

# X-RADIOGRAPHY OF KNOSSIAN BRONZE AGE VESSELS: ASSESSING OUR KNOWLEDGE OF PRIMARY FORMING TECHNIQUES<sup>1</sup>

## HISTORY OF RADIOGRAPHY OF CULTURAL MATERIALS

WHEN Wilhelm Röntgen discovered X-rays in 1895, this opened up a new way for people to 'look through things' (Röntgen 1896). While the first published images demonstrated the technique's potential for medical uses, X-rays of Peruvian and Egyptian mummies soon established its potential also for archaeological applications (Culin 1896; Petrie 1898). However, it was only in the 1930s that archaeologists began to employ X-rays for artefacts. Since then, X-radiography has become a tried and tested tool for the investigation of paintings, metals, ceramics, textiles, stone, and paper objects as well as geoarchaeological applications to soils and sediments (for a useful summary, see Lang and Middleton 2005). Among the most common uses of X-radiography of cultural materials are: (1) identification of the object and its condition; (2) identification of manufacturing method(s); (3) identification of material(s); (4) identification of joins, faults, breaks, repairs and reuse; (5) identification of finishing methods and decoration; (6) identification of forgeries. Given its range of applications, X-radiography has become a particularly valued tool among museum and gallery conservators (Gilardoni 1994; Graham and Eddie 1985; Lang and Middleton 2005). More recently, scholars and practitioners have been exploring the potential of other radiological techniques, such as stereoradiography, computer-assisted tomography (CAT) and microfocus radiography; their application to cultural material, especially regarding the study of mummies, is expanding rapidly (Halmshaw 1995; Vandiver *et al.* 1991; Lang *et al.* 2005).

## HISTORY OF RADIOGRAPHY OF CERAMICS

The earliest application of X-radiography to ceramics is the radiograph of seven sherds from North American Indian burials published by Titterton (1935) in order to illustrate differential proportions of inclusions. A decade later, Digby (1948) employed the technique to investigate a defect in the construction of a Peruvian stirrup-handled pot. Van Beek (1969) was the first to use X-radiography to investigate forming techniques. However, it was only in 1977, with the publication of a seminal paper by Rye (1977; cf. 1981), that the potential of X-radiography for ceramics was fully appreciated. Although it is only now, with a better appreciation of the power of imaging software programmes, that X-radiographic research into ceramics is gaining momentum (O'Connor and Maher 2001; O'Connor *et al.* 2002).

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Characterization of clay fabrics through inclusion or tempers and identification of manufacturing techniques are the two main topics of investigation. The former has been dealt with in some detail elsewhere (Berg 2008). The latter will form the main focus of this paper (for general summaries, see Carr 1990; Middleton 2005).

#### IDENTIFYING VESSEL FORMATION PROCEDURES

Since its first application, X-radiography has established itself as a powerful technique for the identification of primary forming methods—in particular, pinching, drawing, coil-building, slab-building, moulding and wheel-throwing. It was Rye who first recognized that ‘the application of pressure to plastic clay causes mineral particles, voids and organic fragments to take up a preferred orientation’ which will affect the whole clay body (FIG. 1). The resulting alignment and distribution of inclusions (as well as shape and orientation of voids) is characteristic of each forming method and will not normally be obliterated by secondary forming or decoration procedures (Rye 1977, 206). Pinching can be recognized by an alignment of inclusions parallel to the surface, but without a recognizable horizontal or vertical orientation. Drawing orients inclusions weakly vertically when viewed in cross-section, and voids appear flattened and circular when viewed normally. Coiling results in a preferred horizontal orientation of inclusions and elongated, horizontal voids. Inclusions aligned parallel to the surface, but without a predominant orientation, is a characteristic pattern of slab-building. Moulding produces a parallel, but random alignment to the surface. Lastly, inclusions aligned parallel to the surface, but set at a diagonal orientation when seen from the front are characteristic of wheel-thrown pots (Rye 1981). Coil, slab, or section joins, especially when not obliterated fully by secondary techniques, can provide additional clues for the identification when elongated voids between the two joining parts are visible on the X-radiograph (Glanzman 1983). Many scholars have employed radiography successfully (Carmichael 1990; 1998; Ellingson *et al.* 1988; Foster 1983; Henrickson 1991; Levi 1999; Magrill and Middleton 2004; Nenck and Walker 1991; Philpotts and Wilson 1994; van Beek 1969; Vandiver *et al.* 1991; Vandiver and Tumosa 1995), but the two most detailed case studies were undertaken by scholars working in the Near East. In their diachronic study of Baq’ah pottery, Glanzman and Fleming were able to show that, contrary to the common assumption of an evolutionary sequence from hand-building techniques to the potter’s wheel, the Baq’ah LB I wheel-throwing tradition was replaced by a coil-building one in the LB II and Iron I A periods (Glanzman and Fleming 1986; see also Glanzman 1983). Meanwhile, Vandiver employed radiography to reconstruct one specific forming technique, namely sequential slab-building, in the Zagros region of modern-day Iran (1987; 1988). Some of the most intriguing case studies utilizing X-radiography revolve around the detection of hidden vessel parts and added sections, such as the whistling mechanism in Peruvian pots and the fake spout of Aegean stirrup jars (Digby 1948; Leonard *et al.* 1993).

Secondary forming techniques (such as scraping, trimming, and turning) and surface treatments are almost impossible to verify radiographically, because they do not generally involve severe modification of the clay that would be reflected in an X-radiograph (Berg 2008). They are therefore best identified visually. The exception is the paddle and anvil technique, which applies such considerable pressure to the shape that it can obliterate all radiographically visible attributes of the primary forming technique. As a consequence, even when all visible paddle marks have been removed from the vessel surfaces, it may still be

possible to identify the technique by its characteristic pattern of inclusions with a laminar appearance and oriented parallel to the surface; sometimes one can also detect distinctive star-shaped cracks around the larger mineral inclusions (Rye 1981).

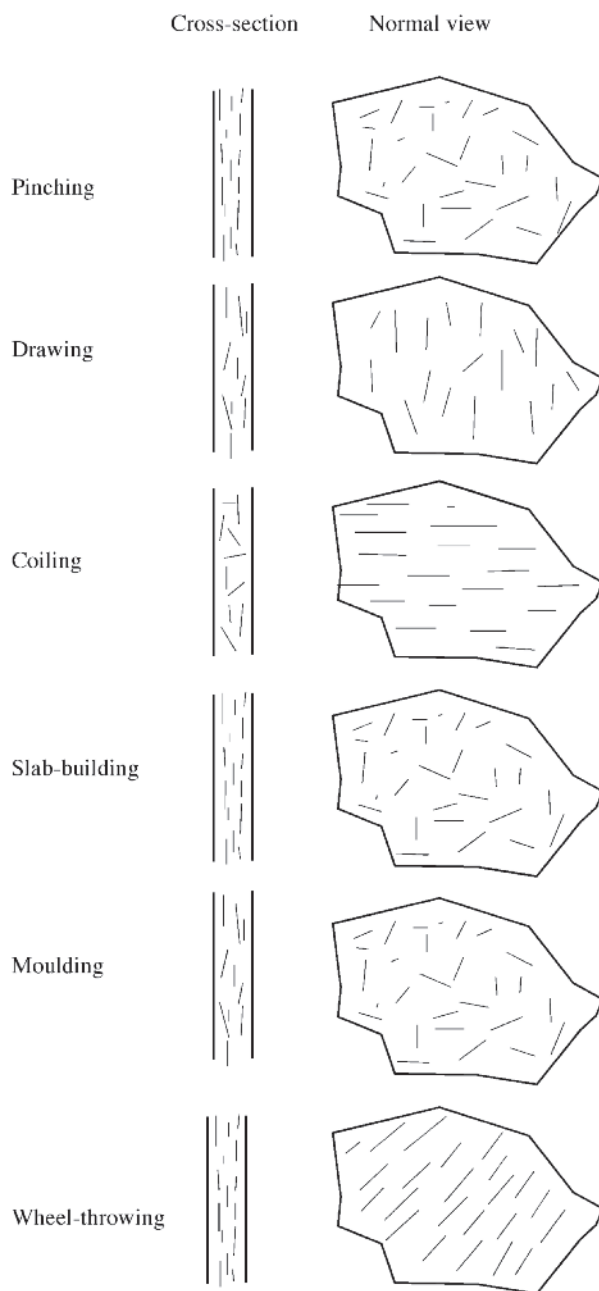


FIG. 1. Characteristic features of the main pottery forming techniques (after Carr 1990, fig. 1; Rye 1981; Middleton 1995, fig. 4. 8).

## RADIOGRAPHIC CASE STUDIES APPLIED TO GREEK BRONZE AGE CERAMICS

So far, radiographic techniques have not been widely employed in Aegean pottery studies. Analysis of East Cretan Dark-on-White Ware and LH III Mycenaean stirrup jars present the only published applications of this technique to Greek Bronze Age pottery known to the author. In both cases, the investigators had to rely on museum's pieces (Museum of Pennsylvania and the British Museum, respectively: see Johnston and Betancourt 1984; Leonard *et al.* 1993). The only example of a study undertaken in Greece is provided by a collection of fifth-century BC Punic amphorae from Corinth (Maniatis *et al.* 1984). All three case studies are examples of highly informative interdisciplinary projects which employed radiography in combination with physico-chemical analyses, visual inspection, and replication studies to investigate the forming technique and fabric composition in relation to a distinct ceramic ware or vessel shape. For example, Johnston and Betancourt (1984) established that East Cretan White-on-Dark ware pots were built up from strips and that their clay preparation was irregular. Leonard *et al.* (1993) were able to document two different ways of making stirrup jars, while Maniatis *et al.* (1984) demonstrated radiography's ability to assign individual vessels to two different fabrics. Despite its acknowledged potential, no projects have since applied the technique to ceramic material located in Greece.

## RADIOGRAPHY: THEORY, METHODS, AND CERAMIC ANALYSIS

A wide range of excellent specialist books is available on industrial and medical radiology which will provide the inquisitive reader with information on all theoretical and practical aspects of the technology (Halmshaw 1995; for literature targeted at an archaeological audience, see Carr and Riddick 1990; Lang and Middleton 2005). Here, I shall limit myself to a brief overview.

To put it simply, X-radiography is a type of electromagnetic radiation that penetrates objects in proportion to the atomic density of the materials and thickness of the object, and captures the outgoing radiation as a greyscale image on a photographic film or monitor. Results can be modified by adjusting a wide range of variables, including type of film, strength of the current, tube voltage, exposure time, positioning of the object as well as the addition of filters or screens. Once developed, the resulting image can then be scrutinized under a strong light and archived. If not already captured directly in digital format, bespoke radiographic scanners permit rapid digitization and subsequent archival storage (O'Connor and Maher 2001). Once digitized, advanced filters and edge detection kernels available for imaging software programmes can be applied to bring out even small details (O'Connor *et al.* 2002; Lang *et al.* 2005).

The advantages inherent in radiography make it a formidable analytical tool for ceramic specialists: (1) it is a non-destructive technique; (2) it permits investigation of sherds *and* complete vessel; (3) it can be done comparatively rapidly and cheaply; and (4) suitable medical or industrial facilities are available in many places. As a consequence, radiography has established itself as an apt complementary technique for conventional destructive and small-scale provenance analysis (Blakely *et al.* 1989; Maniatis *et al.* 1984). However, its greatest advantage lies in its ability to complement visual inspection. Up to now, pottery specialists have relied on traces of the potting process on the vessels themselves to make judgements about the forming technique(s), which sometimes are inaccurate. Based on the existence of

rilling around the interior and/or exterior, concentric striations on the base and compression ripples around the neck, for example, pottery specialists profess to be able to distinguish handmade from wheelmade vessels macroscopically (Courty and Roux 1995; see also Pierret *et al.* 1996 for quantitative procedures). However, even specialists acknowledge that these features may be associated with other techniques besides wheel-throwing, particularly those involving the wheel as a secondary procedure (Roux and Courty 1998). Concentric striations on vessels bases are not exclusively associated with wheel-made production, as they merely indicate the use of a rotational movement at the time of removing the vessel from the bat. Likewise, ripples on the inner vessel walls only occur in the final stage of shaping a pot and are thus not necessarily related to the primary forming. Owing to the polysemic nature of these features and the obliteration of primary forming techniques by secondary ones, only radiographic techniques (as well as destructive and partial thin-section analysis) can safely distinguish between wheel-throwing and wheel-coiling (Berg 2008; Henrickson 1991; Roux and Courty 1998; Courty and Roux 1995), while visual observations are more suited to identifying secondary procedures.

While the last thirty years have seen much advancement in the technical aspects of the technique as well as analytical procedures and practices, X-radiography has some limitations which need to be borne in mind and relate both to the technology itself and ancient potting practices. Technological limitations concern the quality of the film and our inability to distinguish visually between materials with a similar radio-density. Likewise, ancient potting practices can make interpretation difficult, especially when the clays are so refined that they lack large inclusions or when they are so packed with temper that they impede visibility. Additional difficulties can be encountered when secondary forming techniques are so invasive that they obliterate traces of primary methods completely or when primary forming techniques (especially coiling) are so masterly executed that they leave no radiographically visible features. These drawbacks can sometimes be overcome by the use of 'thick sections' pioneered by Glanzman (1983) and Vandiver (1987; 1988) whereby a complete vertical profile is cut off the vessel and the cross-section X-rayed. Coil or slab joins as well as inclusion alignments are more clearly visible, but this procedure will of course result in larger-scale destruction of the ancient vessel. Experiments show that an average identification success rate of around 60–70% can be expected, as regards conventional X-radiography.

## METHODOLOGY

Altogether, ninety-five open and closed coarse, semicoarse and fine EM III through to LM II vessels stored in the Stratigraphical Museum at Knossos were selected for analysis. In addition to comparative ease of accessibility, temporal coverage and sufficiently large sample size, Knossian material was chosen for the following reasons: first, to establish the viability of using X-radiography on Cretan material. Second, to demonstrate the feasibility of undertaking such work in-house on Crete itself.<sup>2</sup> Third, with most of the previous work conducted on the finer wares, it was important to investigate the technique's potential for all fabrics, including fine, semicoarse and coarse pottery. Fourth, to investigate further the technique of wheel-coiling

<sup>2</sup> Subsequent to the completion of this project, the X-ray machine was purchased by the INSTAP Study Centre for East Crete, and this now provides an easily accessible

means of undertaking high-quality industrial X-radiography on the island itself.

(i.e. coil-building a vessel whose walls are subsequently evened out on a slowly revolving turning device) as practised at Knossos and establish its temporal progression (for wheel-coiling, see Berg 2008; Roux and Courty 1998; Courty and Roux 1995; for different forming techniques on Crete, see Knappett 1999; 2004; Poursat and Knappett 2005; MacGillivray 1998; 2007). Fifth, to explore the existence of combination vessels (i.e. vessels where different sections have been made using different primary forming techniques) as suggested by the X-ray analysis of vessels from the British Museum collection (Berg and Ambers forthcoming). Finally, and most importantly, to offer additional evidence on the nature of the adoption of the potter's wheel from MM I B onwards.<sup>3</sup>

Most vessels are fragmentary; the few complete vessels primarily consist of cups. Wherever possible, a representative cross-section of different open and closed vessel types was chosen, although the Late Bronze Age remains underrepresented. Many of the vessels are unpainted or have simple monochrome decoration. Many are made of coarse clays; however, a deliberate effort was made to include also semicoarse and finer fabrics to assess their suitability for X-radiography.

X-radiography took place at the Stratigraphical Museum at Knossos using a Faxitron single cabinet X-ray unit with a 0.5 mm focal spot at 60 cm source-object distance and at 3 mA. The X-ray film used was an industrial Agfa D4 film. Films were developed manually using an Agfa G128 Developer and Agfa G328 Fixer. Digitization of the images took place at the University of Bradford using their Agfa FS50B industrial radiographic film scanner. The images were stored as 12-bit TIFF and lossless JPEG files. Advanced filters and edge detection kernels available for imaging software programmes were applied to make minute details even more visible.

