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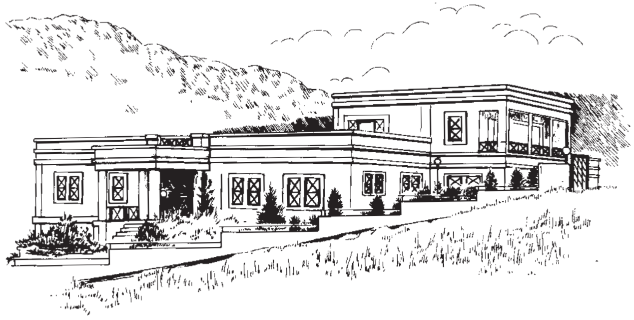

The Excavation at Mesolithic Damnoni: Investigations of a New Culture on Crete

Thomas F. Strasser, Eleni Panagopoulou, and Miriam Clinton

From 2008 to 2013, a collaborative project between the American School of Classical Studies (ASCSA) and the Ephoreia of Speleology-Palaeoanthropology of Southern Greece was conducted around the modern village of Plakias in southwestern Crete (Figs. 1, 2). In the first two years, our survey focused on paleosols in the region to find Mesolithic (ca. 9500–6500 b.c.) remains. In the following years we pursued an excavation at the nearby newly discovered site of Damnoni (Fig. 3). The excavation represents the first stratified Mesolithic site on Crete and, therefore, a culture previously unknown to archaeologists on the island. We hope that this excavation represents a modest beginning to expand our understanding of the early prehistory of the island and provides a novel line of inquiry for future archaeologists.

Figure 1. View of the excavation at Damnoni, near modern Plakias. Photo T. Strasser.

The excavations at Damnoni in 2011 and 2013 were carried out in small trenches that measured 1 x 1 m (Fig. 1). The retrieval system was systematic and careful: all soil was either dry sieved or floated. Because a microlithic industry is characteristic of the Greek Mesolithic, special dry sieves with a grid of >0.5 cm were made for the site, as was a new flotation device. With these meticulous excavation techniques in place and in coordination with the geologist Panayiotis Karkanas, we were able to locate the strata that bracketed the Mesolithic tools. Three strata were discovered: the topsoil, an Aeolian (wind generated) deposit with the majority of the Mesolithic artifacts, and a basal stratum of sterile paleosols (Fig. 4).

The site is small, with two areas ca. 10 x 10 m in size and with shallow deposition (Fig. 5). Much of the site may have been eroded away, but it must also be considered that Damnoni is less a habitation site than an activity area. Though the lithic deposition is relatively impressive in light of its age, there are no walls or any other indications of settlement. The easy access to fresh water nearby, as well as a shallow brackish cove attractive to flora and fauna, were probably the primary reasons for the Mesolithic exploitation of the region. The salient point, however, is that the site is not extraordinarily conspicuous. Because our team was looking at paleosols very intensively, we found the site despite the thick vegetation that lessened visibility. Future survey directors should keep this in mind because this site would most likely have been overlooked by large-scale reconnaissance.

We found a significant quantity of typical Mesolithic lithic artifacts (notches, denticulates, spines, and perforators among others). The most abundant raw material used was quartz, though many artifacts were made of chert, some of which have colors unfamiliar and uncommon to the region (Fig. 6). We also found obsidian in the Mesolithic stratum, which is presently under analysis. We hope further research into the stone sources and dates will lead to interesting conclusions on early seafaring and exchange.

Mesolithic tools have also been recently reported from Livari and Moni Kapsas in the southeast of Crete. Now that this new culture is being accepted as a new phase in Cretan prehistory, it seems very likely that more Mesolithic sites will be found, and an exciting new period in the island's history will continue to be revealed in the near future.

ceramic as well as cultural-political regionalism in Bronze Age Crete. As briefly presented above, the contextualization of the Myrtos-Pyrgos production within the ceramic tradition of eastern and southeastern Crete ultimately supports the identification of a ceramic macro-region and a micro-region. Whether such macro- and micro-regions also indicate different scales of cultural and political interactions is an intriguing topic that I will explore further in my dissertation and hope to discuss in the upcoming 2015 annual meeting of the Archaeological Institute of America.

