Building

Excavation east of the spine wall in trenches B5300 and B5200 exposed parts of two rooms, which appear to have been truncated by the Archaic spine wall and street construction (Figs. 2, 6). The rooms thus seem to form part of the same building, perhaps originally extending to the west as far as the east wall of trench B3700, and thus originally overlying the long LM IIIC wall in trench B5000. The east walls of this structure are well constructed and preserved across both rooms—they are some three courses high and use large dolomite boulders in the construction. The north room is about 5.0 m long (north–south). The south room (B5200) has a possible subdividing cross-wall situated about 2.0 m from the northern end. Only about a meter wide strip of floor surface is preserved across both rooms because the Archaic spine wall on the west was later bedded into these spaces, truncating the rooms and obscuring their function and topography.

The pottery associated with these surfaces dates to the 8th and early 7th centuries, suggesting activities connected with the Protoarchaic Building to the northwest, and with the J-shaped and

Figure 6. Aerial view of southwest terraces (B5200, B5300). Photo D. Haggis.

Figure 7. Aerial view of sondages in B3400 and B5500. Photo D. Haggis.

Figure 8. Aerial view of north end of the Communal Dining Building (B3300, B3400). Photo D. Haggis.

semicircular constructions and platform that were built over the tholos tomb, mentioned above. It is possible that these early rooms represent the eastern edge of a 7th-century building that extended to the west, directly over the LM IIIC wall. Perhaps this 7th-century building was bordered on the west by a poorly preserved boulder wall that forms the east wall of the Protoarchaic Building.

B5500: Sondage under an Archaic Room and Street on the Southwest Terrace

Along the edge of the southwest slope, we followed an Archaic street and the west wall (B3526-B5505) of an Archaic house (Fig. 7). Excavation in 2015 exposed the west wall of the Archaic room, B3400, establishing the full extent of the space in the 6th century—two post bases are symmetrically centered in the room and supported a roughly equidimensional 3.20–3.50 m span from both east and west walls to the central posts. Within the room, soundings were excavated against the faces of the west (B5505) and north walls (B3203), revealing an earlier occupation surface lying 0.30–0.50 m below the level of the Archaic floor. In the northwest corner of this space, the sounding also exposed a short segment of an earlier wall that was constructed with this surface—it is preserved to 1.50 m in length and angles to the southwest, extending from underneath the line of wall B3203. This short segment is most likely a continuation of the eastern part of B3203, which uses similar construction techniques. These soundings indicate the existence of an earlier 8th–7th-century building underlying the hall in trench B3400.

Another early wall (B5506) was discovered at the northern end of trench B5500, on the west side of the west wall of B3400 (B3526-B5505), running at an angle to the southwest—in line with the early phases of wall B3203 (Fig. 7). The north end of the west wall of B3400 was built on top of wall B5506, which is bedded about 1.0 m below the level of the Archaic street, and nearly 2.0 m below the level of the Archaic floor surface of B3400. The wall stands four courses high (large dolomite boulders) and seems to form a corner—a right angle—with a single roughly dressed dolomite block that should be part of a long boulder-wall exposed to the north in trench B5700 (B5704) and running along the western edge of the contour. In the space between wall B5506 and wall B5704, we exposed a narrow patch of floor underlying the fill and street packing.

A3300 and A3400: Early-phase Constructions under the Communal Dining Building

In 2015 we excavated five rooms of the Archaic Communal Dining Building, on the lower terraces of the west slope below the peak. The rooms form a series of kitchens and dining rooms structured in interconnected rows along two terraces. The northernmost kitchen of the complex, A3300, was built into an earlier structure (Fig. 8). In the northeast corner of the trench, north of the Archaic room's north wall, we exposed an earlier (late 8th–early 7th c.) wall and clay floor. The Archaic room had incorporated part of the earlier room's east wall, but its north wall cuts into the earlier floor and abuts the earlier eastern wall. The

Figure 9. Protogeometric B krater (15-0202) from Locus A3312. Photo Ch. Papanikolopoulos.

Figure 10. M. Tzari mending Protogeometric B krater (15-0202). Photo M. Mook.