#### CATALOGUE INFORMATION

As originally established by Rye (1977; 1981) specific primary forming methods can be confidently identified using X-radiography because each method imprints its own specific signature onto the clay structure. To give the reader sufficient information to reproduce and reassess the decision making process that led to the identification of a specific forming technique, each catalogue entry summarizes the most relevant information: wall thickness and regularity; void/fissure quantity, size, shape, and orientation; inclusion quantity, size, shape, and orientation; coil seam visibility and size. Colour changes on the X-ray are a direct indicator of changes in wall thickness as thicker walls are represented by lighter colours, and thin walls are characterized by darker colours. Changes in wall thickness can provide circumstantial evidence for forming techniques as wheel-thrown pots get gradually thinner towards the rim, while handmade ones can retain the same thickness throughout. Horizontal or vertical irregularity of wall thickness—again visible through colour changes on the X-ray—can provide circumstantial evidence of specific forming techniques, such as pinching, drawing, beating, and coiling. Void/fissure orientation is essential to establishing forming technique; their quantity and size can serve as indicators of the amount of water added during the manufacturing process; appreciation of their shape can help distinguish between voids caused

<sup>3</sup> An article in preparation will deal exclusively with this issue.



through coil building and voids created by applying rotative kinetic energy. Inclusion orientation is essential for identifying primary forming techniques, whereas recording quantity, size, and shape of inclusions helps assess the overall visibility contrast between clay matrix and particles (Berg 2008). Coil seams can be identified either by not fully obliterated voids or by layers of horizontal inclusions where two coils meet. Where possible, the size of individual coils is measured, but, if visibility is poor, intermediate coils might be missed out; where this is suspected, no height is provided. Each entry concludes by contrasting the identification of the vessel's *primary* forming technique based on macroscopic observation (carried out prior to radiography) and that derived from radiographically visible features. Secondary forming techniques are not discussed any further as they do not leave distinct radiographic signatures. An exception is made with regard to wheel-coiling. This is the use of a rotating potting device, which does not reach speeds high enough to develop rotative kinetic energy to pull up a vessel; instead it is merely used to join, thin, or smooth the walls that have been built using a handmade technique. 'Wheel-thrown', on the other hand, denotes vessels made on a fast rotating device which developed rotative kinetic energy to pull the vessel wall up; 'coiled' refers to vessels built up by placing coils on top of each other; 'drawing' identifies vessels where the walls were pulled up vertically with the fingers. 'Pinching' denotes a vessel which has been made by squeezing the clay between the fingers. Having been based on experimental data from modern control groups, the reliability of the identification is extremely high; in about 70% of cases the forming technique can be established with the greatest confidence. The remainder of the vessels did not leave enough visible traces for a confident determination of the technique: where it is clear that vessels were not made using a fast-spinning device, but where the precise primary forming technique is impossible to identify, the term 'handmade' has been used. Vessels that cannot be clearly identified as having been wheel-thrown or handmade are classified as 'uncertain'. 'IB' refers to the author's original cataloguing system.

## A GUIDE TO INTERPRETING X-RADIOGRAPHS

To demonstrate how one progresses from image to interpretation, two brief case studies from the catalogue are presented here to explain the meaning of the main features.

As outlined above, the main features to consider in the interpretation of any X-ray in relation to primary forming techniques are: wall thickness and regularity; shape, orientation and abundance of any voids; existence and spacing of coil seams; and the orientation of inclusions.

### WHEEL-THROWN

In relation to **16**, a carinated cup, we can observe the following (PLATE 9): the colour change from a relatively white base (indicating less penetration of X-rays and hence a thicker wall) to a darker rim (indicating greater penetration of X-rays and hence a thinner wall) demonstrates that the wall is getting progressively thinner from the base towards the rim. While this does not speak against a handmade vessel, it is a natural and inevitable feature of wheel-thrown pots using a single lump of clay. This is because the lower part needs to be stronger in order to support the upper part—equal wall thickness would most likely lead to the collapse of the vessel. The regular rilling along the vertical axis can also be achieved using the wheel-coiling

technique, but is commonly associated with wheel-thrown vessels. The rilling is visible on the X-ray through the changing wall thickness whereby whiter and darker areas alternate. Black gaps (indicating very thin layers of clay or no clay) in vessel wall are voids. These voids are a consequence of kneading the clay (the more thorough the kneading, the small and fewer the voids), the amount of water used in throwing the pot (the more water, the more voids) and the stresses exerted by potter onto the pot during the throwing process. Elongated voids indicate that the clay was compressed with one hand either side of the wall and then lifted up. As lifting is done while the vessel is turning, the lift occurs in a diagonal direction. This is mirrored in the diagonal orientation of the voids and is a clear indicator for wheel-throwing. Theoretically, the angle of the elongated voids could provide information about the speed of the manufacture (the steeper the angle, the faster), but in reality, the manufacturing process is too complex for a direct equation (Berg 2008). Inclusions can incorporate a wide range of materials and, depending on the material and its atomic density, might be seen clearly against the clay background (if they are considerably less or more dense than the clay) or blend in perfectly (if they have a similar density to the clay) (Berg 2008). While there is a tendency for wheel-thrown vessels to have smaller and fewer inclusions, the size, frequency, sorting, or type of inclusions do not within themselves provide a guide to forming technique. However, when inclusions are elongated they can, just like voids, indicate direction of pressure (e.g. diagonal for wheel-throwing). In this pot, most of the inclusions are rounded and thus cannot provide further information on the forming technique.

#### COILED

The X-ray of **18**, a jug with cut-away spout, shows characteristics typical of a coiled vessel (PLATE 9): unlike wheel-thrown pots which progressively get thinner towards the rim, handmade vessels can have multiple wall thickness changes. Here the vertical colour change from white (base) to black (body) to white (shoulder) and back to black (neck) indicates that the wall is getting thinner from base to below the shoulder and then thickens drastically in the shoulder section and gets thinner again for the neck. In addition, the colour variations along the horizontal axis at the height of the widest diameter shows that fingers had applied pressure unevenly—a typical occurrence in handmade vessels. Voids are abundant, which indicates that kneading was not as thorough as it could have been, possibly owing to the many large inclusions; they are short to medium in dimensions, reflecting the lack of water and the fewer stresses exerted by the potter during the making of this pot; they are elongated in shape, which is characteristic of coil-manufacture as can be seen in modern X-ray experiments (Berg 2008).

Most telling, however, is their orientation. The same experiments have demonstrated that the making of coils will invariably result in a horizontal alignment of the voids (and/or inclusions) when viewed frontally on an X-ray—as is the case here. Voids become particularly meaningful when they are the result of air trapped between two overlaid coils. In those instances, we can identify the actual coil seams. Here, five coil seams can be recognized. The closest distance between the seams is 1.5 cm. As coils are unlikely to be thinner than 1 cm for practical reasons, we can assume that the measurement of 1.5 cm provides us with the height of the coils once added to the vessel. The inclusions are moderate in amounts and show very poor sorting as they range from small to very large ones. While inclusion size is by no means a fail-safe indicator of manufacturing technique, the use of large and very large inclusions is



more common in handmade vessels as they would be too rough on the potter's hands when wheel-throwing and could potentially damage the whole structure of the wheel-thrown vessel when dragged along by the fingers. Most of the inclusions are rounded and thus lack an indicative orientation. However, they can be of some help when considered in conjunction with the voids: when coils are rolled out and placed on top of each other, inclusions that have been pushed to the outside will be lodged against each other, thus creating a double layer of inclusions that follows along the seam and can be visible on the X-ray as in this case. Frequently, this double layer can be seen in conjunction with voids trapped between the two coils and thus provides another signpost for the identification of coil seams.

#### WHEEL-COILED

While wheel-coiled vessels may appear wheel-thrown macroscopically due to the existence of rilling, the forming techniques are fundamentally different. Wheel-coiled vessels utilize the coiling method as primary forming technique, subsequently followed by spinning on the wheel as a secondary forming technique. Wheel-coiled vessels are spun either at speeds not high enough to develop rotative kinetic energy (RKE) and the wheel is merely used to join, thin or smooth the walls that have been built using a handmade technique, or they are spun at speeds sufficient to develop RKE, but this is not taken advantage of. Experiments undertaken by Roux and Courty have identified four different methods of wheel-coiling (then called 'wheel-shaping') depending on the stage within the production process during which RKE is applied, with Method 4 using the wheel most forcefully (1998; also Courty and Roux 1995). They concluded that all methods can potentially be distinguished by characteristic features detectable through visual inspection and optical microscopy. As demonstrated through experiments elsewhere (Berg 2008), X-radiography is a reliable method to distinguish between the two forming techniques as it investigates the primary forming. Thus, unlike wheel-thrown pots which have characteristic diagonal alignment of inclusions and voids, wheel-coiled vessels (Roux and Courty's Methods 1 and 2) will have a horizontal one indicative of coiling as the primary forming technique. Recent analysis of X-ray films of Method 4 wheel-coiled vessels undertaken by the author shows a mixture of firmly horizontal and very lightly angled inclusions and void orientation. In all cases, wheel-coiled vessels could always be firmly identified as such using X-radiography; they cannot be confused with the wheel-throwing technique.

Thus wheel-coiled vessels can be identified by a mismatch between the X-ray image and macroscopic observations: the X-ray image will show the presence of coil seams and/or a horizontal orientation of inclusions and voids indicative of the primary forming (see above, 'coiling', for details). In contrast, observation by eye will normally show strong rilling indicative of subsequent shaping on the wheel. An example of a wheel-coiled vessel is 92. The X-ray of this vessel shows several horizontal coil seams, but the observed rilling on the interior and exterior appears to indicate wheel-throwing.

#### COMBINATION TECHNIQUES

As an X-ray of a Middle Minoan amphora in the British Museum has shown (lower third wheel-thrown; middle third coiled and drawn; upper third coiled), not all potters use the same forming technique throughout the whole vessel profile (Berg and Ambers forthcoming). Instead, pots might be made in different stages, by different techniques, and

possibly even made by different potters with different levels of expertise. Thus, 'combination techniques' indicate the existence of at least two different primary forming techniques along one vessel profile. Few confirmed (**1**, **68**) or potential (**13**, **17**, **59**, **67**, **76**) 'combination techniques' vessels have come to light in the sample X-rayed.

## CATALOGUE

### EM III/MM I A

#### **1** Rounded cup (PLATE 10) (IB 89)

Rim-to-base fragment; handle missing. H. 6.4 cm.

'Floor deposit' of House A.

Momigliano 1991, 216–20 n. 10, fig. 20, pl. 42.

Wall: uneven thickness; punctuated irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated and irregular shapes; horizontal (body) and diagonal (base) orientation.

Inclusions: moderate in quantity; small to medium in dimensions; elongated and rounded shapes; preferential horizontal orientation.

Coil seams: none visible.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade [with subsequent shaping on wheel].

Forming technique (X-ray): base: wheel-thrown, body: wheel-coiled and drawn, rim: wheel-coiled.

#### **2** Footed goblet (PLATE 10) (IB 83)

Rim-to-base fragment. H. 9 cm.

Upper East Well.

Momigliano 1991, 155–63 n. 2, fig. 1, pl. 19.

Wall: thinning towards rim; patchy irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; medium to large in dimensions; predominantly rounded shapes; no orientation.

Coil seams: 4 probable.

Coil height: 1 cm.

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

#### **3** Footless goblet (PLATE 10) (IB 88)

Chipped rim. H. 7.9 cm.

'Floor deposit' of House A.

Momigliano 1991, 216–20 n. 7, fig. 20, pl. 42.

Wall: except for thick base, similar thickness throughout; no irregularities.

Voids/fissures: abundant in quantity, short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to large in dimensions; mainly rounded shapes; no orientation.

Coil seams: 2.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): secondary knife trimming has obliterated all traces of primary forming.

Forming technique (X-ray): coiled [with subsequent knife-trimming].

#### **4** Flaring bowl (PLATE 10) (IB 92)

Rim-to-base fragment. H. 5.8 cm.

House A.

Momigliano 1991, 216–20, vessel not illustrated.

Wall: similar thickness throughout; few irregularities.

Voids/fissures: virtually non-existent.

Inclusions: abundant in quantity; medium in dimensions; mainly rounded and some oval shapes; no recognizable orientation.

Coil seams: none.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): coiled?

Forming technique (X-ray): handmade?

**5 Flaring bowl (PLATE 10) (IB 84)**

Two joining rim-to-base fragments. H. 8.3 cm.  
House A.

Momigliano 1991, 216–20, vessel not illustrated.

Wall: thick base and rim, thinner body; some irregularities along horizontal axis.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and rectangular shapes; rectangular ones have preferential horizontal orientation.

Coil seams: none.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**6 Beaked jug (PLATE 11) (IB 96)**

23 joined and partially restored rim-to-body fragments with handle, spout missing; H. 19.9 cm.

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Momigliano 2000, no. 54, fig. 12, pl. 20 c.

Wall: getting thinner towards widest diameter, thicker up to neck/shoulder joint, neck thin; few irregularities.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and elongated shape; elongated ones have horizontal orientation.

Coil seams: 2 (shoulder).

Coil height: 1.0 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**7 Spouted jar (PLATE 10) (IB 87)**

Rim to upper body fragment with damaged spout; H. 13.5 cm.

Upper East Well.

Momigliano 1991, 155–63, vessel not illustrated.

Wall: same thickness throughout except for thick rim; patchy irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small to medium in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; large in dimensions; predominantly rounded in shape; some elongated ones; no orientation.

Coil seams: 1.0 (rim).

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): handmade.

**8 Spouted jar (PLATE 11) (IB 85)**

6 joined shoulder-to-body fragments, spout missing; H. 19.9 cm.

Upper East Well.

Momigliano 1991, 153–63, vessel not illustrated.

Wall: same thickness throughout except for thicker rim; irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small to medium in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; large in dimensions; predominantly rounded shape; no orientation.

Coil seams: none.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): handmade.

**9 Side-spouted jar (PLATE 11) (IB 86)**

Rim-to-base fragment with spout, handle missing; H. 7 cm.

Upper East Well.

Momigliano 1991, 155–63 n. 39, pl. 21.

Wall: getting thinner towards rim; elongated patches of irregularities on lower body along horizontal axis, undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; predominantly rounded in shape; no orientation.

Coil seams: 3.

Coil height: 1.3–1.4 cm.

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**10** Cooking vessel (PLATE 11) (IB 91)

2 joined base and lower body fragments; H. 8.9 cm.  
House A.

Momigliano 1991, 216–20, vessel not illustrated.

Wall: consistent thickness throughout except for base region; some irregularities along horizontal axis.

Voids/fissures: rare in quantity; short in dimensions; elongated shape; preferential horizontal orientation, though also some patches with vertical orientation.  
Inclusions: abundant in quantity; small to very large in dimensions; rounded and elongated shapes; elongated ones have preferred horizontal orientation.

Coil seams: 2.

Coil height: 2.0 cm.

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

## MM I B

**12** Saucer (PLATE 11) (IB 95)

Rim-to-base fragment; H. 2.9 cm.

South Front of Palace.

Momigliano and Wilson 1996, P 31, fig. 10.

Wall: regular undulating changes in thickness from base to rim.

Voids/fissures: moderate in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to large in dimensions; rounded to oval shape; oval ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheelmade.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**13** Rounded cup (PLATE 11) (IB 94)

Rim and body fragment, with handle attachments; H. 6.4 cm.

South Front of Palace.

Momigliano and Wilson 1996, P 41, fig. 10.

Wall: getting thinner towards rim; round patchy irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; medium in dimensions; elongated shape; horizontal orientation

**11** Closed vessel (PLATE 11) (IB 90)

4 joined base and lower body fragments; H. 5.4 cm.  
House A.

Momigliano 1991, 216–20, vessel not illustrated.

Wall: similar thickness throughout; light patchy irregularities along horizontal and vertical axis.

Voids/fissures: abundant in quantity; medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; rounded shape; no orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

in upper 1/3, preferential horizontal orientation in lower 2/3.

Inclusions: rare in quantity; small in dimensions; rounded shape; no orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): top 1/3 coiled; bottom 2/3 handmade.

**14** Straight-sided cup (PLATE 11) (IB 59)

Complete except for chipped rim; H. 5.7 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 299, SMP 9558, pls. 1, 33.

Wall: getting thinner towards rim; some irregularities along vertical axis.

Voids/fissures: abundant in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to very large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade [with subsequent knife-trimming and shaping on wheel].  
Forming technique (X-ray): wheel-coiled [with subsequent knife-trimming].

**15** Straight-sided cup (PLATE 12) (IB 66)

Joined from 3 fragments and restored in plaster;  
H. 8.4 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 279, SMP 9619, pl. 40.