I would like to express my thanks to the INSTAP Study Center for granting me the Seager Fellowship, and I would like to thank everyone there who made my time pleasant and productive. In particular, I wish to express my gratitude to Tom Brogan, Philip Betancourt, Jeffrey Soles, Vance Watrous, Kostas Chalikias, Eleni Nodarou, and Eleanor Huffman for their help and advice.

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Figure 2. Hemispherical cup with cresents (N 8012) from Myrtos-Pyrgos. Photo E. Oddo and drawing D. Evely.

Archaeometallurgy at the Kentro

Alessandra Giumlia-Mair and Susan C. Ferrence

Our project uses X-ray fluorescence spectroscopy (XRF) to systematically analyze metal finds from Minoan Crete. We are seeking to discover as much as possible about the archaeometallurgy and to identify the range of alloys and techniques used by the local artisans. XRF is a well-known, fast, and non-destructive scientific method that quantitatively identifies the elements used to create ancient objects. Methods like Atomic Absorption Spectrometry (AAS) or Inductively Coupled Plasma Spectrometry (ICPS) are more precise, but they require destructive samples that have to be dissolved in

Figure 1. Alessandra Giumlia-Mair operating the XRF equipment in the basement storage area of the Kentro. Photo S. Ferrence

Figure 2. Our workspace in the archive of the Kentro. Photo A. Giumlia-Mair.

acids to prepare the solutions for analysis. Besides being nondestructive—a very important characteristic in the study of archaeological artifacts—the XRF analyzer: (1) quantifies over 30 elements, (2) rapidly determines which elements are present in the object, (3) enables quick collection of data (which can be elaborated at a later point), and (4) offers considerable reductions in terms of costs and time (Hahn-Weinheimer, Hirner, and Weber-Diefenbach 1995; Lutz and Pernicka 1996; Giumlia-Mair, Kassianidou, and Papasavvas 2011, 15–16). We used XRF on a group of metals from Gournia and obtained valuable information about fabrication processes and various stages of production from the casting of blanks to the finishing of the objects (Ferrence and Giumlia-Mair 2014). With this in mind, we decided to carry out our work on artifacts housed at the INSTAP Study Center for East Crete.

Analyses at the Kentro

Since June of 2010, Alessandra Giumlia-Mair and her husband Josef Mair have travelled to Crete each summer from northern Italy in a car full of scientific devices. They work as a team at the Study Center on the XRF program of analyses together with Susan Ferrence. Thomas Brogan identified the ideal working place to set up the equipment for the project: the northeastern corner of the basement storage area (Fig. 1). In this area, the temperature does not fluctuate drastically over the course of the work day, the floor is stable, and only a few people are present who might inadvertently disturb the XRF equipment, which is quite sensitive to changes in temperature, humidity, and vibrations. A person walking by the instrument may interrupt the measurement in process (each analysis can require up to 15 minutes of X-ray exposure on any given object). It is important, therefore, to find the best location to set up the equipment. Furthermore, it is imperative for people to keep a safe distance from the system when it is directing X-rays at an object because they can be dangerous for humans. We use the basement archive as our workspace with a second computer for annotation and a digital microscope for photography (Fig. 2).

Methodology

An important part of archaeometallurgical research is examining each object under magnification in order to identify manufacturing traces and details, many of which are not visible to the naked eye. Certain physical characteristics represent evidence for casting, hammering, sharpening, and polishing among other fabrication techniques that would have been used in a Minoan metallurgical workshop. Using magnification to recognize evidence of manufacture helps to target the locations of XRF analyses on the object, thereby improving the scientific results. Furthermore, all parts of the selected objects are microscopically examined to assess their condition and select the best spots for analytical measurement. Metallic looking areas (as opposed to tarnished and/or oxidized spots) are normally selected for analysis. In the case of corroded copper-alloy artifacts, areas with a thin cupritic patina are preferred. Areas with thicker patina or visible corrosion products must be avoided. If corrosion is present, the data is considered qualitative only.

X-ray fluorescence spectroscopy was carried out with transportable equipment consisting of an X-ray source, a transformer, a tripod, a stabilizer, and a laptop computer. This equipment has been expressly developed for analyses of cultural heritage objects, and it utilizes dedicated software for the analysis of ancient metals. Each measurement typically takes 10–15 minutes, but it can be longer if necessary, for example, when the analyzed area is small. The exact spot of a measurement is indicated by a laser pointer, and the equipment gives an audio signal when the distance from the surface of the object is at the correct point. This system ensures that the angle and distance from the object are always the same for each analyzed piece, enabling more precise calculations.

