

TECHNOLOGICAL OBSERVATIONS ON THE MANUFACTURE OF THE LATE MINOAN GODDESSES FROM HALASMENOS EAST CRETE, AS REVEALED DURING THE PROCESS OF CONSERVATION

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ABSTRACT

Halasmenos is a settlement of the Late Minoan IIIC period (c. 1190–1070 BC) in East Crete with individual houses, communal buildings and a shrine. When the shrine was abandoned, it contained a large number of ceramic ritual objects, including figures of a goddess with upraised arms, snake tubes, kalathoi and plaques topped by double horns. A number of significant observations concerning the manufacture of this ritual assemblage were recorded during the process of conservation. This presentation focuses on the goddess figures and the technology employed to manufacture them. The differences which were observed may ultimately indicate different technological traditions and/or workshops, or even various social groups that dedicated these specific cult assemblages in the shrine. A conservation policy and the contribution of different disciplines (archaeology, conservation, petrography) to the study and the publication of this assemblage are also discussed.

ÖZET

Halasmenos, Doğu Girit'te bir Geç Minoan IIIC dönemi (İÖ yaklaşık 1190–1070) yerleşimidir; içinde evler, ortak kullanıma ayrılmış yapılar ve bir tapınak yer alır. Terk edildiği sırada tapınakta kolları kalkık bir tanrıça, yılan biçimli borular, *kalathoi* ve üzeri çift boynuzlu levhalar dahil çok sayıda seramik ayin objeleri bulunmaktaydı. Konservasyon sürecinde bu ritüel objelerinin yapımına dair önemli bazı gözlemlerde bulunuldu. Bu sunum tanrıça figürlerine ve yapım teknolojilerine odaklanmaktadır. Gözlemlenen farklar nihai aşamada farklı teknoloji geleneklerine ve/veya atölyelere, hatta bu kült kümelerini tapınağa armağan eden farklı toplum gruplarına işaret ediyor olabilir. Bir konservasyon politikası, başka disiplinlerin (arkeoloji, konservasyon, petrografi) çalışmaya katkısı ve objelerin yayınlanması da tartışılmaktadır.

THE ARCHAEOLOGICAL CONTEXT

The site of Halasmenos is being excavated by Dr M. Tsipopoulou and work has been going on since 1992. The site covers an area of approximately 4000 m² on a hill (250 m high) overlooking the north end of the Isthmus of Ierapetra, Fig. 1. The largest part of the settlement was occupied for a short period of time, an almost closed deposit of Late Minoan IIIC date (c. 1190–1070 BC) [1, 2].

The shrine is located at the north eastern edge of the settlement overlooking the gulf of Mirabello and the Isthmus of Ierapetra. It is an impressive, free-standing, megaroid building, easily accessible from all the sectors of the settlement and directly connected to three adjacent *megara*. To the north and the east of the building there are large open areas, which produced no finds and which would have allowed significant numbers of people to gather for ritual processions [1–3].

The most important finds are 10 more or less complete specimens of clay figures of the type called 'goddess with upraised arms'. These representations of female deities first appeared at the beginning of the Late Minoan period (c. 1600 BC) and their use continued uninterrupted until the end of the period (c. 1070 BC). Recent archaeological research in the north Isthmus of Ierapetra has brought to light three cult buildings with goddess figures at Kavousi Vronda, Halasmenos and Kephala Vasilikis, while additional evidence of these figures has been documented also at Kavousi Kastro and Azoria, Fig. 1 [2, 4, 5].

CONSERVATION STRATEGY

To conserve the ritual objects from Halasmenos, the team needed to adapt standard ceramic conservation protocols to the specific needs of this important assemblage. Typically, ceramic finds are divided into two groups: (1) objects which are collected from the floor levels and have enough diagnostic fragments to allow

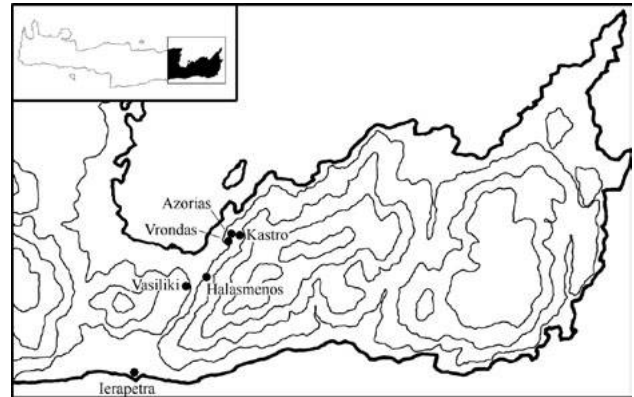


Fig. 1 Map of East Crete, with sites mentioned in the text.

the identification of a single vase and (2) collections of pottery fragments (pottery pails) from all the stratigraphic levels of the excavation, including those from the floors with the objects mentioned above.