Wall: getting thinner towards rim; regular undulating along vertical axis, some irregularities just above base.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated in shape; horizontal orientation.

Inclusions: rare in quantity; small in dimensions; rounded in shape; no orientation.

Coil seams: 4.

Coil height: 1.0 cm.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown or wheel-coiled.

Forming technique (X-ray): wheel-coiled.

**16** Carinated cup (PLATE 12) (IB 58)

2 joined rim-to-base fragments with handle, partially restored in plaster; H. 7.4 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 243, SMP 9631, pls. 3, 41.

Wall: getting thinner towards rim; regular undulating along vertical axis.

Voids/fissures: abundant in quantity; medium to long in dimensions; elongated shape; diagonal orientation.

Inclusions: rare in quantity; medium in dimensions; rounded shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**17** Footed goblet (PLATE 12) (IB 93)

Rim-to-base fragment; H. 7.9 cm.

South Front of Palace.

Momigliano and Wilson 1996, P 33, fig. 10, pl. 5.

Wall: getting thinner towards rim; major irregularities around base.

Voids/fissures: abundant in quantity; small to medium in dimensions; shape crack-like; orientation vertical (and some diagonal) in lower 2/3, horizontal in upper 1/3.

Inclusions: abundant in quantity; small to large in dimensions; square to elongated shape; orientation vertical in lower 2/3, horizontal in upper 1/3.

Coil seams: ?

Coil height: ?

Forming technique (original publication): wheelmade.

Forming technique (visual): handmade [with subsequent light shaping on wheel].

Forming technique (X-ray): lower 2/3 drawn, upper 1/3 wheel-coiled.

**18** Jug with cut-away spout (PLATE 12) (IB 60)

Almost complete, part of handle restored in plaster; H. 11.6 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 331, SMP 9589, pls. 1, 37.

Wall: getting thinner from base to shoulder; shoulder and neck considerably thicker; patchy irregularities around area of widest diameter.

Voids/fissures: abundant in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to very large in dimensions; rounded shape; no orientation.

Coil seams: 5.

Coil height: 1.5 cm.

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**19** Carinated bridge-spouted jar (PLATE 12) (IB 65)

Rim-to-base fragment with spout and one handle; H. 10.5 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 359, SMP 9581, pl. 35.

Wall: except for thick base, similar thickness throughout; irregularities along horizontal and vertical axes.

Voids/fissures: abundant in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; predominantly rounded shape, few elongated ones; elongated ones have horizontal orientation.

Coil seams: 3.

Coil height: 1.5 cm.

Forming technique (original publication): handmade.

Forming technique (visual): wheel-coiled [with subsequent light knife-trimming].

Forming technique (X-ray): wheel-coiled [with subsequent light knife-trimming].

**20** Carinated bridge-spouted jar (PLATE 12) (IB 57)

Largely complete except for chipped spout and rim, handles missing; H. 9.9 cm.

Royal Pottery Stores, Small East Room.

MacGillivray 1998, K 861, SMP 9710, pl. 118.

Wall: getting thinner from base to carination, relatively even thickness above, rim itself thin; square irregular patches along horizontal axis at carination.

Voids/fissures: abundant in quantity; small to large in dimensions; elongated shape; horizontal orientation.

Inclusions: rare in quantity; small in dimensions; rounded and elongated shapes; no orientation.

Coil seams: 5.

Coil height: 1.5–2 cm.

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**21** Three-handled jar (PLATE 12) (IB 62)

Joined from 4 fragments, rim missing, one handle broken; H. 11.6.

Early Chamber beneath West Court.

MacGillivray 1998, K 334, SMP 9656, pl. 45.

Wall: getting thinner towards upper body, shoulder to rim thicker; irregularities along vertical axis.

Voids/fissures: moderate in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: rare in quantity; small to medium in dimensions; rounded shape; no orientation.

Coil seams: 2.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**22** Spouted jar (PLATE 13, bottom and top displayed separately) (IB 61)

Almost complete except for parts of rim and spout, joined from many fragments; H. 24 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 363, SMP 9666, pl. 47.

Wall: similar thickness throughout; irregularities along horizontal axis.

Voids/fissures: moderate in quantity; small and large in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; mainly rounded and some elongated shapes; elongated ones have horizontal orientation.

Coil seams: 6.

Coil height: 1.5 cm.

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**23** Lamp (PLATE 13) (IB 63)

Largely complete, part of rim and handle missing; H. 3.0 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 356, SML 955, pl. 47.

Wall: even thickness throughout; undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; short to medium in dimensions; elongated shape; diagonal orientation.

Inclusions: rare in quantity; medium to very large dimensions; rounded shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**24** Pyxis (PLATE 13) (IB 64)

19 joined rim-to-base fragments, gaps restored in plaster; H. 9.7 cm.

Early Chamber beneath West Court.

MacGillivray 1998, K 320, SMP 9653, pls. 5, 45.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; diagonal orientation.

Inclusion: rare in quantity; small and large in dimensions; predominantly rounded shape, some



elongated ones; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

## MM II A

### **25** Conical cup (PLATE 13) (IB 70)

Complete except for chipped rim; H. 5.1 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; small to medium in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and rectangular shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### **26** Rounded cup (PLATE 13) (IB 68)

Rim-to-base fragment; H. 5.9 cm.

Area encircling the Middle Kouloura.

Momigliano 1991, 236–9, vessel not illustrated.

Wall: similar thickness throughout vessel profile; patchy irregularities along vertical and horizontal axes especially around widest diameter.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to medium in dimensions; rounded to rectangular shapes; preferential horizontal orientation.

Coil seams: none.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

### **27** Straight-sided cup (PLATE 14) (IB 49)

Rim-to-base fragment with handle; H. 6.0 cm.

Floor beneath Room of the Olive Press.

MacGillivray 1998, K 99, pl. 133.

Wall: getting thinner towards rim; irregularities along horizontal and vertical axes.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

Voids/fissures: moderate in quantity; small in dimensions; elongated shape; preferential horizontal orientation.

Inclusions: abundant in quantity; medium to large in dimensions; mainly rounded and few elongated shapes; elongated ones have horizontal orientation.

Coil seams: 3.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

### **28** Carinated cup (PLATE 13) (IB 48)

2 joining rim-to-base fragments with handle;

H. 7.1 cm.

Floor beneath Room of the Olive Press.

MacGillivray 1998, K 94, pl. 134.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; small in dimension; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to large in dimensions; rounded to elongated shapes; elongated ones have preferential diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### **29** Footed mug (PLATE 13) (IB 71)

2 joining rim-to-base fragments with handle;

H. 7.6 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner towards rim; irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated and irregular shapes; preferential horizontal orientation, but also diagonal and vertical.

Inclusions: abundant in quantity; small to large in dimensions; rounded and rectangular shapes; oriented diagonally along rim, horizontal and diagonal on body.

Coil seams: 2 possible ones.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): handmade.

### **30** Footed goblet (PLATE 14) (IB 67)

Rim-to-base fragment; H. 7.0 cm.

Area encircling the Middle Kouloura.

Momigliano 1991, 236–9, vessel not illustrated.

Wall: variable thickness; few irregularities along vertical axis.

Voids/fissures: moderate quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and rectangular shapes; no orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

### **31** Footless goblet (PLATE 14) (IB 69)

Rim-to-base fragment; H. 6.9 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner towards rim; irregularities along vertical axis.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: low in quantity; small to medium in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

### **32** Flaring bowl (PLATE 14) (IB 50)

Rim-to-base fragment; H. 4.8 cm.

Floor beneath Room of the Olive Press.

MacGillivray 1998, K 127.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissure: abundant in quantity; medium to large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to very large in dimension; rounded and rectangular shapes, rectangular ones have preferential diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### **33** Flaring bowl (PLATE 14) (IB 80)

3 joined rim-to-base fragments, one quarter restored in plaster; H. 4.5 cm.

Vat Room deposit.

Momigliano 1991, n. 14, fig. 4, pl. 34.

Wall: same thickness from base to rim; irregularities along vertical and horizontal axes.

Voids/fissures: moderate in quantity; short in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to large in dimensions; square and elongated shapes; no orientation.

Coil seams: 2.

Coil height: 1.3 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

### **34** Flaring bowl (PLATE 14) (IB 74)

Rim-to-base fragment; H. 4.5 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: similar thickness throughout; light irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; preferential horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and rectangular shapes; rectangular ones have horizontal orientation.

Coil seams: 4.

Coil height: 0.8–1.0 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**35** Carinated bowl (PLATE 14) (IB 72)

2 joining rim-to-base fragments with right handle attachment; H. 8.9 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner towards carination, rim thicker; irregularities along horizontal axis on lower body.

Voids/fissures: abundant in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; predominantly rounded shape; no orientation.

Coil seams: none.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**36** Beaked jug (PLATE 14) (IB 81)

4 joining rim-to-base fragments with handle and spout; H. (combined) 17.3 cm.

Vat Room deposit.

Momigliano 1991, 167–75, vessel not illustrated.

Wall: same thickness throughout; irregularities along vertical axis on shoulder and neck.

Voids/fissures: moderate in quantity; short to long in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to large in dimensions; predominantly rounded shape; few elongated ones have horizontal orientation.

Coil seams: 5.

Coil height: 1.0 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**37** Jug (PLATE 15; upper and lower sections in separate images) (IB 54)

Complete except for spout, restored in plaster; H. 33.5 cm.

Area of Polychrome Jug.

MacGillivray 1998, K 891, SMP 9668, pls. 48, 49.

Wall: similar thickness from base to widest diameter, shoulder thicker, neck thinner again; irregularities along vertical and horizontal axes.

Voids/fissures: moderate in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: 7.

Coil height: 1.5–2.0 cm.

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**38** Juglet (PLATE 16) (IB 79)

Complete except for chipped rim; H. 9.6 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: except for thicker base similar thickness up to rim; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to very large in dimensions; predominantly rounded shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**39** Hole-mouthed jar (PLATE 16) (IB 51)

Rim-to-body fragment with handle; H. 17.2 cm.

Early Floor beneath Room of the Oliver Press.

MacGillivray 1998, 42–4; vessel not illustrated.

Wall: thin lower body, then getting thicker towards rim; rectangular irregularities along horizontal axis.

Voids/fissures: virtually absent in quantity, no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; small to large in dimensions; mainly rounded and some elongated shapes; no orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): drawn (lower part), coiled (upper part).

Forming technique (X-ray): handmade.

**40** Necked jar (PLATE 16) (IB 82)

Shoulder-to-base fragment with one handle and one handle attachment; H. 25.3 cm.

Vat Room deposit.

Momigliano 1991, no. 44, pl. 46.

Wall: same thickness from base to rim; irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: 2.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**41** Spouted jar (PLATE 15) (IB 76)

Rim-to-body fragment with tubular spout;

H. 24.5 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: similar thickness throughout except for thin section half-way up; rectangular irregularities along horizontal axis.

Voids/fissures: rare in quantity; medium dimensions; irregular shape; horizontal orientation.

Inclusions: moderate in quantity; medium to large in dimensions; mainly rounded shapes; few elongated ones have horizontal orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**42** Jar (PLATE 16) (IB 53)

7 joined body fragments with vertical handle;

H. 14.8 cm.

Early Floor beneath Room of the Olive Press.

MacGillivray 1998, 42–4, vessel not illustrated.

Wall: similar thickness throughout; irregularities along horizontal axis.

Voids/fissures: virtually non-existent in quantity; no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; large in dimensions; rounded and rectangular shapes; rectangular ones have preferential vertical orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): pinched or drawn.

Forming technique (X-ray): drawn?

**43** Jar (PLATE 16) (IB 75)

2 joining base and lower body fragments;

H. 19.4 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner from base upwards; irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; rounded and elongated shape; elongated ones have horizontal orientation.

Coil seams: 4.

Coil height: 1.0–1.5 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): shoulder: coiled; lower body: handmade.

Forming technique (X-ray): coiled.

**44** Oval-mouthed amphora (PLATE 17; upper and lower sections in separate images) (IB 55)

Rim, neck, shoulder and handles fragment; 4 joined shoulder to lower body fragments; H. (combined) 39.9 cm.

Royal Pottery Stores, Area of the Lime Kiln.

MacGillivray 1998, K 820, SMP 9709, pl. 116.

Wall: similar thickness of body fragment; marked irregularities along vertical axis.

Voids/fissures: moderate in quantity; small to large in dimensions; predominantly irregular air spaces, some elongated ones; horizontal orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; rounded and rectangular shapes; rectangular ones have horizontal orientation.

Coil seams: 13.

Coil height: 1.5–2.5 cm.

Forming technique (original publication): handmade.

Forming technique (visual): lower body: handmade; shoulder: coiled.

Forming technique (X-ray): coiled.

#### 45 Amphora (PLATE 17) (IB 78)

Rim-to-shoulder fragment with handle, base to lower body fragment; H. (combined) 18.6 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: neck has same thickness throughout, no data for shoulder, base fragment getting thinner upwards; patchy irregularities along horizontal axis (base fragment).

Voids/fissures: moderate in quantity; short to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; predominantly rounded shape; no orientation.

Coil seams: 2.

Coil height: 1.5–2 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled [with subsequent drawing or scraping on base fragment].

Forming technique (X-ray): coiled [with subsequent drawing or scraping on base fragment].

#### 46 Amphora (PLATE 17) (IB 56)

Complete; H. 11.4 cm.

Royal Pottery Stores, Area of the Lime Kiln.

MacGillivray 1998, K 816, SMP 9701, pl. 111.

Wall: getting thinner towards upper body, thick around shoulder, thin neck region; irregularities along vertical and horizontal axes.

Voids/fissures: moderate in quantity; short in dimensions; elongated shape; horizontal orientation.

Inclusions: rare in quantity; small to very large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: 3.

Coil height: 1.0 cm.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

#### 47 Tripod cooking pot (PLATE 17) (IB 52)

5 partly joined fragments of rim to base, leg and two handles; H. (combined) 37.3 cm.

Floor beneath Room of the Olive Press.

MacGillivray 1998, K.128, pl. 29.

Wall: same thickness throughout; irregularities along horizontal axis.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to very large in dimensions; predominantly rounded shapes, some rectangular ones; rectangular ones have horizontal orientation.

Coil seams: 3.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade [with subsequent drawing].

Forming technique (X-ray): coiled [with subsequent drawing].

#### 48 Closed vessel (PLATE 17) (IB 77)

Base to lower body fragment; H. 10.5 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7, vessel not illustrated.

Wall: getting thinner towards rim; irregularities along vertical axis.

Voids/fissures: rare in quantity; short in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; small to medium in dimensions; rounded and elongated shapes; elongated ones have horizontal and vertical orientation.

Coil seams: 4?

Coil height: 1.5 cm?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): handmade.

#### 49 Tub (PLATE 15) (IB 73)

Rim to upper body fragment with handle and base to lower body fragment; H. (combined) 20.1 cm.

Monolithic Pillar Basement.

Momigliano 1991, 163–7.

Wall: getting thinner towards rim, rim itself thick; some irregularities along horizontal axis.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; no orientation.

Inclusions: abundant in quantity; medium to large in dimensions; elongated and rounded shapes; no orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): handmade.

## MM II B

### 50 Saucer (PLATE 18) (IB 27)

Rim-to-base fragment; H. 2.4 cm.

KV Trial.

Popham 1975, 186, vessel not illustrated.

Wall: except for thick base, roughly even thickness up to rim; no irregularities.

Voids/fissures: rare in quantity; short to medium in dimensions; elongated shape; horizontal/diagonal orientation (lack of normal view makes it difficult to establish orientation)

Inclusions: abundant in quantity; small to very large in dimensions; rounded and elongated shapes; elongated ones have horizontal/diagonal orientation (lack of normal view makes it difficult to establish orientation)

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated, but wheel-thrown by implication.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): uncertain.

### 51 Conical cup (PLATE 20) (IB 23)

Rim-to-base fragment; H. 4.4 cm.

KV Trial.

Popham 1975, 186, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; long in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### 52 Bell-shaped cup (PLATE 18) (IB 24)

Complete except for chipped rim; H. 5.3 cm.

KV Trial.

Popham 1975, 186, vessel not illustrated.

Wall: getting thinner towards carination, even thickness above it; light undulating irregularities along vertical axis.

Voids/fissures: rare in quantity; small in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; small to medium in dimensions; mainly rounded shapes; no orientation.

Coil seams: 2?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): uncertain.

