CASTING FINGER RINGS IN MYCENAEAN TIMES: TWO UNPUBLISHED MOULDS AT THE NATIONAL ARCHAEOLOGICAL MUSEUM, ATHENS[1]

MYCENAEAN signet rings have already attracted much scholarly interest. Yannis Sakellarakis (1981) has worked extensively on their moulds, whereas Agni Xenaki-Sakellariou (1989), John Younger (1984), Walter Müller (2003) and others (e.g. Ogden 1982, Pini 1983; Tournavitou 1997, Evely 2000) have dealt with chronological, technological, and stylistic aspects of the actual finger rings. The aim of this article is to present two moulds recently recorded in the storerooms of the Prehistoric Collection of the National Archaeological Museum, Athens, and to contribute some thoughts on the casting technique used in the manufacture of finger rings and the type of finger rings produced with these moulds.

DESCRIPTION

1. INV. NO. NAM 17976

Dimensions: L. (max.) 0.027 m, H. 0.016 m, D. (hoop). 0.015 m, half bezel 0.012 × 0.013 m.

Semi-cylindrical part of a stone mould, made of a reddish stone, perhaps bauxite. One side (FIG. 1 *a*) features a longitudinal central groove flanked by two holes; the second (FIG. 1 *b*) bears the negative of half an ellipsoid bezel and a hole on the edge; the third (FIG. 1 *c*) carries the almost complete negative of the hoop, an inlet funnel, and two holes, one of them now partially preserved, on either side of the funnel.

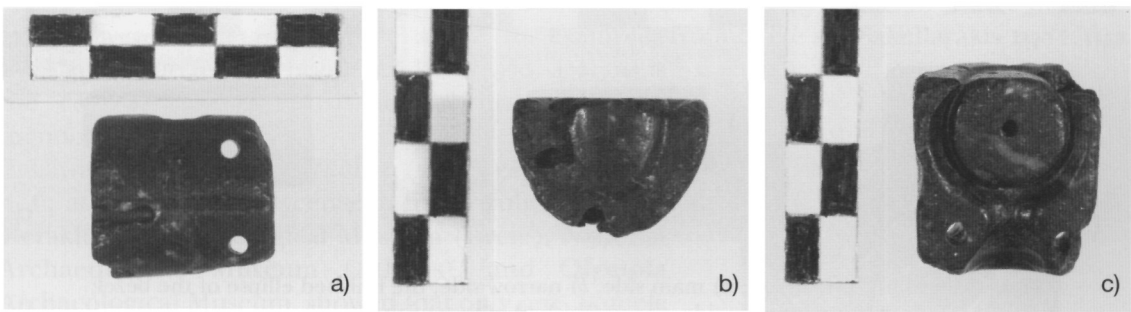

FIG. 1. Mould inv. no. 17976; *a*) main side; *b*) cast of the ellipsoid bezel; *c*) upper side.

This mould was recently discovered among unrecorded material dating primarily to the LH III A–B periods (Phi and Psi-type figurine fragments, buttons and spindle whorls, a potsherd with figurative painted decoration). The assemblage, kept in the storeroom of the Museum's Prehistoric Collection, is without

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provenance and also includes much later artefacts, such as a Roman torso. It may originate from the citadel of Mycenae, where similar moulds have been found. A stone chisel, a fragment of Egyptian blue, and two glass beads suggest the activity of artisans.

The material, bauxite, is already known from another ring mould (NAM inv. no. 1021) on display in the Mycenaean Gallery of the National Archaeological Museum (FIG. 2). The circles for the hoop were drawn with a compass, as indicated by the hole in the centre. The holes on the edges served to dovetail the mould with its other half.

FIG. 2. Mould inv. no. 1021 from the Acropolis of Mycenae.

2. INV. NO. NAM 18128

Dimensions: 0.04 × 0.035 m, D. (hoop, both sides) 0.025 m, half-bezel 0.006 × 0.008 m.

Rectangular part of a mould, made of dark stone, probably steatite. One side features the almost complete circle of a hoop (FIG. 3 *a*). On the narrow, vertical side, two curved incisions form an incomplete (possibly for lack of space) ellipse. The ring ends in an inlet funnel. On the other side, the mould's surface is very worn, with an almost complete hoop of the same size as the previous one, and a hole. On the narrow side, next to the hoop, is half an ellipsoid bezel.