Figure 11. Early Protoarchaic monochrome cup (15-0215) from Locus A3312. Photo Ch. Papanikolopoulos.

space of this Protoarchaic room is preserved only about 1.0–1.5 m wide, and its north wall has one face constructed of dolomite cobbles and small boulders. It forms a distinctive curve on the north and northeast as it conforms to the bedrock outcrop that projects behind it and along the east side of the adjacent LM IIIC bench sanctuary (D600). Among the contents of this space, there was a Protogeometric B (PGB) krater (Figs. 9, 10) and a nearly complete, low-necked, monochrome cup dated to Early Protoarchaic (Fig. 11). Unusually, this bell krater had stirrup handles, and while it has both the rim profile and interior spatter decoration typical of PGB kraters, the exterior, although worn, is decorated on one side with a panel pattern framing antithetic stylized bees or bee-lotus motifs, with dotted wings, that anticipate those decorations of the 7th century.

On the terrace immediately below A3300 we excavated another space (A3400) that had evidently been abandoned at the time of the late 7th-century rebuilding (Fig. 8). We were unable to complete the excavation of A3400 in 2015, but it appears to have been partially filled in to support the western edge of A3300 to the east and the north wall of A3500 on the south. An interesting feature is a one-course-high paved platform that runs along the western edge of the space. It is made of *sideropetra* and schist blocks and pavers, measures 1.0–1.5 m wide and about 3.5 m long, and runs from about a meter north of the north wall of A3500 nearly up to the south wall of the LM IIIC bench sanctuary. It is possible that the paved platform was an early 7th-century construction established for a purpose related to the earlier LM IIIC shrine—not unlike the Protoarchaic buildings on the southwest terraces, which appear to have been constructed with reference to an LM IIIC wall and tholos tomb.

Comments

The terminus ante quem for the beginning of post–LM IIIC activity on the site appears to be late 8th century. Study of the pottery in the Protoarchaic Building and finds from the early phase floor at the north end of A3300 suggest a late 8th or early 7th century date for the foundation of these structures, though we have not determined yet a solid terminus post quem or ad quem date for the foundations. Late Geometric pottery is present or extensive in these deposits, and the phase has been recovered in soundings in B1700 and B3500 in earlier seasons, but the main period of pre-urban activity on the site appears to be the late 8th to early 7th centuries. The material traces, buildings, and installations are concentrated in areas with LM IIIC buildings that were a visible part of the landscape and the material memory of people residing in the region. This renewed interest in Azoria, in the latter 8th or early 7th century, would have been a way for certain groups to assert their connections to the site, and even to individual buildings that had some social relevance—the activities in these spaces and buildings may have served to connect social groups to known or presumed ancestral tombs, and to the LM IIIC bench sanctuary—the latter would have had an important connection to specific households.

The soundings conducted during 2015, in trenches B5300 and B5200, produced more evidence of this Protoarchaic use phase. The extant architecture suggests two or three rooms of a building that was built over the top of the LM IIIC wall. Its location, at the southeastern edge of the Protoarchaic Building and LM IIIC tholos tomb, should point to a function associated with these constructions. The late 7th-century rebuilding effectively destroyed these earlier structures, and their remains were buried in a deep deposit of cobble fill that extended behind the spine wall to the east, forming the foundations for Archaic rooms.

The deposition and rebuilding in B5300-B5200 is similar to the transformation of A3300 in the Communal Dining Building. The Archaic room A3300 effectively cut into an earlier 8th–early 7th-century room, partially using the architecture of the northeast corner, but building over and into the earlier building, leaving only its far northern end undisturbed. The rebuilding is deliberate and destructive, and the condition of earlier LG and Protoarchaic occupation suggests that the transition was relatively rapid and extensive. Seventh century and earlier material is sometimes found in unusually good condition in such spaces (Figs. 9, 11).

The rate of the phase change thus is interesting and important. The transition from a period of localized installations in the 8th and 7th century to one of site-wide renovation at the end of the 7th century was an abrupt and transformative event. It is likely that the Early Iron Age and Protoarchaic objects, recycled for use in Archaic contexts, were derived from selective curation activities during the late 7th-century rebuilding phase. A Daidalic plaque fragment recovered from the Archaic dining room in trench A3500 is a result of such recycling; in this case, the piece was probably removed from a shrine that had once occupied this area of the slope above the Monumental Civic Building. In our first phase of excavation in 2002–2006 we recovered a series of LG and early 7th-century terracotta figurines and plaques from the fill behind the Monumental Civic Building. Such an early shrine would have been the predecessor of the Hearth Shrine (D900)—where a number of LG to Orientalizing figurines were found—and the successor of the LM IIIC bench sanctuary. The likely location would be in the area of A3400, which appears to have been abandoned at the time of the late 7th-century rebuilding phase, and contained a paved platform that extends up to the southern edge of the LM IIIC bench sanctuary.