### 53 Straight-sided cup (PLATE 18) (IB 26)

Complete; H. 8.2 cm.

KV Trial.

Popham 1975, 186, pl. 28 g.

Wall: getting thinner towards upper body, rim section slightly thicker again; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; mainly rounded shapes; no clear orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### 54 Carinated cup (PLATE 18) (IB 25)

Rim-to-base fragment with handle; H. 4.7 cm.

KV Trial.

Popham 1975, 196, vessel not illustrated.

Wall: getting thinner towards rim; undulating irregularities along vertical axis up to carination.

Voids/fissures: abundant in quantity; medium to long in dimensions; elongated shape; diagonal orientation.



Inclusions: moderate in quantity; small to medium in dimensions; mainly rounded and some elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### 55 Small bowl (PLATE 19) (IB 28)

Complete except for chipped rim; H. 3.7 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: getting thinner towards rim, rim itself thick; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; long in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### 56 Flaring bowl (PLATE 18) (IB 29)

Rim-to-base fragment; H. 7.7 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: thick at base, thin middle section, thick rim; light undulating irregularities along vertical axis in body section.

Voids/fissures: virtually absent in quantity; no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; small to medium in dimensions; mainly rounded and some elongated shapes; no orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-coiled.

Forming technique (X-ray): handmade [with subsequent shaping on wheel].

### 57 Large bowl (PLATE 18) (IB 42)

Joined rim-to-base fragments, restored in plaster;

H. 13.9 cm.

Loomweight Basement.

MacGillivray 1998, K 193, SMP 2024, pls. 26, 131.

Wall: similar thickness throughout, rim itself thicker; irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; horizontal orientation.

Inclusions: rare in quantity; small to medium in dimensions; elongated shape; preferential horizontal orientation.

Coil seams: 3.

Coil height: 1.5–2.0 cm.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): coiled?

Forming technique (X-ray): coiled.

### 58 Deep basin (PLATE 18) (IB 43)

3 non-joining rim-to-body fragments with one handle; H. 17.9 cm.

Loomweight Basement.

MacGillivray 1998, K 195, pl. 131.

Wall: same thickness throughout; light undulating irregularities along the horizontal and vertical axis.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to large in dimensions; rounded and elongated shape; elongated ones have horizontal orientation.

Coil seams: 3.

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

### 59 Tub (PLATE 18) (IB 30)

Complete vessel profile with handle, one-third of vessel preserved; H. 15.4 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: except for thick base, similar thickness throughout; some irregularities along vertical axis.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to medium and very large in dimensions; rounded and some elongated shapes; elongated ones have horizontal orientation.

Coil seams: 2?

Coil height: 1.5 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled; rim area wheel-coiled?

**60** Bucket (PLATE 20) (IB 31)

5 partly joined rim and upper body fragments;

H. 19.2 cm.

KV Trial.

Popham 1975, 188, pl. 32 *b*.

Wall: thick lower body, thin upper body; patchy irregularities along horizontal and vertical axes.

Voids/fissures: virtually absent in quantity; no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; mainly rounded and some elongated shapes; elongated ones have preferred horizontal orientation.

Coil seams: 4.

Coil height: 1.0 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**61** Bucket (PLATE 19) (IB 32)

4 joined rim-to-body fragments with handle;

H. 21.1 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: same thickness from base to just below rim, rim itself thicker; irregularities along horizontal and vertical axes.

Voids/fissures: rare in quantity; short in dimensions; irregular air spaces; no orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; rounded and elongated shapes; no preferred orientation.

Coil seams: 2?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled?

**62** Bucket (PLATE 19) (IB 33)

7 joined rim-to-base fragments with vertical handle;

H. 22.0 cm.

KV Trial.

Popham 1975, 188, pl. 32 *d*.

Wall: same thickness from base to just below rim, rim itself thicker; irregularities along horizontal and vertical axes.

Voids/fissures: rare in quantity; short in dimensions; irregular air spaces; no orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; rounded and elongated shapes; no preferred orientation.

Coil seams: 1?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled?

**63** Tray (PLATE 19) (IB 45)

Rim-to-base fragment; H. 1.7 cm.

Loomweight Basement.

MacGillivray 1998, K 192, pl. 132.

Wall: thicker in centre, thinner towards edge, rim itself thick; localized irregularities.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; no orientation.

Inclusion: rare in quantity; small in dimensions; mainly rounded and some elongated shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): moulded [with subsequent shaping on wheel].

Forming technique (X-ray): moulded or pinched [with subsequent shaping on wheel].

**64** Tray (PLATE 20) (IB 36)

2 joined rim-to-base fragments; H. 2.7 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: similar thickness throughout; undulating irregularities.

Voids/fissures: virtually absent in quantity; no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; small to very large in dimensions; mainly rounded and some elongated shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): mould-made [with subsequent shaping on wheel].

Forming technique (X-ray): mould-made [with subsequent shaping on wheel].

**65** Lamp (PLATE 21) (IB 35)

3 joined rim-to-base fragments with handle;

H. 3.9 cm.

KV Trial.

Popham 1975, vessel not illustrated.

Wall: thick at base, thinner middle section, thick rim; undulating irregularities along vertical axis.

Voids/fissures: virtually absent in quantity; no dimensions; no shape; no orientation.

Inclusions: moderate in quantity; small to large in dimensions; mainly rounded and some elongated shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): uncertain.

**66** Large jar (PLATE 19) (IB 40)

Multiple joined base-to-body fragments;

H. 32.5 cm.

West Polychrome Deposits.

MacGillivray 1998, K 688, SMP 9693, pl. 92.

Wall: getting thinner upwards; irregularities along vertical and horizontal axes.

Voids/fissures: moderate in quantity; small to medium in dimensions; elongated shape; no orientation.

Inclusions: abundant in quantity; medium to large in dimensions; mainly rounded shape; no orientation.

Coil seams: 3?

Coil height: ?

Forming technique (original publication): handmade.

Forming technique (visual): handmade.

Forming technique (X-ray): handmade.

**67** Jar (PLATE 20) (IB 46)

5 non-joining fragments of base, body and shoulder;

H. (combined) 22.5 cm.

Loomweight Basement.

MacGillivray 1998, K 202, pl. 130.

Wall: similar thickness throughout; many irregularities along horizontal and vertical axes.

Voids/fissures: moderate in quantity; small in dimensions; elongated shape; some oriented horizontally, others clearly vertically.

Inclusions: abundant in quantity; medium to large in dimensions; mainly rounded shapes; no orientation.

Coil seams: 1 (shoulder/neck)

Coil height: n/a.

Forming technique (original publication): handmade.

Forming technique (visual): coiled.

Forming technique (X-ray): handmade—probably combination of techniques.

**68** Oval-mouthed amphora (PLATE 20) (IB 34)

Joined rim and shoulder fragments with one complete handle and one handle attachment;

H. 14.4 cm.

KV Trial.

Popham 1975, 188, pl. 31 c (bottom right).

Wall: getting thicker towards shoulder, relatively consistent thickness from shoulder to neck; irregularities on upper body and shoulder along horizontal and vertical axes, irregularities on neck along vertical axis.

Voids/fissures: upper body: abundant in quantity; short to medium in dimensions; elongated shape; preferential vertical orientation.

Shoulder and neck: abundant in quantity; medium to long in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation (shoulder and neck) and preferential vertical orientation (upper body).

Coil seams: neck: 2; shoulder: 3.

Coil height: neck: 1.0 cm; shoulder: ?

Forming technique (original publication): not indicated.

Forming technique (visual): shoulder: coiled, neck: uncertain, upper body: handmade.

Forming technique (X-ray): shoulder and neck: coiled, upper body: drawn/pinched.

**69** Closed vessel (PLATE 21) (IB 41)

Base-to-body fragment; H. 17.9 cm.

Loomweight Basement.

MacGillivray 1998, 39–42; vessel not illustrated.

Wall: except for thick base, similar thickness throughout; irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; large to very large in dimensions; mainly rounded and some elongated shapes; elongated ones have horizontal orientation.

Coil seams: 6.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): coiled.

**70** Pedestalled lamp (PLATE 20) (IB 44)

Foot fragment; H. 18.9 cm.

Loomweight Basement.

MM III A

**71** Conical cup (PLATE 21) (IB 20)

Rim-to-base fragment; H. 3.0 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; medium to large in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**72** Straight-sided cup (PLATE 22) (IB 19)

4 joined rim-to-base fragments with lower handle attachment; H. 7.4 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards middle and then thicker towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; small in dimensions; elongated shape; diagonal orientation.

MacGillivray 1998, K 204; pl. 26.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; small in dimensions; elongated shape; horizontal orientation.

Inclusions: few in quantity; small to very large in dimensions, rounded (large) and elongated (small) shape, elongated ones have horizontal orientation.

Coil seams: 3?

Coil height: ?

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-coiled.

Forming technique (X-ray): wheel-coiled.

Inclusions: rare in quantity; small in dimensions, rounded shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray) wheel-thrown.

**73** Carinated cup (PLATE 22) (IB 16)

Rim-to-base fragment, handle missing; H. 6.4 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards middle, then getting thicker again; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to medium in dimensions, rounded shape and few elongated ones; elongated ones have diagonal or horizontal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**74** Jug (PLATE 21) (IB 39)

Joined rim-to-base fragment, partially restored in plaster; H. 25.5 cm.

Deposit: none given.

MacGillivray 1998, K 962, SMP 9738; Vessel not catalogued or illustrated.

Wall: getting thinner from base to widest diameter, shoulder thicker, neck thinner again; irregularities along vertical and horizontal axes.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; horizontal orientation.

Inclusions: rare in quantity; medium to large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: 4 (body), 3 (shoulder).

Coil height: 1.2 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

**75** Bridge-spouted jar (PLATE 22) (IB 37)

Joined rim-to-base fragment with handle, restored in plaster; H. 15.3 cm.

South Polychrome Deposits.

MacGillivray 1998, K 977, SMP 9736, pls. 30, 149.

Wall: getting thinner towards widest diameter, then getting thicker towards rim; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheel-thrown.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**76** Jar (PLATE 21) (IB 38)

Complete except for one handle; H. 23.8 cm.

Corridor S. N + E. between House of Sacrifice and House of Fallen Blocks.

MacGillivray 1998, SMP 9739; vessel not illustrated.

Wall: getting thinner towards widest diameter, shoulder area thicker, neck thin again; irregularities along horizontal and vertical axes.

Voids/fissures: rare in quantity; small in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; medium to very large in dimensions; mainly rounded shape; no orientation.

Coil seams: 7.

Coil height: 1.0–2.0 cm.

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled (body and upper body); handmade (lower body).

**77** Cooking pot (PLATE 22) (IB 17)

Base to lower body fragment; H. 10.0 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards top; undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; medium to large in dimensions; elongated shape; preferential orientation differs (horizontal/diagonal near upper break; horizontal near lower break).

Inclusions: abundant in quantity; medium to large in dimensions; mainly rounded and some elongated shapes; elongated ones have horizontal/diagonal orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): uncertain.

Forming technique (X-ray): uncertain.

**78** Tripod cooking pot (PLATE 22) (IB 18)

3 joined base to lower body fragments, legs missing; H. 11.4 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: similar thickness throughout; irregularities along horizontal and vertical axes.

Voids/fissures: abundant in quantity; small to medium in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; medium to large in dimensions, rounded shape, no orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

# MM III B

## 79 Conical Cup (PLATE 22) (IB 11)

Rim-to-base fragment; H. 4.3 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to large in dimensions, mainly rounded shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

## 80 Conical cup (PLATE 22) (IB 12)

4 joining rim to lower body fragments; H. 4.3 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim, rim itself thicker; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to medium in dimensions; mainly rounded shape; diagonal orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): uncertain.

Forming technique (X-ray): wheel-thrown.

## 81 Straight-sided cup (PLATE 22) (IB 15)

2 joining rim-to-base fragments; H. 6.8 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim; undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; medium in

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

dimensions; elongated shape; diagonal orientation (lower 2/3), no orientation (upper 1/3).

Inclusions: abundant in quantity; medium to large in dimensions; mostly rounded shape and few elongated ones; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

## 82 Bowl (PLATE 22) (IB 14)

Rim to upper body fragment; H. 8.2 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: even thickness throughout; light irregularities along vertical axis.

Voids/fissures: rare in quantity; medium in dimensions; elongated shape; horizontal orientation—some diagonal ones at very bottom of fragment.

Inclusions: abundant in quantity; small to large in dimensions; mainly rounded and some elongated shapes; elongated ones have horizontal orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-coiled.

Forming technique (X-ray): upper section: handmade, lower section: uncertain.

## 83 Closed vessel (PLATE 22) (IB 13)

Base to lower body fragment; H. 7.3 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: similar thickness throughout; few irregularities.

Voids/fissures: rare in quantity; medium in dimensions; irregular shape; no orientation.

Inclusions: abundant in quantity; large in



dimensions; predominantly rounded shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

LM I A

**84** Conical cup (PLATE 23) (IB 5)

Complete; H. 4.0 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim; undulating irregularity along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to medium in dimensions, elongated shape; diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**85** Rounded cup (PLATE 23) (IB 22)

Almost complete vessel assembled from 8 fragments;

H. 6.7 cm.

KV Trial.

Popham 1975, 185, pl. 32 *g* (far left).

Wall: getting thinner towards rim, rim itself thicker; light undulating irregularities along vertical axis.

Voids/fissures: moderate in quantity; short in dimensions; elongated shape; diagonal orientation (view from top), undetermined (frontal view).

Inclusions: moderate in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have horizontal/diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**86** Bell-shaped cup (PLATE 23) (IB 6)

Rim-to-base fragment; H. 5.5 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Forming technique (original publication): not indicated.

Forming technique (visual): handmade.

Forming technique (X-ray): uncertain.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; no orientation

Inclusions: moderate in quantity; small to large in dimensions; mostly rounded, few elongated shapes; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**87** Straight-sided cup (PLATE 23) (IB 10)

2 joined rim-to-base fragments, handle missing;

H. 6.5 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: abundant in quantity; small to medium in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

**88** Bucket (PLATE 23) (IB 9)

2 joined rim to upper body fragments with right handle attachment; H. 14.1 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: except for thick rim, similar thickness throughout; patchy irregularities along vertical axis.

Voids/fissures: virtually non-existent in quantity; no dimensions; no shape; no orientation.

Inclusions: abundant in quantity; large in dimensions; rounded and rectangular shapes; rectangular ones have preferential horizontal orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

### **89** Tray (PLATE 23) (IB 7)

Rim-to-base fragment; H. 2.1 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting slightly thinner towards rim, rim itself thick.

Voids/fissures: rare in quantity; small in dimensions; elongated shape; no orientation.

Inclusions: abundant in quantity; medium to large in dimensions; mainly rounded shape, few elongated ones; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): mould-made and subsequently shaped on wheel.

Forming technique (X-ray): uncertain.

### **90** Small tripod cooking pot (PLATE 23) (IB 21)

Virtually complete vessel assembled from 13 rim to foot fragments with one lug handle; H. 13.5 cm. KV Trial.

## LM II

### **92** Saucer (PLATE 24) (IB 1)

Rim-to-base fragment, rim chipped; H. 4.9 cm.

South Front of the Palace.

Momigliano and Hood 1994, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; horizontal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; rounded and elongated shapes, elongated ones have horizontal orientation.

Coil seams: 1?

Coil height: 2.0–2.5 cm.

Popham 1975, 184, vessel not illustrated.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to long in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to large in dimensions; rounded and elongated shapes; elongated one have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

### **91** Closed vessel (PLATE 23) (IB 8)

3 joined base to lower body fragments; H. 21.8 cm.

Acropolis Houses.

Catling, Catling, and Smyth 1979, vessel not illustrated.

Wall: getting thicker towards top; irregularities along horizontal axis.

Voids/fissures: moderate in quantity; short to large in dimensions; elongated shape; horizontal orientation.

Inclusions: abundant in quantity; small to large in dimensions; predominantly rounded shape; no orientation.

Coil seams: 1.

Coil height: ?

Forming technique (original publication): not indicated.

Forming technique (visual): coiled.

Forming technique (X-ray): coiled.

Forming technique (original publication): not indicated.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-coiled.

### **93** Conical cup (PLATE 24) (IB 2)

Rim-to-base fragment; H. 4.6 cm.

South Front of the Palace.

Momigliano and Hood 1994, no. 59, fig. 16.