Pottery fragments that can be identified as individual objects during the excavation are given a catalogue number and are taken directly to the conservation laboratory to be treated by the specialist staff. The pottery pails, on the other hand, are washed by trained personnel and then sorted in order to match diagnostic shapes or fragments that can be identified in the catalogued objects.

The problem for the conservators with this approach is that the surface patina of pottery fragments which are washed with the pottery 'pails' differs from that of the fragments cleaned by the conservators. As a result, when joins are found between the pottery 'pails' and the ceramic objects, the sherds do not present the same kind of surface. Moreover, the surface slip or occasionally the paint, on the washed pottery from the 'pails' has been lost.

The only way to overcome this problem so as to achieve a fairly homogeneous surface is to remove the fragments which may join to the objects from the pottery 'pails' before they are cleaned, so that all parts undergo the same cleaning procedure in the conservation laboratory. This is an extremely difficult and time-consuming step because the broken sherds typically are covered with hard encrustations which mask the diagnostic features that help identify joins between the pottery sherds and the objects.

However, when a start was made to deal with the ritual equipment of the shrine, it became apparent that this was the only procedure that would ensure that these important ceramic objects could be cleaned and reassembled correctly. It was decided to go through all the bags from the pottery 'pails' as soon as they arrived from the excavation and to extract literally every fragment that could not be identified as belonging to a vase. All this material, along with the objects, was then sorted before cleaning in order to make sure that all the fragments of each object would be cleaned by the same conservator and would undergo exactly the same treatment (Fig. 2).

Although various cleaning tests were undertaken, including the use of lasers, poultices, ultrasonic pen, ultrasonic tank, treatment with hydrochloric acid and use of the scalpel, it was



Fig. 2 Arms and head fragments of the figures of Group A, before cleaning.

decided that actual conservation of the material would only begin after the excavation of the shrine and its immediate vicinity was finished. This was to eliminate the possibility of finding new fragments that could be joined after the completion of conservation [6].

While this time consuming conservation project was in progress, macroscopic observation, petrography and X-radiography were employed to understand how the ritual material was manufactured. This study led to the classification of the goddess figurines into three categories and the documentation of important structural details and forming techniques.

CLASSIFICATION OF THE RITUAL EQUIPMENT FROM THE SHRINE OF HALASMENOS

The ritual equipment from the Halasmenos shrine has been classified into three groups — A, B and C — according to both the macroscopic and microscopic characteristics of the materials employed. The stylistic characteristics of the three groups are also distinct.

Group A: This group is characterized by a semi-fine layered ‘sandwich’ fabric with pinkish ([Munsell] 7.5YR 7/4) margins and a light greenish-grey core (GLE Y2 7/1), frequent black and white angular non-plastic inclusions set in a fine-grained matrix, and a pale brown (10YR 8/3) slip at the surface. Petrographic examination showed that the fabric used for the manufacture of these figures is composed of acid igneous rock fragments, mainly granite (Fig. 3a). This clay recipe constitutes a characteristic product of Mirabello Bay on the north coast of East Crete and it was used for a range of vessels types (storage, cooking and transport). At Halasmenos it was used for ritual equipment as well as cooking vessels.

Group B: This group is characterized by a very fine pinkish fabric ([Munsell] 7.5YR 7/4) with a slightly darker core, and a very pale brown (10YR 7/4) slipped surface. It is almost devoid of non-plastic inclusions. The petrographic examination is not conclusive as to the origin of the fabric, since its fineness does not allow a secure assignment of provenance, but the colour and texture of the matrix seem to link this fabric with Group C (Fig. 3b).

Group C: This group is characterized by a coarse red-brown fabric with sparse rock fragments, and a red slipped surface ([Munsell] 5YR 5/4 reddish brown). The petrographic analysis showed that the non plastic inclusions consist mainly of metamorphic rock fragments of basic composition (basalt) set in a fine calcareous matrix (Fig. 3c). This composition leads to a provenance on the south coast, in the broader area of the Isthmus of Ierapetra.