In the broader region there is evidence for Early Iron Age interest in abandoned LM IIIC settlements and cemeteries, which seems to have intensified dramatically by the 8th century with the construction of burial cists and enclosures, and primary and secondary cremations, nested within the destruction debris of long-abandoned LM IIIC houses at Vronda. The cists at Vronda accommodated multiple cremations over the 8th and 7th centuries, implying the continuation of the tradition of family tombs, but now localized within the still-visible remains of real, fictive, or expropriated ancestral houses (Day 2011). Another important example of this LG engagement with the LM IIIC landscape is at Chalasmenos, where Tsipopoulou recovered a LG dining building constructed directly on the destruction debris of the LM IIIC settlement and near a PG tholos tomb (Tsipopoulou 2004, 2005). It is this kind of ritual elaboration that is expressed at Azoria, where the LM IIIC–PG tholos tomb was incorporated into an 8th–7th-century communal building.

Thus, during phases of the Early Iron Age and Protoarchaic periods, the act of burial and the choice of location of burial had become social-symbolic references to the LM IIIC landscape, and no doubt ritual focal points articulating regional identities, claims to land, and social affiliations. By the 8th and 7th centuries this process had become formalized through the construction of communal dining buildings and funerary or mortuary chapels (Gaignerot-Driessen 2012, forthcoming). The use of LM IIIC settlements and cemeteries (specific places, tombs, and buildings) for ritual reflects the establishment or appropriation of visible connections to specific early settlements and kinship groups in order to shape new social identities in the formative communities of the Late Geometric and Archaic periods.

Based on stratigraphic work to date, it appears that Azoria may have been largely abandoned as a settlement at the end of LM IIIC, while the tholos tomb, which contained PG burials, is an indication of continued use of the cemetery. Settlement during PG–LG probably shifted to the Kastro, which was the dominant acropolis site in the region during the Early Iron Age. There are residual remains of Early Iron Age activities at Azoria: figurines, pottery, and iron-smithing debris are found in Archaic foundation levels and are recycled or curated in later Archaic contexts. But the surviving built structures and preserved stratigraphy belong to the late 8th and early 7th centuries, and they seem to be concentrated in areas of specific LM IIIC remains. The buildings and deposits evince ritual or ceremonial use rather than normal domestic functions.

The activities were intrusive and actively ritualized in character, implanted as it were within the fabric of the earlier settlement. At Azoria, this process continued throughout the 7th century, indeed lasting far longer than at either Vronda or Chalasmenos. Whatever social restructuring and regional integration may have been encouraged or informed by these ritual interactions, they were ultimately successful at Azoria—perhaps a causal variable leading to the urban transformation. Dating to the end of the 7th century is a clear horizon of rebuilding that buried or destroyed the earlier buildings. The resultant settlement was carefully planned, monumental in form, and complex in the scale of landscape modification, construction, and allocation of labor. This Archaic settlement lasted the duration of the 6th century, culminating in a catastrophic burned destruction in the first quarter of the 5th century.

The construction of the Archaic city at Azoria may be attributed to the evolving social dynamics of the Late Geometric period

and the 7th century, times in which long-abandoned Late Minoan IIIC settlements and cemeteries had most likely become historically significant focal points of rituals that served to legitimate and articulate the form and the limits of local and regional identity and ultimately civic status in emerging cities. Azoria represents the end result of the process.

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The Kentro Has a New Kiln

Jerolyn E. Morrison

A heartfelt "Thank you!" goes out to the Ms. Foundation for Women for its generous financial support, which has advanced ceramic studies at the Kentro. This year an electric kiln was added to the repertoire of equipment in the W.A. McDonald Laboratory of Petrography (Fig. 1).

The lab was founded in 2002 with the vision and financial support of Dr. Jennifer A. Moody. The primary focus of interest is the study of ancient ceramics by thin section petrography with the use of a polarizing microscope. Under the direction of Dr. Eleni Nodarou, the laboratory conducts five to six petrographic projects annually that address questions which allow archaeologists to better understand ancient life on Crete. Through this work, the Kentro has built an in-house collection of thin sections that includes more than 7,000 slides of ancient pottery. The ceramic samples come from sites all over Crete that date from the Final Neolithic to the Byzantine period.

The addition of the Ms. Foundation kiln allows those working at the Kentro to further their investigation of ancient ceramics by conducting projects that utilize methods of experimental archaeology. Such projects will include extensive geological sampling programs that collect clays and temper from the field to make comparisons with the ancient pottery. This allows one to more accurately identify plausible pottery production centers. One may also manufacture pottery from Cretan clays to test the workability of the raw materials.