Wall: getting thinner towards rim; light undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; large in dimensions; elongated shape; diagonal orientation.

Inclusions: moderate in quantity; small to medium in dimensions; rounded and elongated shape; no orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheelmade.

Forming technique (visual): wheel-thrown.

Forming technique (X-ray): wheel-thrown.

#### **94** Jug (PLATE 24) (IB 4)

5 joined lower-body-to-base fragments; H. 6.3 cm. South Front of Palace.

Momigliano and Hood 1994, no. 17, fig. 11.

Wall: getting thinner upwards, top 2 cm thicker again; undulating irregularities along vertical axis.

Voids/fissures: abundant in quantity; medium to large in dimensions; elongated shape; diagonal orientation.

Inclusions: low in quantity; small to medium in dimensions; rounded and elongated shapes; elongated ones have diagonal orientation.

Coil seams: n/a.

Coil height: n/a.

Forming technique (original publication): wheelmade.

Forming technique (visual): wheel-coiled.

Forming technique (X-ray): wheel-thrown.

#### **95** Cooking pot (PLATE 24) (IB 3)

Rim to upper body fragment; H. 6.8 cm.

South Front of the Palace.

Momigliano and Hood 1994, no. 51, fig. 15.

Wall: same thickness throughout; light irregularities along vertical axis.

Voids/fissures: rare in quantity; medium in dimensions; elongated shape; horizontal/diagonal orientation.

Inclusions: abundant in quantity; small to large in dimensions; rounded and elongated shapes; elongated ones have horizontal orientation.

Coil seams: ?

Coil height: ?

Forming technique (original publication): wheelmade.

Forming technique (visual): uncertain.

Forming technique (X-ray): coiled.

### SUITABILITY OF X-RADIOGRAPHY FOR PREHISTORIC CRETAN CLAYS

The research has demonstrated the suitability of X-radiography for prehistoric Cretan clays in general. Fine, semicoarse and coarse fabrics were investigated and were clearly visible on the X-ray. As discussed elsewhere, there are some general limitations that impact on the visibility of any X-ray, such as the proportion of inclusions/temper within the clay matrix, the thickness of the sherd and the contrast in density between different particles (Berg 2008). These also apply to our Knossian sample and, for example, often hindered identification of specific manufacturing techniques of heavily tempered clays due to overlaying particles (e.g. **52**, **77**, **83**, **89**, **95**). Overall, 80 vessels (a success rate of over 80%) could be assigned to a specific primary forming technique, while 9 could merely be identified as 'handmade' and 6 had to be classed as 'uncertain'. There is no doubt that X-radiography, alongside visual inspection, thin-sections and chemical analysis, has a contribution to make to our understanding of ancient pottery.

### X-RADIOGRAPHY VS. VISUAL INSPECTION

Pottery specialists often pride themselves on being able to identify forming techniques accurately. However, there is rarely an opportunity to check the reliability of our observations against scientific data. As X-ray analysis required the scanning and digitization of the original X-ray images while a visual inspection could be done on the spot, visual assessment and X-ray analysis were separated in time and space, affording the opportunity to compare the results,

which were, for all intents and purposes, arrived at independently. In addition, published assemblages sometimes contained information on the forming technique that could be drawn on as additional independent data sets. The results show that (a) in 23% of the cases pottery specialists do not agree with one another's categorization of forming techniques, and (b) in up to 25% of the cases they have been misled by the expertise of ancient potters who often obliterated traces of the primary forming by applying secondary techniques—this is particularly apparent in the case of coiled vessels that were subsequently wheel-coiled and might be identified as wheel-thrown (TABLE 1). In other instances, X-ray data were able to provide greater detail. For example, 'handmade' vessels could clearly be identified as 'coiled' (e.g. 2, 5, 6, 9, 10). However, X-radiography does not allow the identification in all cases, and, in some (rarer) instances, visual traces provided clearer indicators of manufacture than radiographs. Examples can be found in 7, 8, 39, and 56. Thus it is clear that a combination of techniques will give us the greatest possible chance of an accurate identification of past primary forming techniques. As regards secondary forming techniques, they cannot normally be recognized radiographically and will always require visual assessment.

#### DISCUSSION AND CONCLUSION

With the potential of X-radiography for Cretan clays established, we can now turn to an interpretation of the findings. While every effort was made to sample a large number of vessels and ensure a representative spread of open and closed, fine and coarse vessels, small and large, etc., for each period, excavation and publication biases could not be overcome: in total 95 vessels were X-rayed, EM III/MM I A being represented by 11 vessels, MM I B by 13, MM II A by 25, MM IIB by 21, MM III A by 8, MM IIIB by 5, LM I A by 8, and LM II by 4. In order to achieve larger sample sizes, periods had to be combined for analysis.

Forming techniques show a long-term trend: handmade vessels gradually decline over time while techniques utilizing the potter's wheel (fully or partially) become more popular after its introduction in MM I B. In line with other work (e.g. Knappett 1999, 204; MacGillivray 1998; 2007), this study confirms that the introduction of the potter's wheel did not result in an immediate replacement of handmade modes, but it was adopted gradually (FIG. 2). Most importantly, handmade techniques never vanish completely, but remain the most common construction method for larger vessels even in the Late Bronze Age. The existence of slow wheel use is confirmed for Knossos. Present already in EM III/MM I A as part of a combination technique (1), it is clear that potters toyed with the concept of a wheel prior to the actual introduction of the fast wheel. Surprisingly perhaps, wheel-coiling continues through time and can still be found as a (occasional) manufacturing method in LM II. This development naturally raises questions about the potter's wheel itself, its capabilities and the potters' expertise. Overall, a wide range of forming techniques was used, mostly individually but also in combinations. In addition to the combination jar identified in the British Museum X-ray study (Berg and Ambers, forthcoming), this analysis has revealed a further two clear examples (1 and 68—a cup and an amphora) where the wheel was combined with coiling or coiling with drawing. While these combination techniques are infrequently represented in this sample, it is likely that they were regularly used by potters in all periods.

The association of vessel types and shapes with forming techniques is an interesting one: while both hand and wheel techniques are used to produce virtually all vessel types, there is a

TABLE 1. Comparison of the accuracy of primary forming technique identification by X-radiography and visual inspection.

Catalogue No.	Technique based on X-radiography	Technique based on visual inspection by author	Technique given in original publication
1	Base: wheel-thrown; body: wheel-coiled & drawn; rim: wheel-coiled	Handmade and shaped on wheel	Handmade
2	Coiled	Handmade	Handmade
3	Coiled (and knife-trimmed)	Knife-trimming has obliterated all traces	Handmade
4	Handmade?	Coiled?	Handmade
5	Coiled	Handmade	Handmade
7	Handmade	Coiled	Handmade
8	Handmade	Coiled	Handmade
9	Coiled	Handmade	Handmade
10	Coiled	Handmade	Handmade
11	Coiled	Handmade	Handmade
12	Wheel-thrown	Wheel-thrown	Wheel-thrown
14	Wheel-coiled (and knife-trimmed)	Handmade and knife-trimmed	Handmade
15	Wheel-coiled	Wheel-thrown or wheel-coiled	Wheel-thrown
16	Wheel-thrown	Wheel-thrown	Wheel-thrown
17	Lower 2/3: drawn; upper 1/3: wheel-coiled	Handmade and shaped on wheel	Wheel-thrown
18	Coiled	Handmade	Handmade
19	Wheel-coiled (and knife-trimmed)	Wheel-coiled and knife trimmed	Handmade
20	Coiled	Coiled	Handmade
21	Coiled	Coiled	Handmade
22	Coiled	Handmade	Handmade
23	Wheel-thrown	Wheel-thrown	Wheel-thrown
24	Wheel-thrown	Wheel-thrown	Wheel-thrown
27	Coiled	Handmade	Handmade
28	Wheel-thrown	Wheel-thrown	Wheel-thrown
32	Wheel-thrown	Wheel-thrown	Wheel-thrown
37	Coiled	Coiled	Handmade
44	Coiled	Lower body: handmade; shoulder: coiled	Handmade
46	Coiled	Coiled	Wheel-thrown
47	Coiled (and drawn)	Handmade and drawn	Handmade
57	Coiled	Coiled?	Wheel-thrown
58	Coiled	Coiled	Handmade
63	Moulded or pinched (and shaped on wheel)	Moulded and shaped on wheel	Wheel-thrown
66	Handmade	Handmade	Handmade
67	Handmade – probably combination of techniques	Coiled	Handmade
70	Wheel-coiled	Wheel-coiled	Wheel-thrown
75	Wheel-thrown	Wheel-thrown	Wheel-thrown
93	Wheel-thrown	Wheel-thrown	Wheel-thrown
94	Wheel-thrown	Wheel-coiled	Wheel-thrown
95	Coiled	Uncertain	Wheelmade

predominance of using the wheel for cups (FIG. 3). As a direct consequence of this preference, wheel-thrown vessels are much more likely to be small (<10 cm). Handmade ones, on the other hand, are represented evenly across the entire height spectrum (FIG. 4). Broadly speaking, wheel-thrown vessels are made of finer clays as can be seen by the inclusion

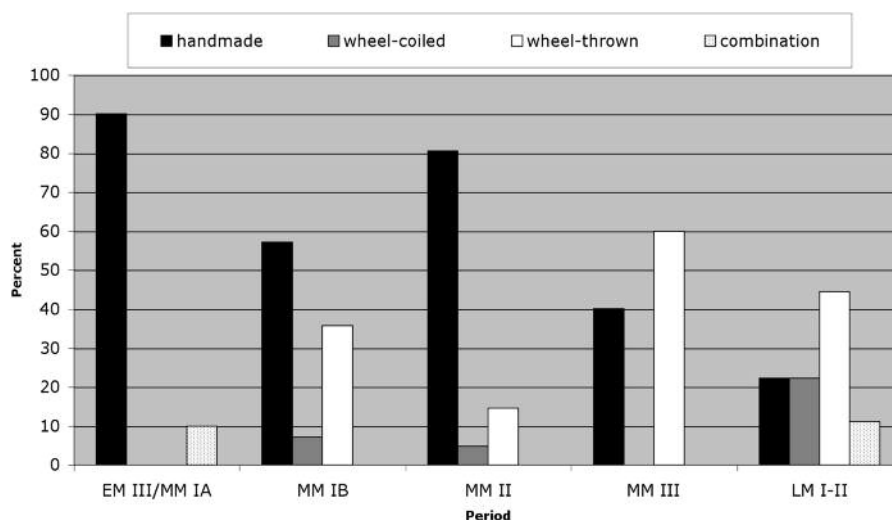


FIG. 2. Comparison of forming techniques by period.

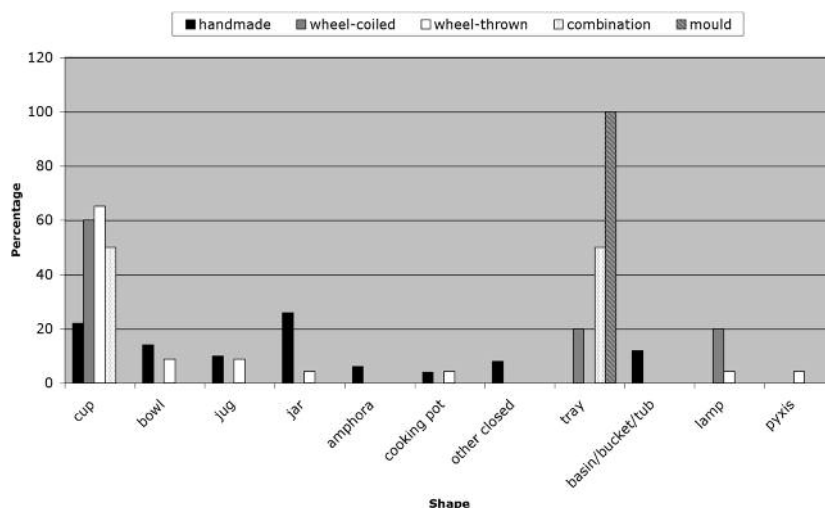


FIG. 3. Comparison of vessel types by forming techniques.

frequencies which show a much higher proportion of few or moderate quantities of inclusions. Handmade pots have the highest proportion of abundant inclusions (FIG. 5).<sup>4</sup> Looking at functional categories, it is interesting to note that serving, cooking and storage vessels can be found in most forming techniques, but processing vessels seem to be the

<sup>4</sup> No such division is discernable between inclusion sorting and size, or indeed forming technique, where all categories are comparatively evenly matched with each showing a spread of good to very poor sorting. Whether

this is an accurate reflection of the assemblage or reflects a subconscious bias in the same requires a larger-scale study.



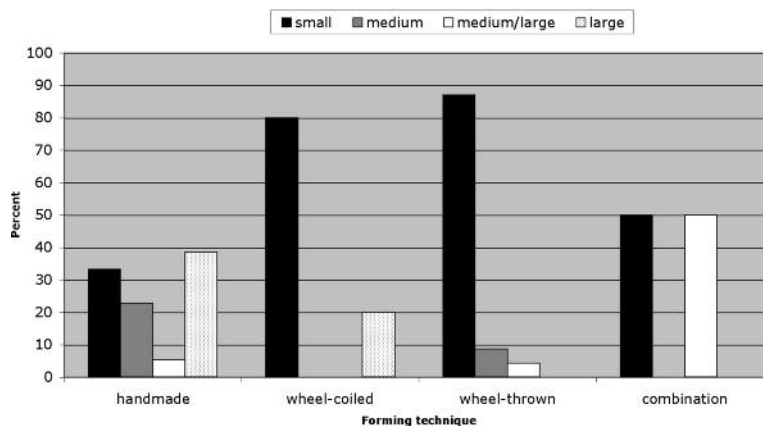


FIG. 4. Comparison of vessel size by forming techniques.

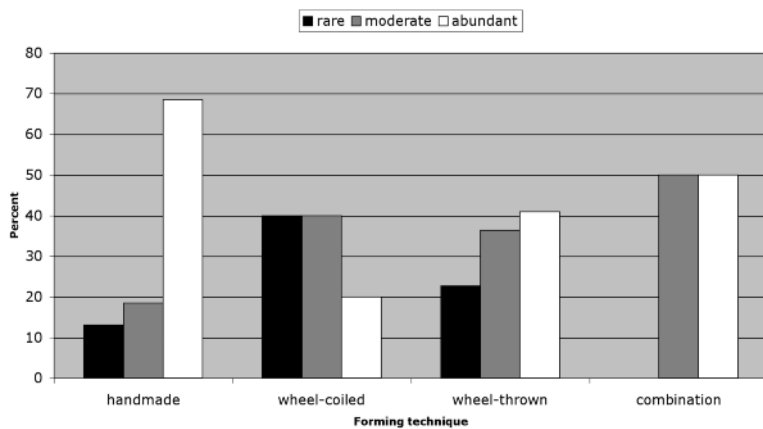


FIG. 5. Comparison of inclusion frequency by forming techniques.

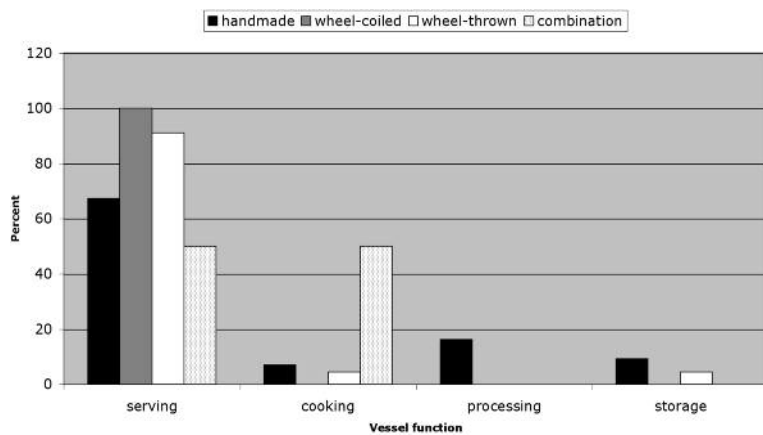


FIG. 6. Comparison of vessel function by forming techniques.

exclusive domain of handmade techniques (FIG. 6). In all, the results presented here confirm that our macroscopically-derived knowledge of the Knossian ceramic development is in line with scientific data. However, the X-ray study also highlights our lack of knowledge and our frequent inability to illuminate the specifics of an individual vessel's manufacturing process. The reconstruction of two different forming techniques for the making of stirrup jars (Leonard *et al.* 1993), the recognition of wheel-coiled vessels, and the existence of vessels that combined multiple forming techniques are only three examples of how the interpretative potential of X-radiography studies can benefit pottery specialists.