This fragment was also found in the storeroom of the Prehistoric Collection of the National Archaeological Museum with the indications 'Mycenae' and 'Mycenae 1904'. Unfortunately, Christos Tsountas who excavated at Mycenae during that period, does not mention the mould in his reports. The bezel's negative on one side (FIG. 3 *b*) was probably left unfinished because the craftsman miscalculated its final dimensions. But even the finished bezel on the opposite side (FIG. 3 *c*) seems rather small for the size of the hoop, suggesting that the mould might be the unsuccessful attempt of an apprentice.

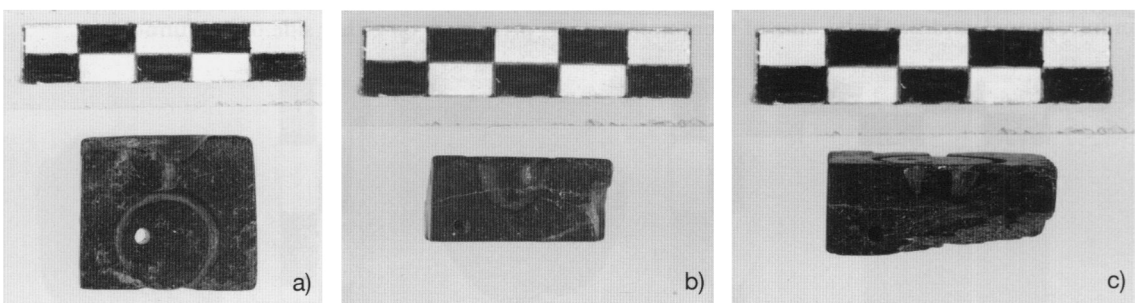

FIG. 3. Mould inv. no. 18128; *a*) main side; *b*) narrow side, the finished ellipse of the bezel; *c*) narrow side, the unfinished ellipse of the bezel.

DISCUSSION

Mycenaean jewellery moulds are relatively rare (see Hughes-Brock 2008 for the most recent list), hence the importance of these two examples. Several were used for the manufacture of plain hoops, like the one in the Thebes Archaeological Museum (inv. No. 1477; Demakopoulou 1974, 166–7, figs. 1–3), others for bezel rings, like these two. Similar moulds come from Mycenae (NAM inv. no. 1021, already mentioned), Poros (Herakleion Archaeological Museum, inv. nos. 2456 and 2465), Malia (Herakleion Archaeological

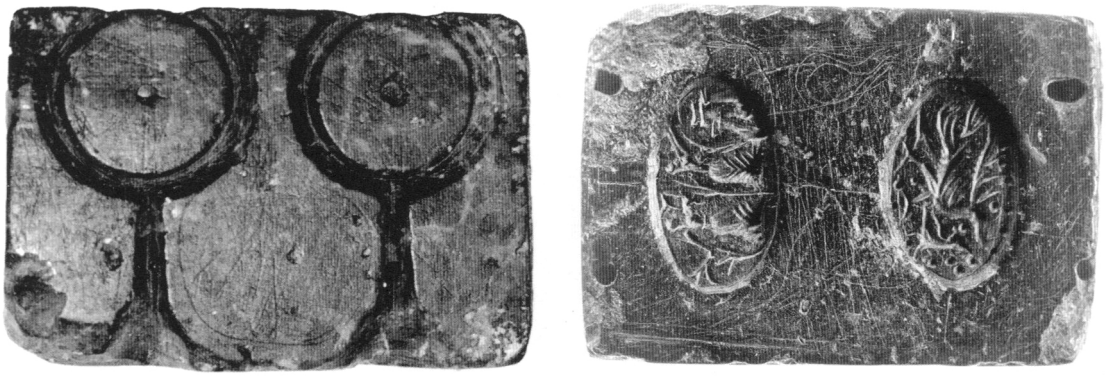

FIG. 4. Mould from Eleusis (inv. no. 4110, Eleusis Archaeological Museum) *a*) hoop cast; *b*) bezel cast.