Figure 1. Jerolyn Morrison, Tom Brogan, and Eleni Nodarou with the new electric kiln. Photo E. Huffman.

A Report on 2015 Work Supported by the Richard Seager Fellowship

Paraskevi Stamataki

The doctoral research conducted at the University of Athens by the author involves the examination of the ceramic assemblage from the Late Minoan I building complex of Vathypetro. This site is one of the most architecturally impressive Minoan "villas" in Central Crete, and it occupies a very important geographical position, very close to the peak sanctuary of Juktas and the palatial center at Archanes, on the road that leads from Knossos to Kommos (Bonias 1983, 49).

Vathypetro was discovered in 1948 (Platon 1948) and was excavated in the period from 1949 to 1953 by S. Marinatos, under the auspices of the Archaeological Society at Athens, with supplementary investigations in 1955 and 1956 (Marinatos 1949, 1950, 1951, 1952, 1953, 1955, 1956), but it has remained unpublished since then. It consists of two building complexes (Driessen and Sakellarakis 1997, 64–65, figs. 3, 4): the main building complex to the northwest and the "workshop" area to the southeast. Over 60 areas and rooms have been discovered on the ground floor, many exhibiting palatial architectural features, including significant storage facilities (Christakis 2006, 74), cooking areas, and workshop installations. A second floor was attested in the western part of the main building complex (Marinatos 1949, 104; Driessen and Sakellarakis 1997, 69).

Regarding the date of Vathypetro, two propositions have been put forward. The first suggests that the site belonged to the LM IA period (Marinatos and Hirmer 1960, 76), at the end of which it was either abandoned (Marinatos 1950, 248) or destroyed by violent means (Marinatos 1949, 108; Marinatos and Hirmer 1960, 76). The second proposition argues that it belonged to both the LM IA and LM IB periods (Driessen and Macdonald 1997, 176–178; Driessen and Sakellarakis 1997), with earthquake destruction at the end of LM IA and abandonment due to an unclear cause at the end of LM IB (Driessen and Sakellarakis 1997, 63).

The research undertaken by the author is the first effort after Marinatos' initial pottery conservation work—through which a small number of vessels was conserved, now stored at the Archaeological Museum of Herakleion—to conserve and study a new sample of the Vathypetro pottery. This sample originated mainly from the collapsed layers of the ground and the first floor of the main building complex, as well as from the foundation deposit identified at the site (Marinatos 1951, 259–261). The author was able, after laborious work, to mend nearly complete or whole-profile vessels (Figs. 1, 2) from piles of sherds (Fig. 3) that were stored unprocessed until then. The conservation, drawing, and photographing of the joining sherds was carried out with the support of the INSTAP Publication Team. The study of both the recently conserved pottery, as well as of the assemblage conserved by Marinatos, is work toward the complete publication of

Figure 1. A Vapheio cup from the collapsed layers at LM I Vathypetro. Photo Ch. Papanikolopoulos, drawing D. Faulmann, and conservation G. Rogdakis.

the pottery from the site, for which both the Archaeological Society at Athens and the Greek Ministry of Culture have granted the author permission.

The main goal of the ongoing doctoral research is to establish a ceramic technological typology for the site of Vathypetro by recording ceramic morphology, manufacturing techniques and methods, surface treatment, decoration, and fabrics in a detailed and systematic manner. This analytical method of technological examination was developed in an attempt to distinguish between the different technological types existing within a specific ceramic vessel category, with each type representing a different workshop tradition. Based on the technological information collected, it was possible to detect the ceramic workshop traditions present at Vathypetro, to investigate the character of the local ceramic production, and to identify imported pottery—in other words, to describe pottery production and consumption patterns at the site. The technological traditions detected at Vathypetro were then compared to the ones existing at Archanes and Knossos, and pottery distribution patterns within the area were examined. Along these lines of study, the organization of the pottery workshops in the region and the way these workshops interacted with the administration at Vathypetro, Archanes, and Knossos can be investigated. Finally, aspects of the socioeconomic and political organization at and around Vathypetro could be envisaged.

The proposed technological methodology of ceramic typology is also a strong dating tool, because each ceramic type representing a specific workshop tradition belongs to a specific time phase. When the technological character of each vessel thus is accurately established, the ceramic periods during which Vathypetro existed can be determined with more accuracy. This information is important when examining the function of the complex, because it will be possible to place it within the wider social conditions of a specific chronological phase within the troubled LM I period.