As a technique, X-radiography has much to offer to pottery specialists working on prehistoric Cretan ceramics. Fine and semicoarse fabrics are highly suitable for analysis, though X-radiography is less successful when applied to coarse fabrics with abundant inclusions as these have a tendency to overlap and thus obscure potential features. The technique is equally suitable for small and large vessels, and, while fragments should be as large as possible, it makes no difference whether vessels are complete or fragmentary.

Given the comparative ease and speed with which X-rays can be taken, the non-destructiveness of the technology and the relatively low costs involved make radiography an ideal companion both for visual assessments and established scientific techniques, such as thin section analysis. Until now, application to Greek material has been sparse and selective. However, it is hoped that the presence of an industrial X-ray machine, ideally suited to X-ray analysis of all small finds, at the INSTAP Study Centre for East Crete, as well as mobile units and technicians for loan from the Technological Educational Institution of Athens (Giannoulaki *et al.* 2006) will make X-radiography much more affordable and appealing to pottery specialists.

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## PLATES

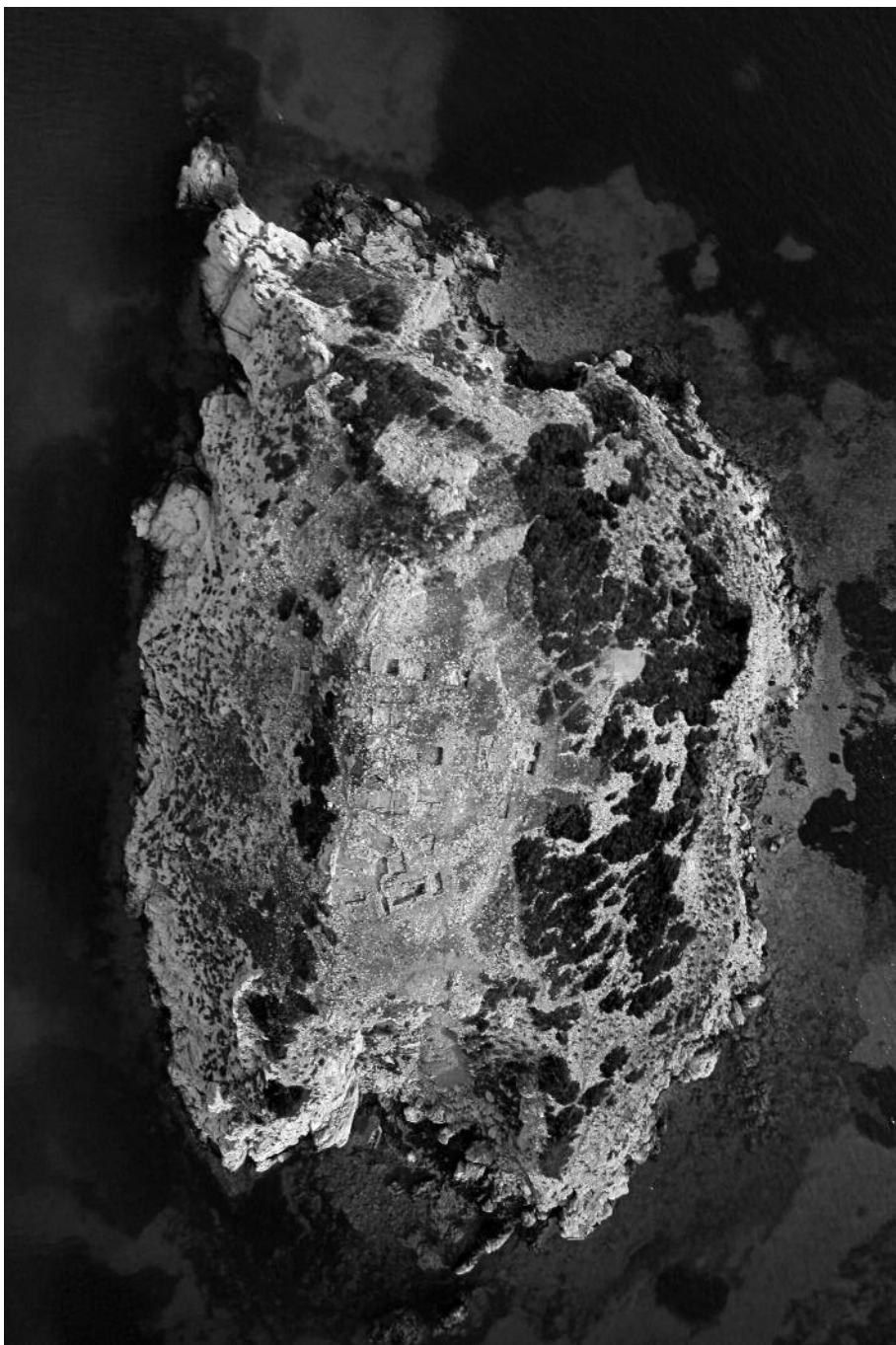




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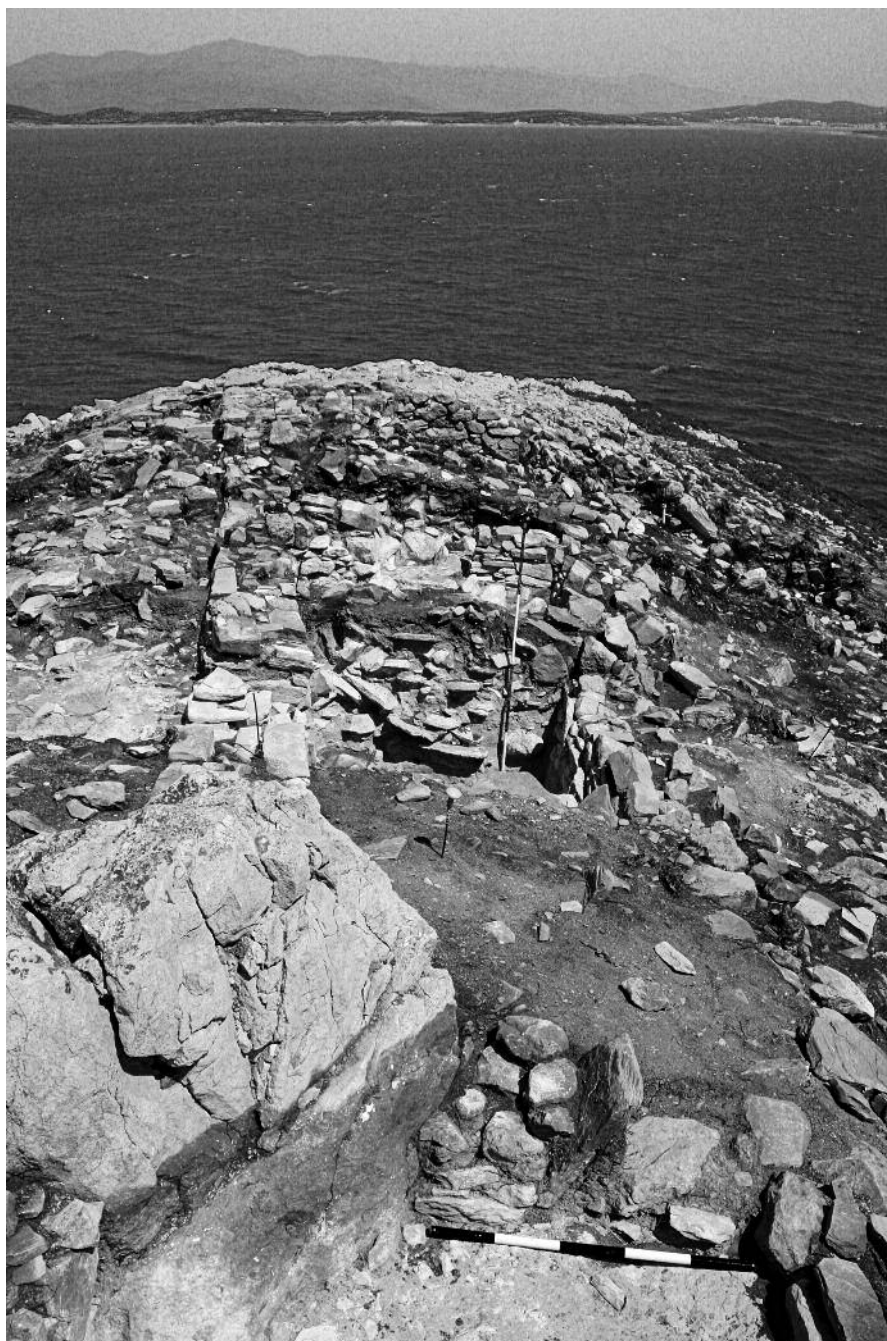
THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS

(a) Helicopter view of Dhaskalio island (right) and of Dhaskalio Kavos on Keros (left), seen from the north. (b) Dhaskalio, seen from the north, showing early Bronze Age walls.



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THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS  
Helicopter view of Dhaskalio, showing excavation trenches near the summit.





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The Hall at the summit of Dhaskalio during excavation, seen from the south,  
with rock outcrop in the left foreground.



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THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS

(a) The Summit Enclosure seen from the north (50 cm scale). (b) Early Cycladic street (left) in Trench XXI running up to and under the south wall of the Byzantine church, with EC walling (right).





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THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS

(a) The summit area looking south, with Early Cycladic buildings; the north and south walls of the Byzantine church run obliquely, indicated by horizontal ranging rods. (b) Tumbled building stones in Trench XVIII, below the Hall, seen from the north-east (50 cm scale).



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Pottery: (a) of phase B (Kastri period) with tankard (1) and depas handle (3); (b) of phase C (EC III).  
(See TABLE 1).

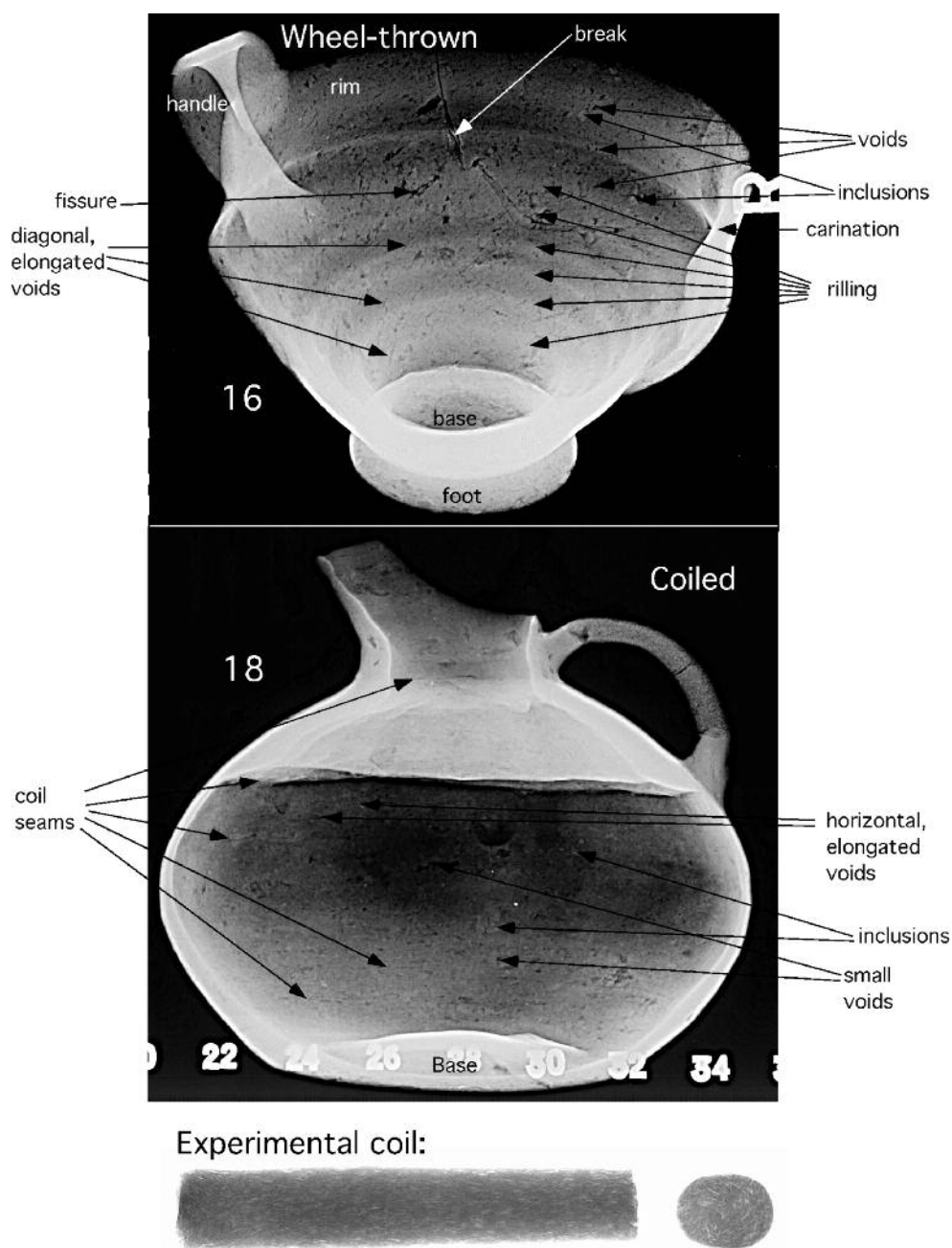




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 THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS  
 (a) Axe-adze, (b) chisel of copper or bronze from the Dhaskalio hoard; (c) ceramic  
 tuyères, probably used in metalworking, found in Trench I (scales in cm.).



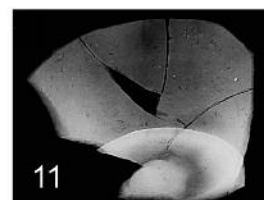
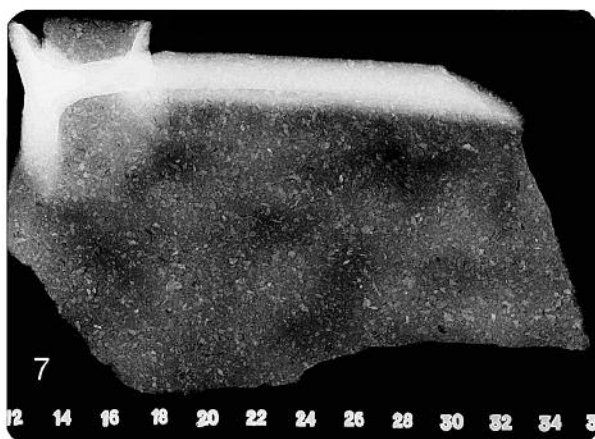
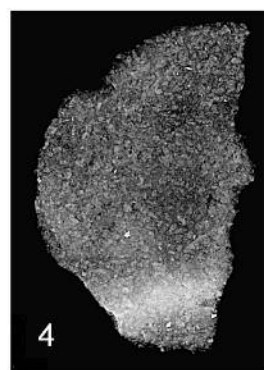
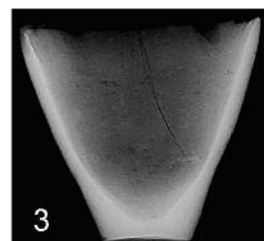
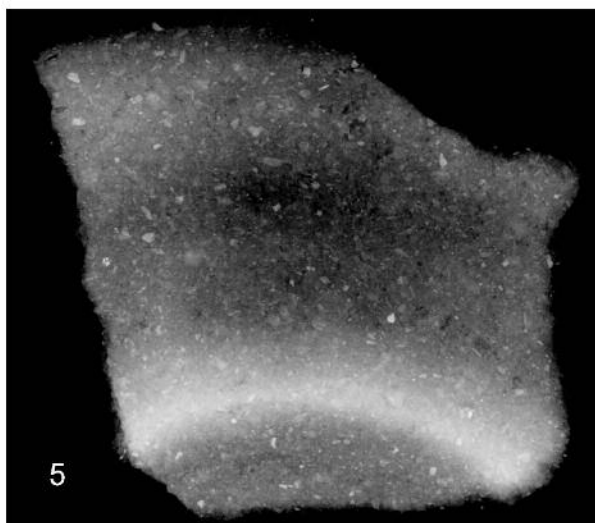
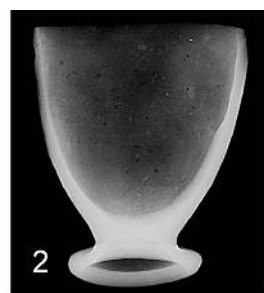
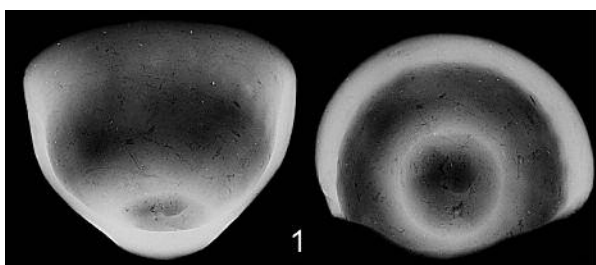
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THE EARLY CYCLADIC SETTLEMENT AT DHASKALIO, KEROS  
Marble schematic figurines of Dhaskalio sub-variety (scale in cm.).