Museum, inv. no. 2477), Eleusis (Eleusis Archaeological Museum inv. no. 4110; FIG. 4 *a*, Mylonas 1956, 80; 1975, A 306, pls. 64, 65 *a*) and Enkomi, Cyprus, now in the British Museum (FIG. 5). They were used to cast rings with ellipsoid bezels, of which at least some belonged to the elite class of signet rings.

The study of Mycenaean bezel rings has shown that most of them have a beaten hoop with a hollow or solid bezel soldered onto it (Xenaki-Sakellariou 1989, 326). Solid-cast bezel rings necessitated a larger quantity of precious material and a much higher degree of technical ability. Like their hollow counterparts, solid-cast rings usually had the decorative motif either stamped, by means of a tool with a shaped edge, or punched and engraved on the bezel at a later stage (Sakellarakis 1981, 170). Moulds with motifs for the decoration of the bezel do exist, however; some for the bezel alone (for examples from Crete see Sakellarakis 1981, figs. 1–2) and some for the hoop and bezel (FIG. 4 *b*), as is the case with the Eleusis mould inv. no. 4110 mentioned earlier.

Ultrasound analysis by Müller (2003, especially 476 n. 6; 2005) of thirty Mycenaean finger rings from the Herakleion Archaeological Museum (Crete), National Archaeological Museum (Athens), and Olympia Archaeological Museum, showed that only one, namely NAM inv. n. 3178 from Chamber Tomb 90 at Mycenae (Sakellariou 1965, no. 125) was solid cast in one piece (FIGS. 6 *a*–6 *b*).

Müller's analysis further showed that the bezel and hoop of signet rings until recently believed to be solid cast, namely NAM 992 and 993 from the Acropolis of Mycenae and NAM 8084 from Perati, were cast separately. Considering the rarity of solid-cast finger rings, whether signet rings or not, the number of known moulds is relatively large. Hence the hypothesis

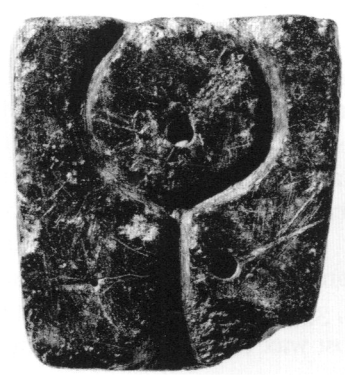

FIG. 5. Mould from Enkomi, Cyprus (courtesy of the British Museum).

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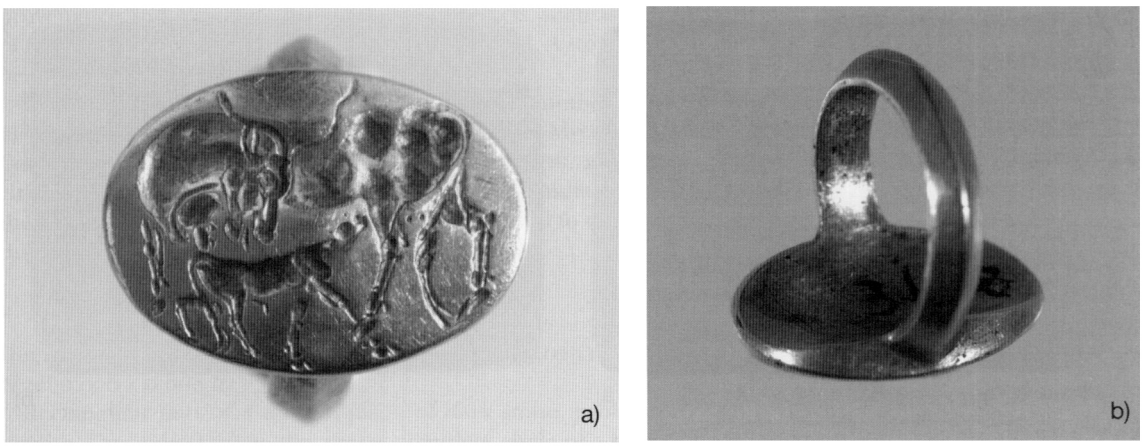

FIG. 6. Signet ring inv. no. 3178; *a*) bezel; *b*) hoop of triangular section, detail of interior.

that these moulds were used to hammer gold plate into shape, either directly or with the use of an intermediate layer of lead (Sakellarakis 1981, 172). They may also have been used to cast finger rings using other materials, such as silver, a metal that oxidizes very easily and quickly, of which no examples have yet been found (Konstantinidi 2001, 6).