Continuing the support of this project, INSTAP, through the 2015 Richard Seager Fellowship, gave the author the opportunity to spend valuable time at the library of the Study Center for East Crete, carrying out bibliographic research, detecting ceramic examples technologically comparable to the Vathypetro pottery, and establishing the preliminary conclusions of this research.

For their continuous support of this research project on the pottery from Vathypetro, I would like to express my sincerest gratitude to INSTAP, the INSTAP Publication Team, and the staff working at the INSTAP Study Center for East Crete, all of whom have made possible this attempt to revive an old excavation of great importance.

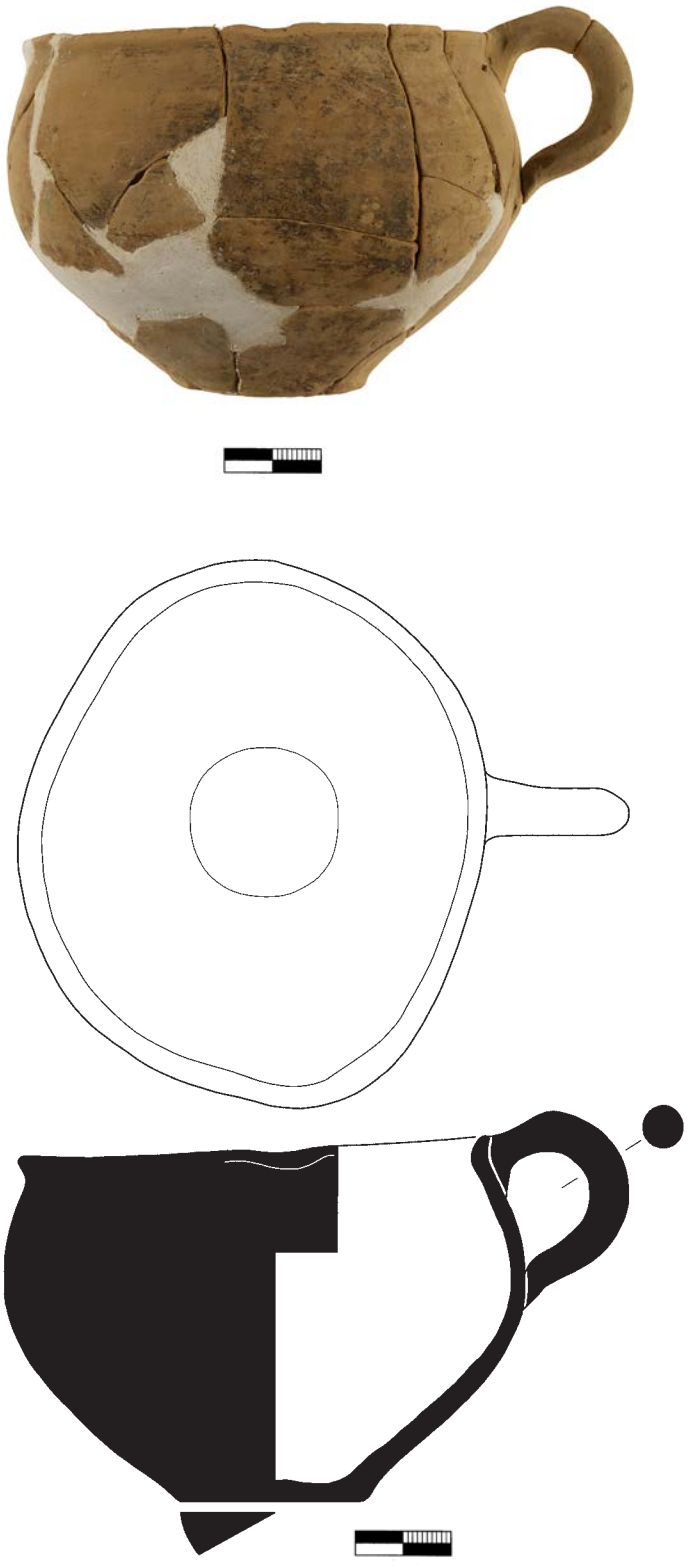

Figure 2. A hemispherical cup with a spout from the collapsed layers at LM I Vathypetro. Photo Ch. Papanikolopoulos, drawing D. Faulmann, and conservation G. Rogdakis.

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Figure 3. Piles of sherds that were assembled into nearly complete vessels or vessels with whole profiles. Photo P. Stamataki.