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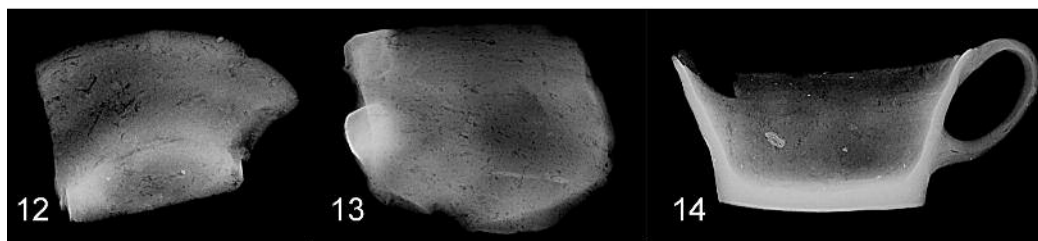
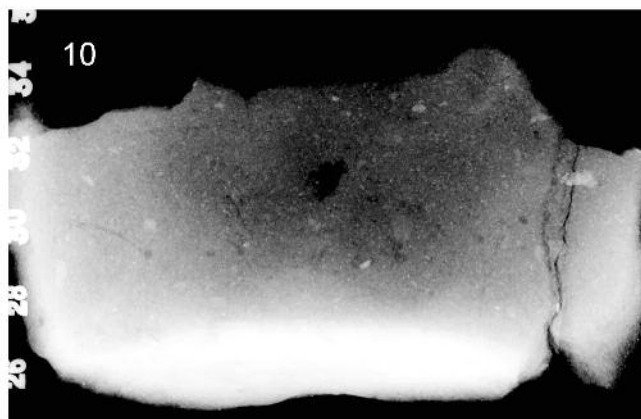
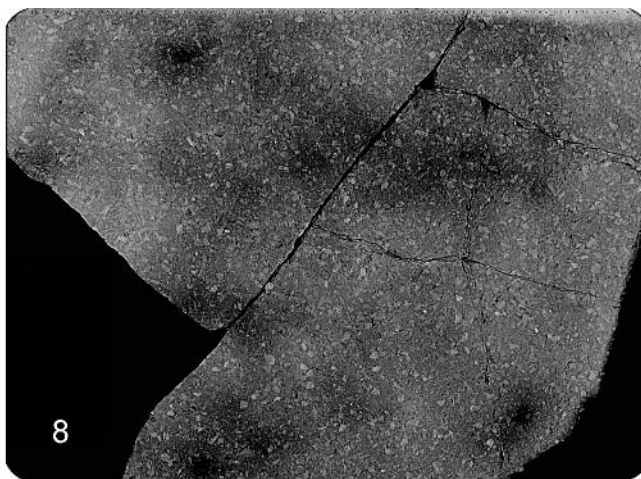
# X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

Top: annotated enhanced radiograph of catalogued vessel 16 (wheel-thrown). Middle: annotated enhanced radiograph of catalogued vessel 18 (coiled). Bottom: enhanced radiograph of an experimental coil in frontal view (left) and cross-section (right).

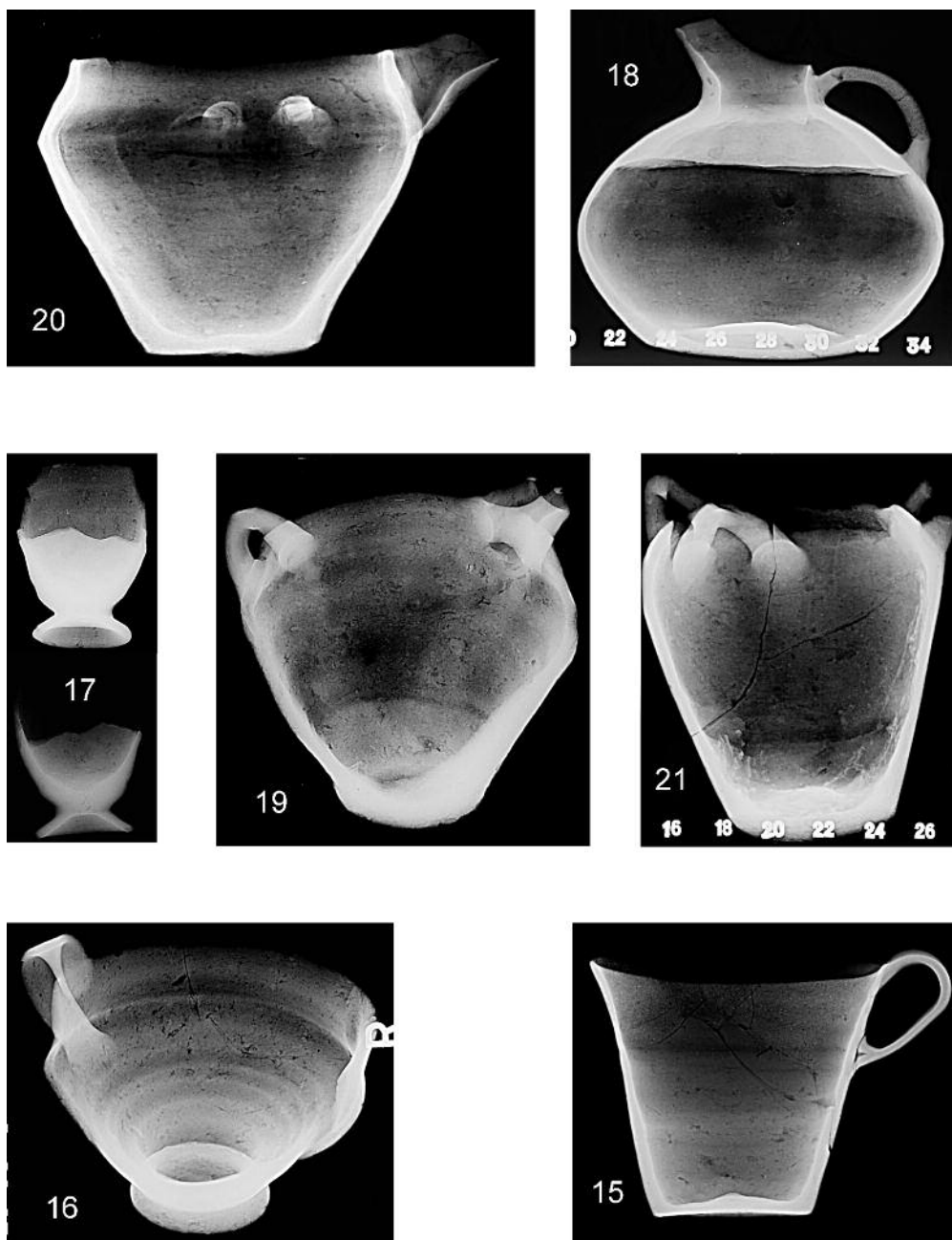


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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Radiographs of catalogued EM III/MM I A vessels (1-5, 7, 11). Except for 5,  
all images had their visibility enhanced.





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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued EM III/MM I A (6, 8–10) and MM I B vessels (12–14).

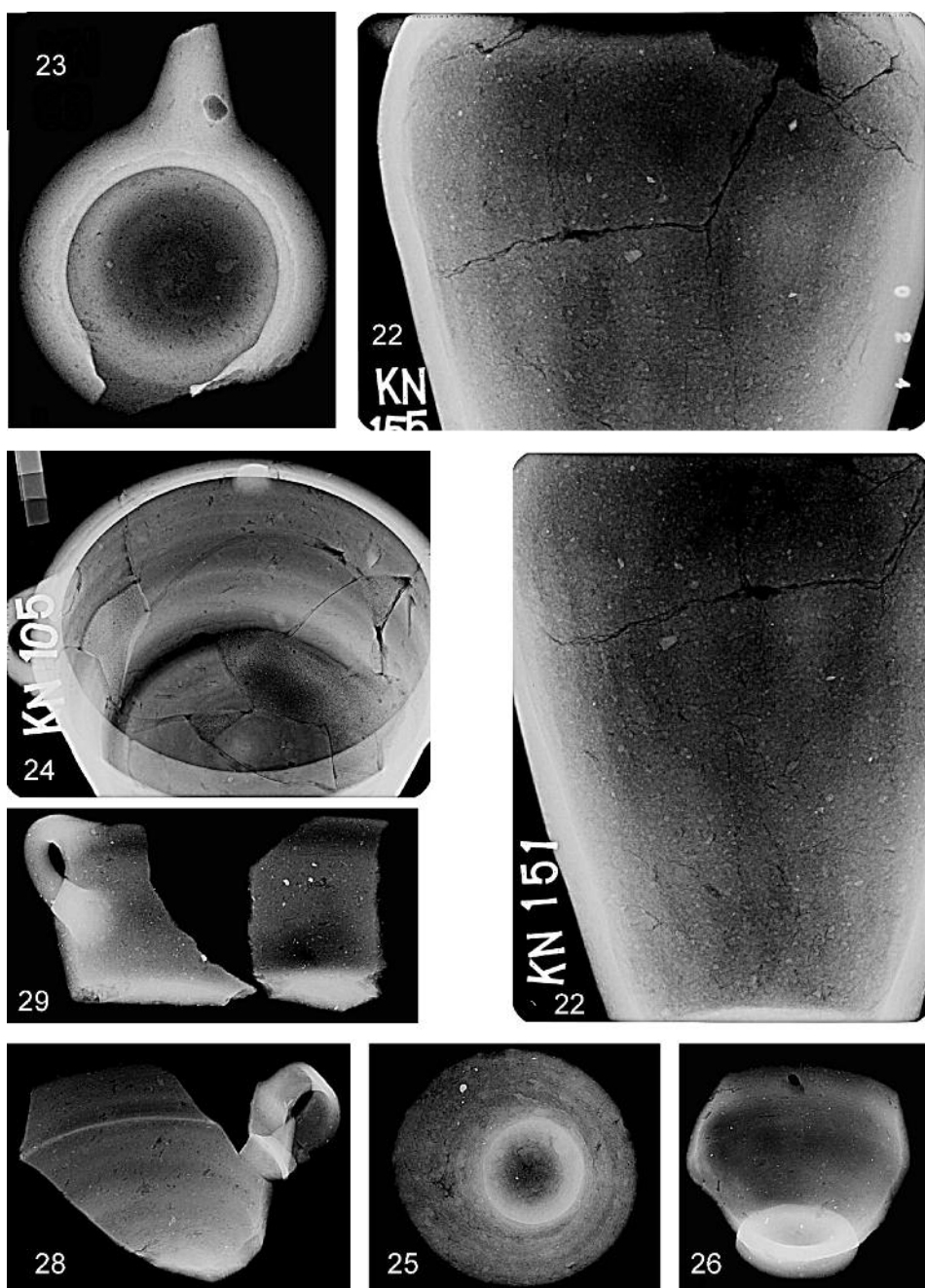


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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

Enhanced radiographs of catalogued MM IB vessels (15–21). Two views, one focusing on the upper and one on the lower half, are shown for 17.