The most important tool for this kind of scientific analysis is a set of standards used to routinely calibrate the system. The standards used by Giumlia-Mair have been specifically produced by AGM Archeoanalisi Laboratory in Merano, Italy, for the analysis of ancient metals of various compositions. For the Minoan Bronze Age, standard samples of copper containing single alloying elements (5% Sn; 1% of As, Sn, Ag, Fe, Pb; 0.5% As, Ag, Fe, respectively) and composite alloying elements (e.g., 1% Sn, As, Fe, Pb in Cu; 1% As, Sn, Ag, Sb, Fe in Cu; 1% Sn, Ag, Au, As in Cu) are vital to this research, as well as various other alloys with different silver and gold percentages. The standards of known composition are compared with the analysis results from the ancient objects, allowing for the calculation of possible drifts in the spectra due, for example, to a change in temperature, humidity, or other parameters that can affect the performance of the system.

Metal Artifacts from Petras

The first program of analyses was performed on the finds from the Prepalatial cemetery of Petras, which has been under excavation since 2004 by Metaxia Tsipopoulou. The cemetery has revealed countless important artifacts and architectural features. It is composed of many house tombs and at least one rock shelter, all of which contained mostly disarticulated human remains along with grave goods such as pottery, stone vessels, beads, seals, jewelry, and metal objects among other items (see Part II in Tsipopoulou, ed., 2012).

To date, the metal artifacts from the cemetery number over 250 cataloged pieces. The corpus is composed of different classes of objects, such as jewelry (pendants, rings, bracelets), objects for personal use (tweezers [Fig. 3] and cosmetic scrapers), weapons (a dagger and a knife), small tools (awls and fish hooks), and sheet fragments (probably belonging to small vessels and ornaments). The finds are made of copper-based alloys, gold, silver, and lead. We carried out ca. 100 analyses, and the data are being processed. During the testing of the objects, we noticed some significant peculiarities of the metallurgical tradition of the time and interesting production techniques, including the use of certain alloys that would allow for good performance by the tool or other type of object.

Figure 3. Fragment of tweezers with decorative rivets made of silver (PTSK ME 05-124) from the cemetery of Petras. Photo Ch. Papanikolopoulos.

Other analyses (ca. 50 tests) were performed on metal objects from the settlement of Petras. They consisted of Minoan pins, chisels, tools, and similar objects and post–Bronze Age artifacts such as Byzantine bullae and Venetian and Ottoman coins.

Metal Artifacts from Mochlos

A third batch of over 200 analyses was carried out on metal objects from the excavation at Mochlos, directed by Jeffrey Soles and Costis Davaras. Approximately 60 of the analyzed objects are Late Minoan (LM) III. These data have been published, and they give interesting insight into the metallurgical tradition of this period (Giumlia-Mair 2011; Soles et al. 2011). Among the examined objects are gold decorations and fragments and several classes of copper-based objects such as ornaments, weapons, tools, vessels, everyday objects, and also semi-finished products. Ingots and semi-finished materials (Fig. 4) are particularly important for the reconstruction of the working processes. Furthermore, Soles pointed out the spots on site where the metal hoards were located and described the position in which the objects were found (Fig. 5). All this information is relevant and very useful for the interpretation of the XRF results.

Conclusion

The Kentro and its staff have been very hospitable to our ongoing program of XRF analyses. The institute facilitates the work on metal objects from several excavations in the local region. The analytical results are adding important new information to our knowledge of the archaeometallurgy of eastern Crete, for example, the Egyptian influence on LM III gold jewelry from Mochlos (Giumlia-Mair 2011) and the preparation of specific metal alloys for crafting different types of everyday objects and other prestige goods at Gournia (Ferrence and Giumlia-Mair 2014). Significant new results about the metal objects and technologies used in the creation of items from the Petras cemetery will be presented in 2015 in Athens at the next Petras conference, organized by Metaxia Tsipopoulou.

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Figure 4. Metal strip (CA268) from Mochlos. Similar examples come from Gournia and Papadiokambos. With all probability, they were traded as semi-finished products. Photo A. Giumlia-Mair.

Figure 5. Jeffrey Soles (right) discussing the excavations at Mochlos with Shari Stocker (left) and Susan Ferrence (center). Photo A. Giumlia-Mair.