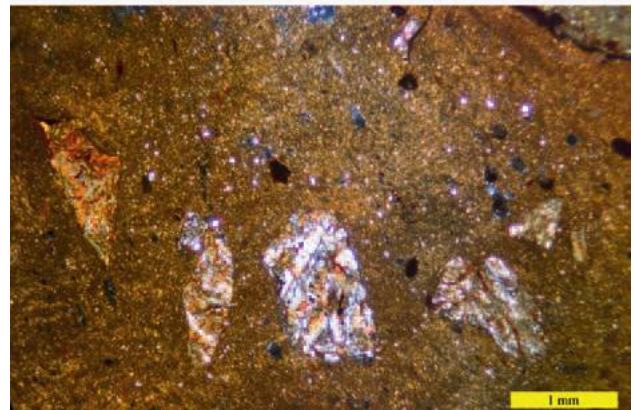
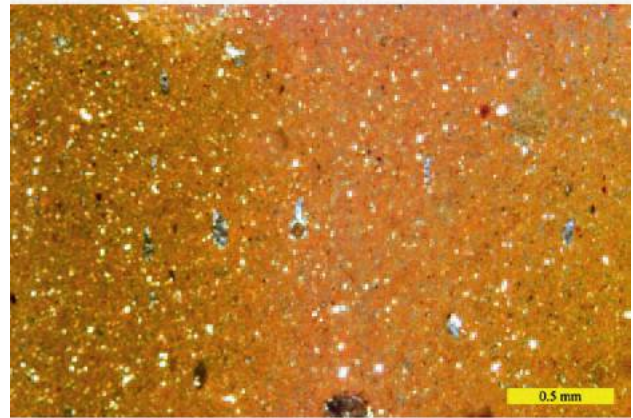
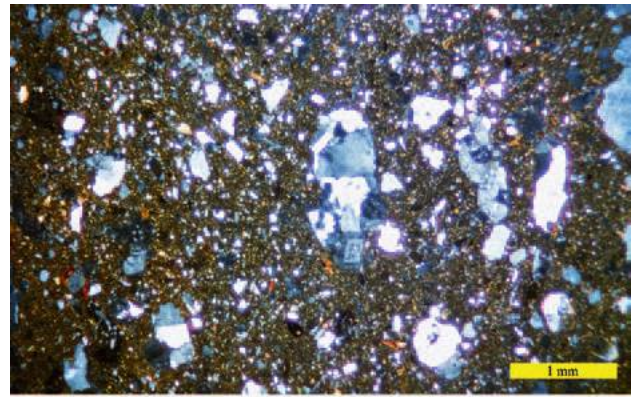


Fig. 3 Clay fabrics: (a upper) Group A fabric with granite; (b middle) Group B fine fabric; (c lower) Group C fabric with volcanic and metamorphic rocks.

The analysis of contemporary material from the nearby shrine of Kavousi Vronda demonstrated that the fabrics of Halasmenos Groups A and C are also found there in ritual as well as domestic ceramic material [7].

NOTES ON THE MANUFACTURING PROCESS

The manufacturing techniques of clay figures and figurines from Minoan Crete have been extensively discussed in the archaeological literature, see, for example [8–10]. However, the fragmented state of the ritual assemblage of Halasmenos allowed us to make some observations that were important to document prior to conservation. Additional information was obtained by X-radiography which helped detect hidden features such as the attachment of fingers to the palms of hands or the assembly of arms and forearms. The methods used for forming details such as the nose, eyes, chin, cheekbones and wrists of the figures were also investigated.

The original height of the figures varied, probably between 50–78 cm. The basic method of construction is the same as



Fig. 4 A fairly complete figure of Group C.

that of the statues found in the Late Minoan IIIC shrine at the neighbouring site of Kavousi Vronda (Fig. 1) as outlined by Gesell and Saupe [8]. The figures consist of two attached clay cylinders: an open, tall cylinder thrown on a slow wheel forms the body up to the shoulders, and a second cylinder was placed on top of the body to form the neck and the head (Fig. 4). The body cylinder was compressed to form the waist and its upper part was squeezed into an oval to form the upper torso while the lower part, referred to as the 'skirt', remains circular or slightly elliptical. Two flat rectangular pieces of clay were placed on top of the oval-shaped upper body to form the shoulders, leaving an open space on the upper side for the attachment of the neck and two holes on the sides for the attachment of the arms.