It has also been argued that the stones used for Mycenaean moulds are relatively soft in order to facilitate engraving, and that they could not have been used for casting metal (Higgins 1980, 18). The mould for plain rings from Thebes preserves traces of molten metal on one side (Demakopoulou 1974, 166–7) although one could argue that these are the remains of the stamping process by means of a tool mentioned earlier. Normally, a stone mould has to be heated prior to casting, otherwise the metal will immediately cool the moment it comes into contact with it, so preventing the mould from being filled. Experiments, however, showed that steatite, the stone used for most of the moulds, can be heated to 1100° C and suffer only a very small percentage of shrinkage (Evely 1992, 29–30) and so be able to tolerate the molten gold (MP of 1063 °C, or lower, when mixed with copper/silver).

If the moulds were not used for casting, they may have been used to make wax models, themselves then used in the lost wax technique.[2] Because of its fluidity, wax makes perfect casts and reproduces the slightest surface detail, thus saving the craftsman time and labour (Untracht 1975, 351). Chunks of beeswax have been found on sites like Kommos (Shaw and Shaw 1995, 497–523), sometimes together with pieces of resin, as part of workshop equipment. The mixture of these two materials is still used today in this technique (Untracht 1975, 358), in order to improve the quality of the model. Furthermore, there is evidence that the lost wax technique was already known in Egypt and the Levant during that period.[3]

[2] For the same reason it has been suggested that all Mycenaean jewellery moulds were used for casting glass or faience. Sakellarakis 1981, 172, lists the arguments for both theories.

[3] For the technique of casting solid metal finger rings during the New Kingdom and later, see Andrews 1990, 85–6; for the use of the technique in Egypt and the Levant, see Laviosa 1967, 507–9; for actual wax models, see Noble 1975.