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Library News

Accomplishments for the 2014–2015 Librarian Fellow, Gabriella Lazoura, included work on her Master's thesis, "Settlement Patterns in Crete in the Final Neolithic and the Early Bronze Age I Period: The Survey at Mesorachi Siteia, East Crete," which she submitted in May at the National and Kapodistrian University of Athens. The number of books in the Kentro collection was increased by over 150 (bringing the number of books, offprints, and journals to 8,051), and many new PDFs of books and articles were added to the digital media collection. Additionally, Gabriella assisted with several pottery studies, the antiquities inventory, and the record number of school visits to the Study Center last fall.

We welcome Dr. Melissa Eaby back as the interim 2015–2016 Librarian Fellow. Melissa is currently the Assistant Director of the Azoria Project, and she works with several other excavations in East Crete. Her current research focuses on the LM IIIC period, including preparing House A2 at Chalasmenos for publication.

Melissa Eaby visiting the site of Chalasmenos in 2009. Photo T. Alusik.

Collaborative Research Projects at the Study Center

Philip P. Betancourt

Experts in many different fields come together at the Study Center, and this interaction facilitates collaboration on many problems that require more than a single type of investigation to yield useful results. Collaborations range from simple and informal ones to large interdisciplinary teams of researchers in disparate fields. All of the the excavation projects that use the INSTAP Study Center as a base of operations are large interdisciplinary teams. For Minoan archaeology in the 21st century, international collaboration by specialists from different countries with training in different fields is a normal and routine part of the operation. In addition to the teams that require months or years of planning ahead of time, some collaborations begin because unique questions arise from what is being excavated.

An example of a small and informal collaboration, for example, developed when Prof. Jeffrey Soles was directing the excavations at Mochlos that discovered a small lens of gray soil. No one on the site, including this writer, had any idea of what it might be. Collaboration solved the issue. A pinch of the gray powder was shown to Stephania Chlouveraki, who was then the Chief Conservator at the Study Center, and she scanned it with the LIBS Instrument in the conservation laboratory. The instrument, which shines a laser beam on a material and provides elemental analysis, is used by conservators in several ways (for example, in cleaning metals it is necessary to know when all the chlorides have been removed from a cuprous artifact). The scan showed that the gray dust was mostly tin. The excavators had discovered the remains of the first tin ingot ever recorded from Minoan Crete, proof that the metal workers at Mochlos were importing their raw materials of copper and tin as separate metals, and theywere manufacturing the bronze at the site. The tin ingot was published by Soles in an article in the Festschrift in honor of Joseph Shaw (*Krinoi kai Limenes*, INSTAP Academic Press, Philadelphia, 2004).

An example of a more complex research team is the group assembled to determine the contents of vessels excavated by Vili Apostolakou at Alatzomouri-Pefka, a MM IIB workshop with several rock-cut vats, a well, and other evidence suggesting an installation for making dyes. Proof for the nature of the installation was needed, and the research team included Vili Apostolakou, Thomas Brogan, Philip Betancourt, Kathy Hall, Andrew Koh, M. Nicole Pareja, and Alison Crandall. Gas Chromatography–Mass Spectroscopy (GC-MS) was conducted at Brandeis University in the United States under a Greek export permit, and dyes were identified to demonstrate conclusively that the facility was used to make purple from murex, red from madder, and yellow from weld. The work by the members of the collaborative project added the proof for the proper identification of the industry.

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Leslie P. Day
Susan C. Ferrence
Geraldine C. Gesell
Donald C. Haggis
Floyd McCoy
Jennifer Moody
Margaret S. Mook
James D. Muhly
Elizabeth Shank
Jeffrey S. Soles
Thomas Strasser
L. Vance Watrous
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Study Center in Crete

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Eleanor J. Huffman, *Business Administrator*
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Kathy Hall, *Senior Conservator*
Matina Tzari, *Conservation Technician*
Chronis Papanikolopoulos, *Chief Photographer*
Doug Faulmann, *Chief Artist*
Lily Bonga, *Artist*
Eleni Nodarou, *Ceramic Petrographer*
Dimitra Mylona, *Faunal Analyst*
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Matina Papadaki, *Soil Flotation Technician*
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Jesse Obert during an August rainstorm at the Study Center, 2015. Photo J. Morrison.

Celebrating U.S. Independence Day 2015 at the Study Center, left–right: Michalis Solidakis, Rod Fitzsimons, Matt Buell, and Brian Kunkel. Photo P. McGeorge.