Once the head had been attached to the body, the head 'accessories' (palettes and birds) and the hair were added (Fig. 5). In most cases the nose and the chin were added as separate elements, while the eyes and the cheekbones were pushed out from the inside. The arms were made separately in three parts: the upper arm, the forearm with the palm, and the fingers (Figs 6 and 7). The arms and forearms, made of narrow, thick-walled tubes, may have been rolled around sticks as suggested by Gesell and Saupe [8] or thrown on a slow wheel as indicated by the rough wheel marks in the interior of some examples. The arm and forearm tubes were joined at the elbow, while the top end of the forearm was pulled up in the form of a shallow cup or bowl, where five rolls of clay were inserted to form the fingers (Fig. 6). It was then squeezed to take the shape of a palm with the fingers extended. All the joins were finally smoothed over with soft clay.

Although the major parts of the figures were formed and assembled using the same method, there are significant differ-



Fig. 5 Representative heads of Groups A (left) B (middle) and C (right).



Fig. 6 X-radiograph of hands of Groups A (left), B (middle) and C (right). Faxitron 43855A, 56 cm focus-to-film distance, 100 kV, 1 min, 3 mA.

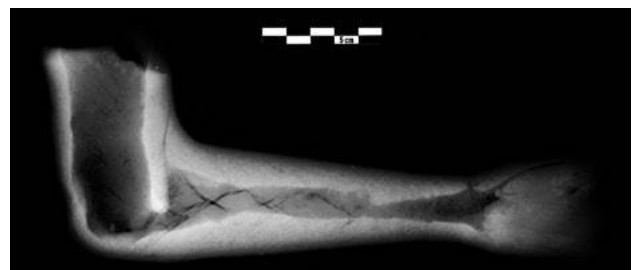


Fig. 7 X-radiograph of arm showing the join of the two cylinders at a right angle to form the elbow. Faxitron 43855A, 56 cm focus-to-film distance, 70 kV, 2.30 min, 3 mA.

ences between the three groups in both the details and the style of the construction. These differences are summarized in Table 1.

Figures of Group A

There are five examples of this type, all of which are very fragmentary. They exhibit distinct stylistic characteristics and find close parallels in the material from the neighbouring site of Kavousi Vronda. Their main structural features are:

1. The skirt is plain and cylindrical with a circular section and a carination at the upper part towards the waist.
2. The head and the neck were formed by a wheel-thrown cylinder, the lower part of which was compressed to form the neck. It was attached directly to the body and the join was smoothed over with soft clay (Fig. 5a).
3. The head is flat, surmounted by three or four clay bars. The tiara consists of three palettes: one above the

Table 1 Summary of the structural and plastic characteristics of the figures.

	GROUP A	GROUP B	GROUP C
Body	circular skirt, carination	circular skirt, carination	elliptical skirt, no carination
Head to neck attachment	direct attachment, no reinforcement	reinforced with extra clay coil	reinforced with extra clay coil
Head	1 piece, flat top, tiara with 3 palettes and a bird	2 pieces, round top, tiara with 2 or 3 palettes	1 piece, round top, tiara with three palettes
Face	nose and chin added separately, eyes and cheek bones pushed out	nose, chin and eyes added separately, cheek not formed	nose, eyes, chin, and cheek bones pushed out
Hair style	long elaborate braids	stylized, 2 clay coils	stylized, one clay coil around the head
Arms and hands	extra portion of clay between the index finger and thumb, wrist bone not formed	extra portion of clay between the index finger and the thumb, wrist bone not formed	thumb joined directly to the index finger, extra portions of clay on the interior and exterior of the wrist



Fig. 8 X-radiograph of a representative palm of group A showing the difference in the grain size of the clay used for the arm-forearm-palm and the finger coils. Faxitron 43855A, 56 cm focus-to-film distance, 40 kV, 7 min, 3 mA.

forehead, two at the sides and a moulded bird at the back.

- The nose and the chin were formed with two separate pieces of clay and then smoothed over, while the eyes and cheekbones were pushed from the inside as indicated by the depression and finger marks on the interior.
- The hair is quite elaborate, formed of successive coils of clay applied on the back of the head and reaching down to the waist. Subsequently, the coils were incised with a sharp tool to resemble braids.
- The arms and forearms were formed from thick cylinders of clay joined at a right angle to form the elbow (Fig. 7). The edge of the forearm was pulled out to form a cup where the fingers, made of five coils of clay, were placed to form the hand. Elongated parallel voids characteristic of the coil-rolling process can be detected in the X-radiographs of the finger coils (Fig. 6) [11, p. 1185; 12, p. 17].