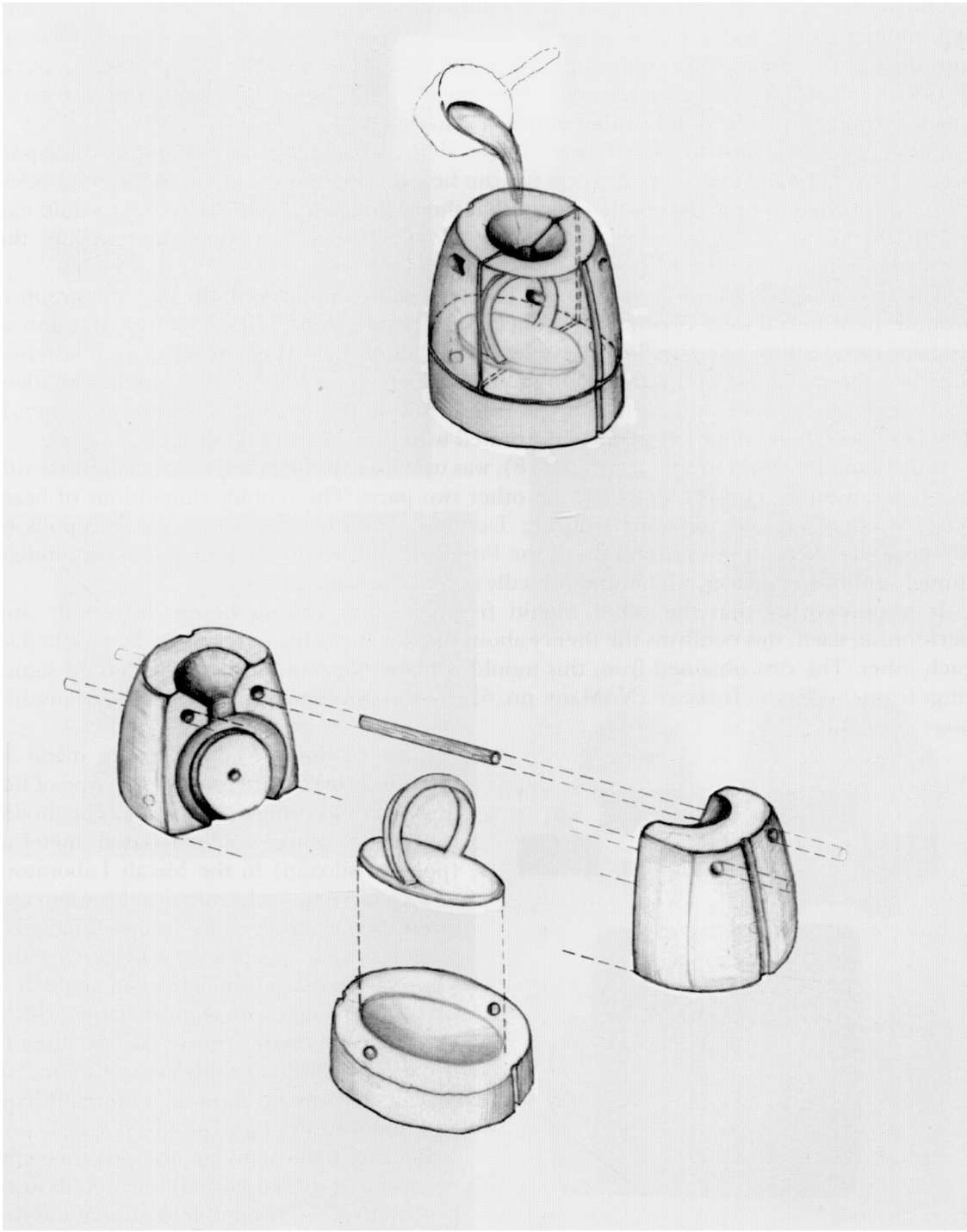

FIG. 7. Drawing of a three-part mould, based on inv. no. 17976.

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One of the challenges of casting lies in the difficulty of filling the entire cavity of the mould with molten metal. Today, this is achieved mechanically with the use of centrifugal force by introducing the metal while spinning the mould quickly around its axis (Untracht 1975, 371–2). Centrifugal force is necessary for the metal to fill the entire mould and give an as much accurate reproduction possible of the original piece.

Either way, the construction of bezel finger rings would have necessitated a three-part mould (two parts for the hoop and one for the bezel). Our two examples and mould NAM 1021 correspond to one-third of the mould that they belonged to. The three parts would clip together (FIG. 7) by means of metal (copper alloy) flat wire and rivets inserted into the preserved holes.

This type of wire is known from Gournia (Crete) (where moulds with the wire still wrapped around them *in situ* were excavated), Menelaion (Sparta), and the Unexplored Mansion at Knossos (see Catling 1984, 218–19 for relevant bibliography). After the parts were fastened together, the metal was poured into the mould and left to cool before the mould was taken apart again, sometimes causing it to break (see break on the edge of NAM inv. no. 17976). The bezel was then either left plain or decorated with punches and other tools.

A third mould, NAM inv. no. 2736 (FIG. 8), was used to cast the bezel; it is rectangular, with two holes at either end for attaching the other two parts. The mould (dimensions of bezel 0.037 × 0.025 m) was discovered during Tsountas' 1890 excavations at the Acropolis of Mycenae. It is kept in the storerooms of the Prehistoric Collection together with two similar, though unfinished pieces, which undoubtedly served the same purpose.

It is noteworthy that the other mould fragments, for casting hoops, bear only one perforation each: this confirms the theory about the way the three parts would be attached to each other. The cast obtained from this mould is plain ellipsoid, of the type seen on signet rings from the Tiryns Treasure (NAM inv. no. 6210) and the cemetery of Perati (NAM inv. no. 9047).

FIG. 8. Mould inv. no. 2736 for the cast of a bezel.

Casts of the two moulds were made in order to provide evidence for the type of the finished finger rings (FIG. 9 *a–g*). The model was made using a silicon-based material (polyvinylsiloxan) in the Metals Laboratory of the National Archaeological Museum. An interesting feature is the hoop's triangular section, which was obtained by carving the stone with a sharp tool held at an angle. It is possible to suggest that most hoops with a triangular section were cast, as already shown by Müller's analyses. Carving a rounded groove on a mould is more difficult and time-consuming.