An extra portion of clay was added to bridge the gap between the index finger and the thumb (Fig. 6a). A series of X-radiographs of hands of this type indicate the use of coarser clay for the palm and finer clay for the fingers (Fig. 8). Unfortunately, this observation has not been confirmed by petrographic analysis since the number of samples and sampling areas is too restricted for this set of material.

Figures of Group B

There is only one fragmentary but fairly complete goddess of this type. The main structural features are:

- The skirt is cylindrical with circular section and two relief bands: one on the hemline and the other just below the waist on the carination of the skirt.
- The head and the neck were made of two separate cylinders that are attached to the torso, and these joins were reinforced with an extra coil of clay.
- The head was also made of two parts: one starting from the base of the neck and ending at the eyebrows and the other with the shape of a vault that forms the forehead, the palettes and the hair. Both parts of the head were wheel-thrown (Fig. 5b).
- The eyes, the nose and the chin were added as separate pieces as clearly shown in the X-radiographs, while the cheekbones were not formed at all.
- The hair is stylized, consisting of two short coils of clay, running from the top of the head to the back.
- The arms and forearms were manufactured with thick cylinders of clay joined at a right angle to form the elbow. The edge of the forearm is pulled out to form a cup shape where the fingers, made of five coils of clay, were placed to form the hand. An extra portion of clay was added to bridge the gap between the index finger and the thumb (Fig. 6b). Wheel marks that are clearly visible on the interior surface of a fragmentary palm of this type indicate that the arm tubes were wheel-thrown.

Figures of Group C

There are fragments of at least four figures of this type, two of which are fairly complete. There are various stylistic characteristics which differentiate this group from the other two in terms of construction technique and the modeling of details.

- As for Groups A and B, the body was made with a clay cylinder, but the section of the skirt is elliptical. There is no carination, but the skirt becomes narrower towards the waist and a thick coil of clay was added around the waistband (Fig. 4).
- The head and the neck were constructed separately and, as in group B, an extra coil was added internally, at the attachment of the neck to the torso, to reinforce the join.
- The head is smaller and was made with one wheel-thrown piece. It is egg-shaped, and has a narrow opening on the top (Fig. 5c). The palettes of the tiaras are flat and leaf-shaped and they are larger than those of Groups A and B, although the figures themselves are smaller.
- The eyes, the chin and the cheeks were pushed from inside, while the nose was pushed from the inside and pinched from the outside.
- The hair is stylized and was formed by a thick coil which is affixed at the top of the forehead to the back of the neck, ending in the middle of the upper body.
- The arm and the forearm were formed with two narrow cylinders while the fingers employ separate clay coils, as in Groups A and B. The base of the thumb is bent in such a way as to join directly to the index finger (Fig. 6c). A separate piece of clay was added to the interior of the forearm cylinder, blocking the cylinder at the height of the wrist (Fig. 6d). Finally, a small lump of clay was also added to form the wrist bone (Fig. 6e).

CONCLUSIONS

Conservation of the ritual equipment from Late Minoan IIIC Halasmenos resulted in a series of important observations on the technology and manufacture of the figures of goddesses with upraised arms. The macroscopic examination was complemented by the application of scientific techniques such as X-radiography and ceramic petrography in order to investigate whether technological patterns could be detected and possibly to differentiate between workshops.

The division of the goddess figures into three groups was based on typological criteria and differences in clay fabrics. Petrographic analysis demonstrated that the figures of Group A were produced in the area of the gulf of Mirabello on the north coast, whereas those of Groups B and C were made on the Isthmus of Ierapetra and the south coast of the island. X-radiography allowed us to elaborate further details of manufacture by revealing subtle differences in the construction and assembly of the various parts of the heads, the faces, hands and the arms of the figures. The identification of these manufacturing details contributed greatly to optimizing the conservation process, since it allowed the recognition of goddess fragments among thousands of pottery sherds of similar fabrics and textures.

These preliminary results opened the way to archaeological interpretations with regard to the centres of production of the goddesses with upraised arms and the other ritual objects. Information about the people who visited the shrine of Halasmenos and deposited these ritual items also derived from these studies. There appear to have been more than one source in the broader area of the Isthmus of Ierapetra producing ritual equipment using the same clay recipes as those in use for domestic wares. Moreover, Halasmenos appears to have received ritual equipment from many places. One significant direction of future research should be to investigate the similarities and differences of this new assemblage with those from neighbouring sites at Kavousi Vronda, Kastro and Kephala Vasilikis. Finally, we hope that this contribution has demonstrated how conservation in combination with an interdisciplinary approach to archaeological questions can result in a better understanding of the materials under study as well as to open the way to new interpretations.

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