Because their manufacture took time and necessitated special skills, stone moulds were probably reused several times. If that was the case, they might not have been used for directly casting metal, as even steatite cannot

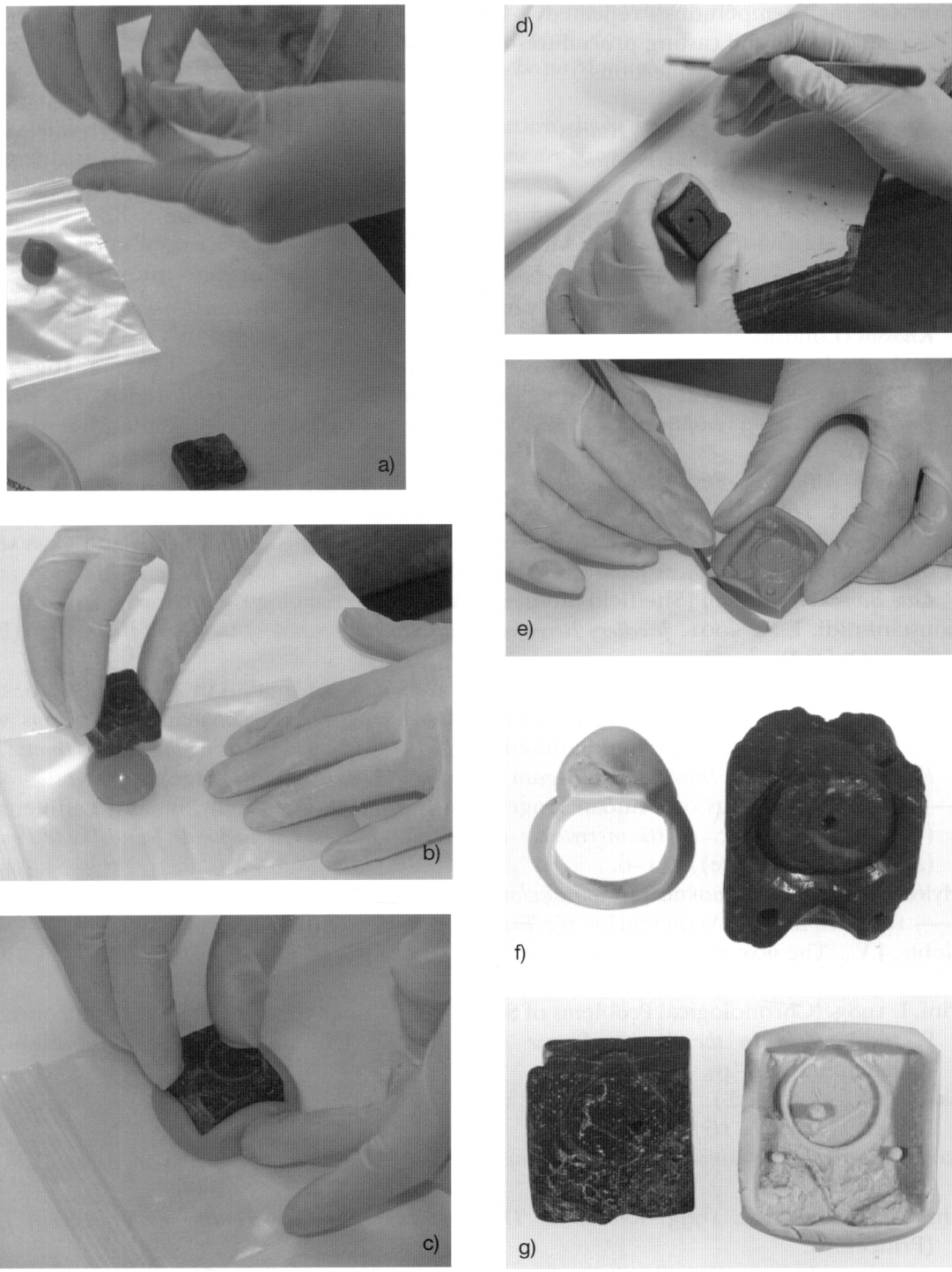

FIG. 9. *a–g*) Stages of the cast making for moulds inv. nos. 17976 and 18128.

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withstand high temperatures repeatedly. They were rather used for producing wax models. The simulation of the casting procedure by the authors and a team of experts is expected to provide answers to these questions.

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