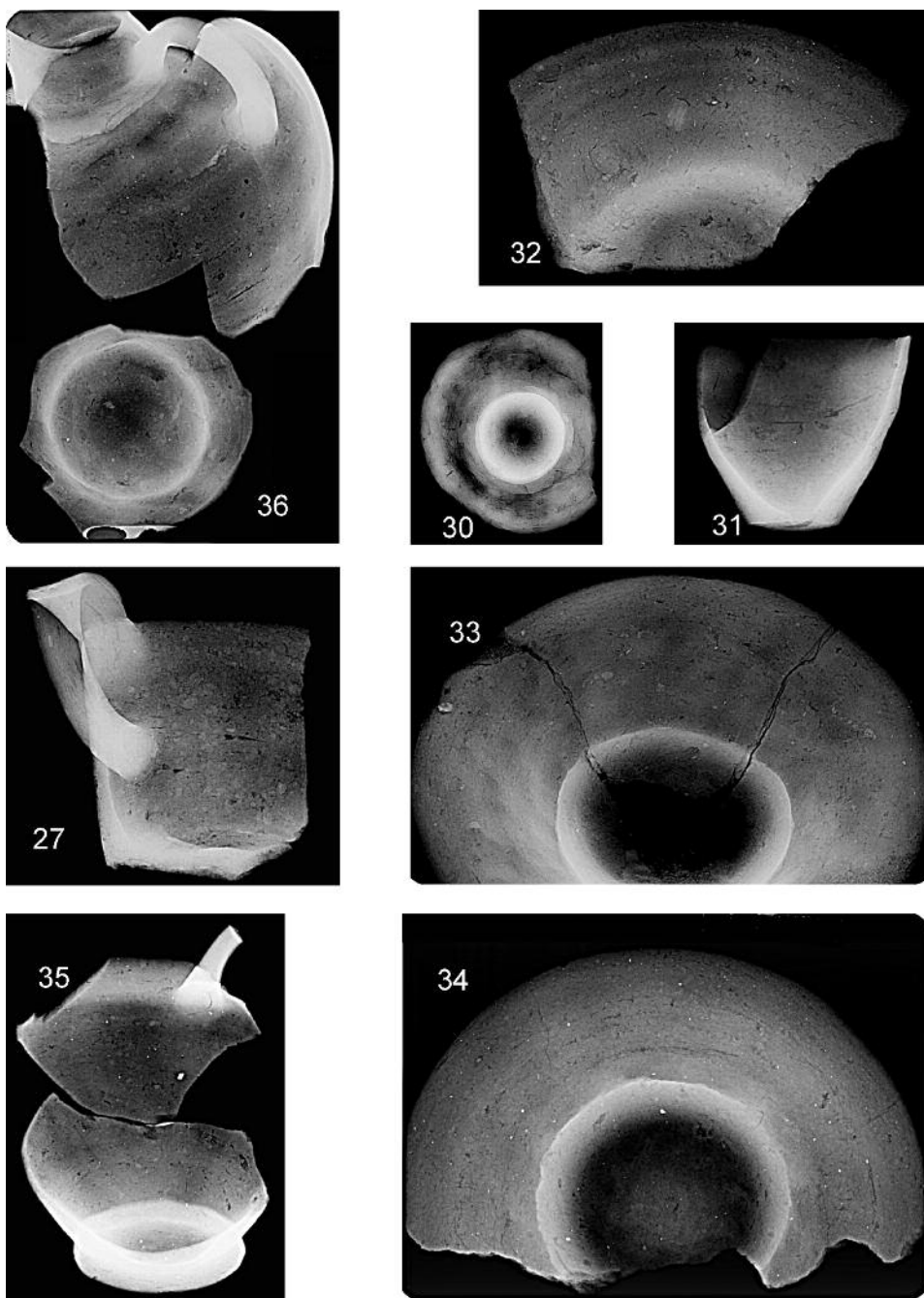


INA BERG

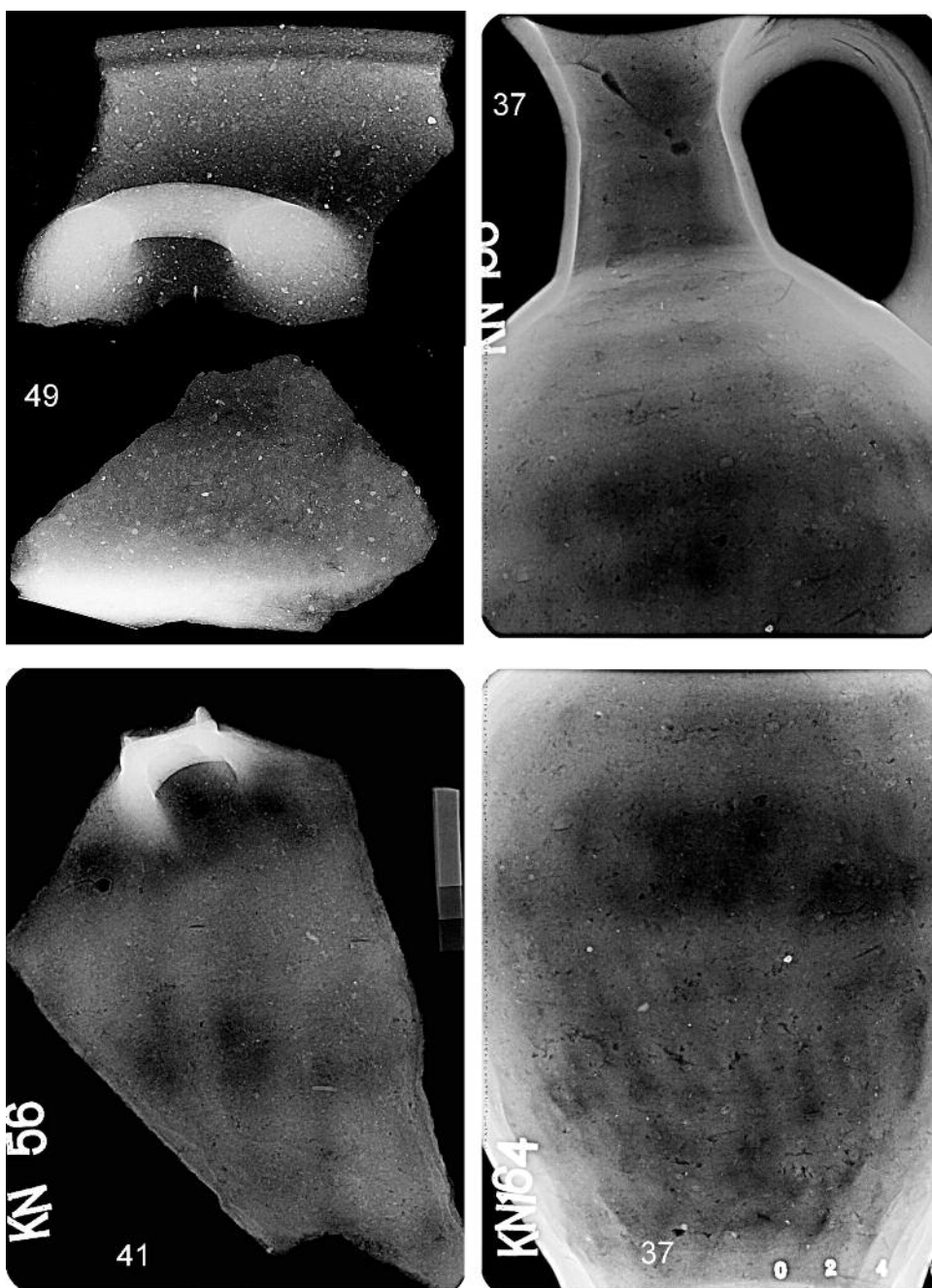
X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

Enhanced radiographs of catalogued MM I B (22–24) and MM II A vessels (25–26, 28–29).

Upper and lower half of 22 are shown in separate images.



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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued MM II A vessels (27, 30–36).



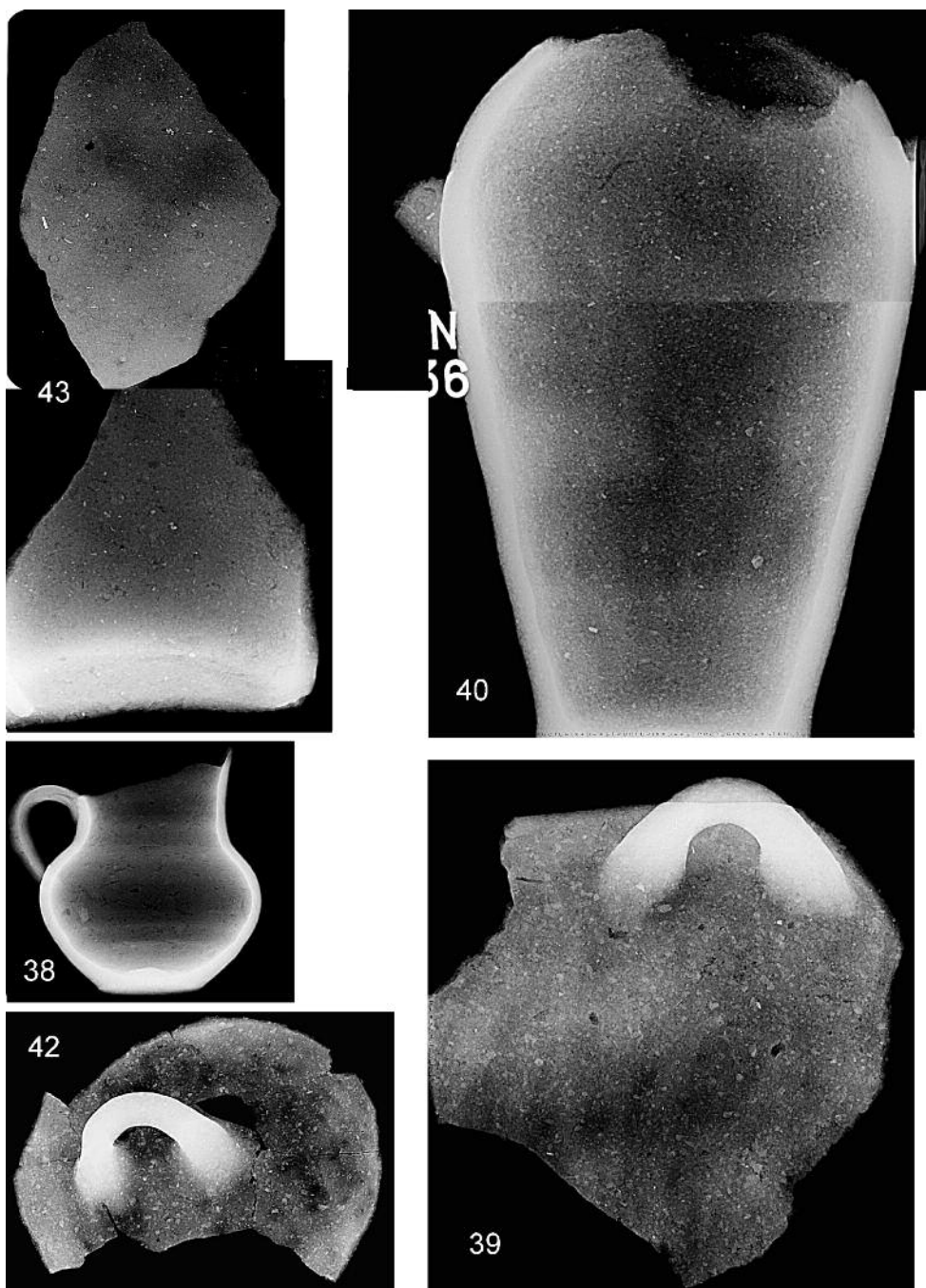
INA BERG

X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

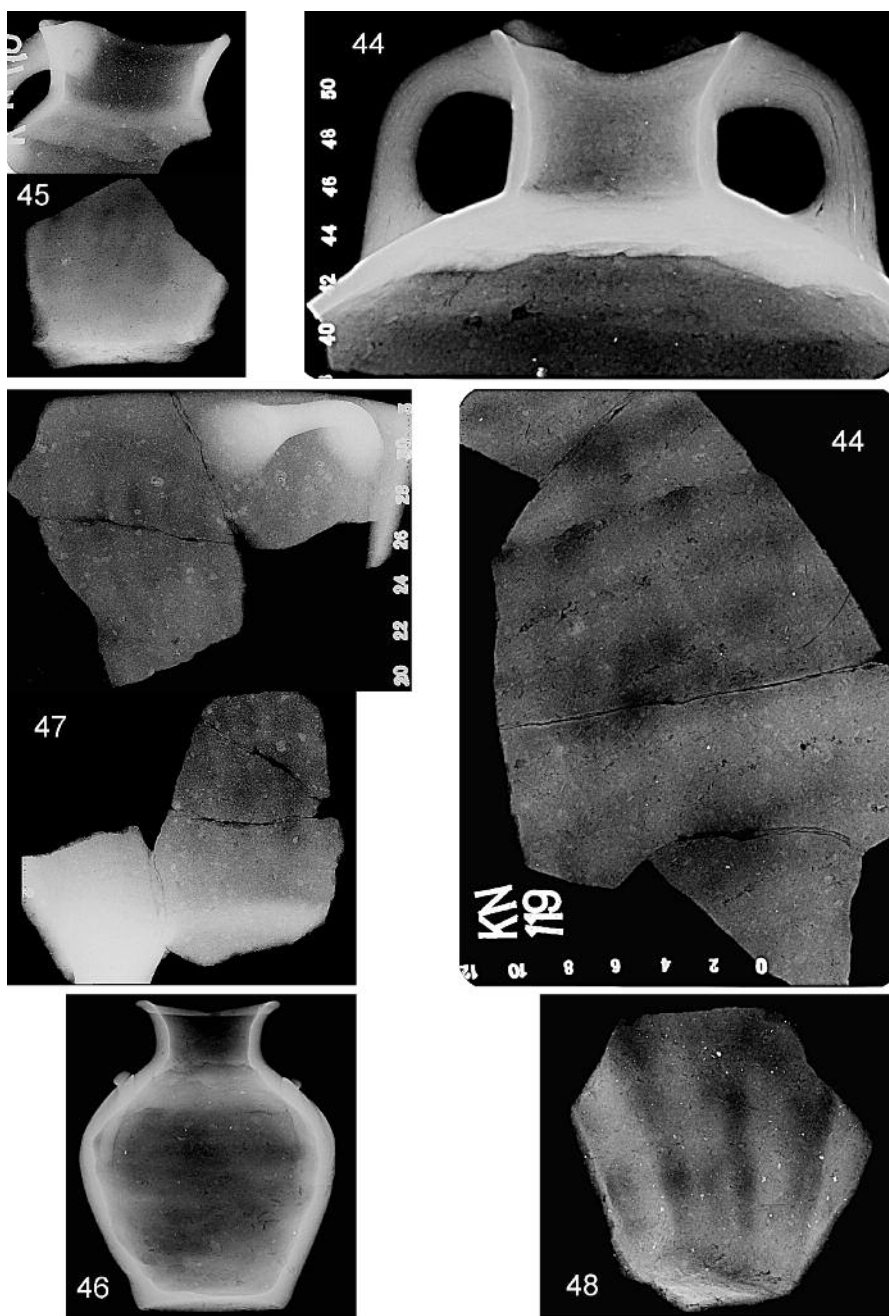
Enhanced radiographs of catalogued MM II A vessels (37, 41, 49).

Upper and lower half of 37 are shown in separate images.





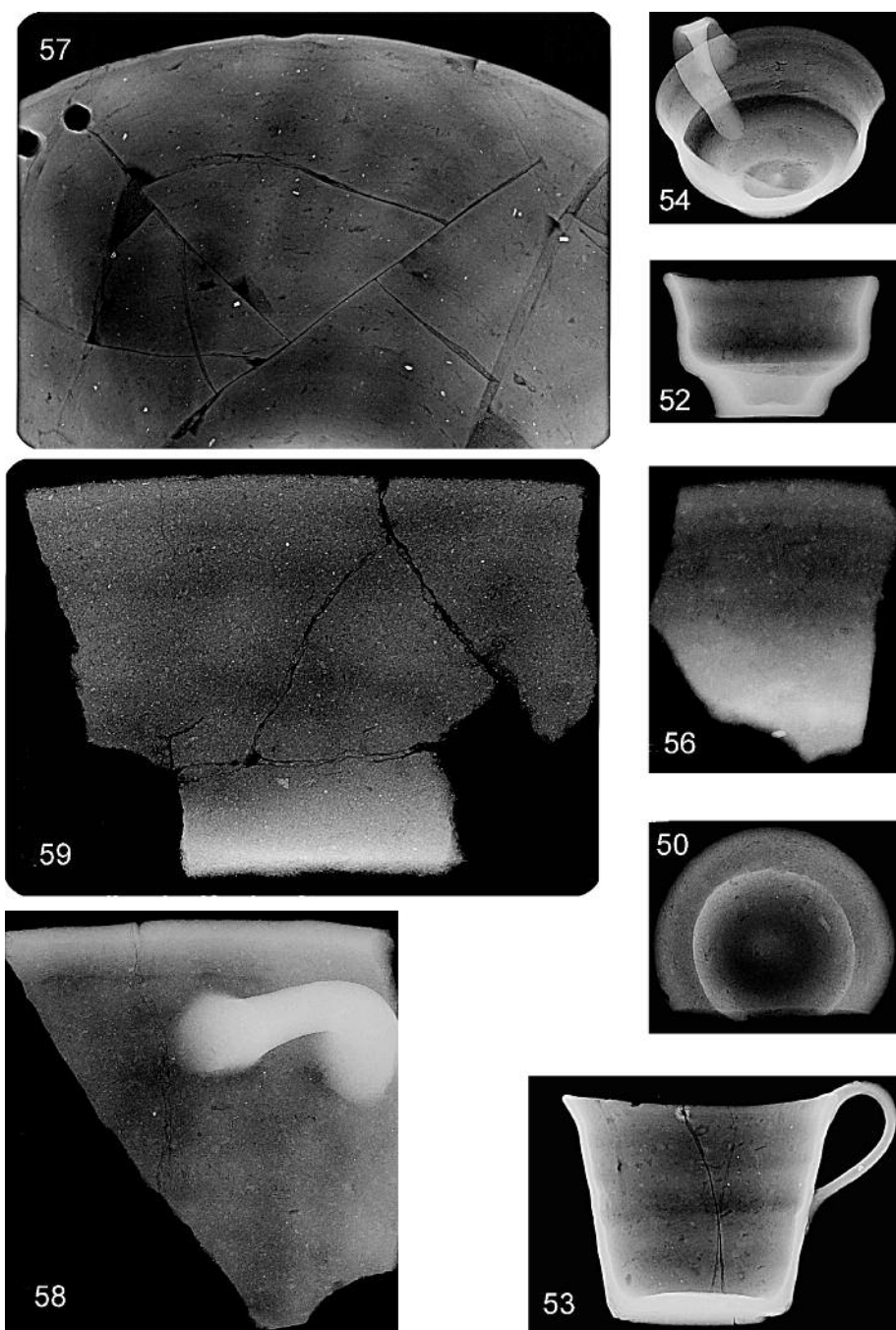
INA BERG  
X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued MM II A vessels (38–39, 40, 42–43).



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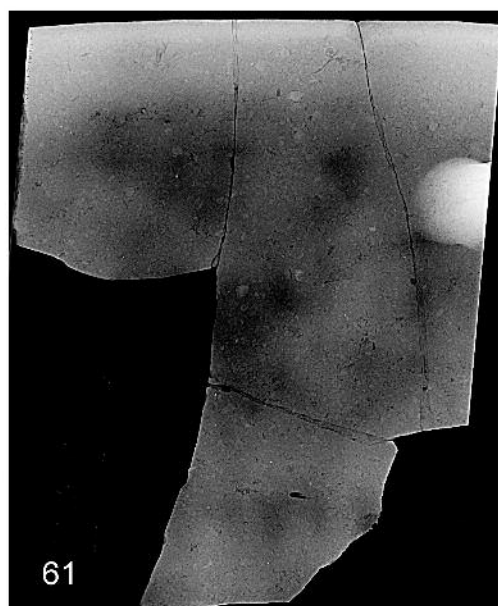
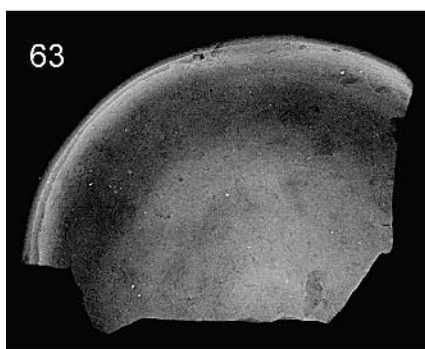
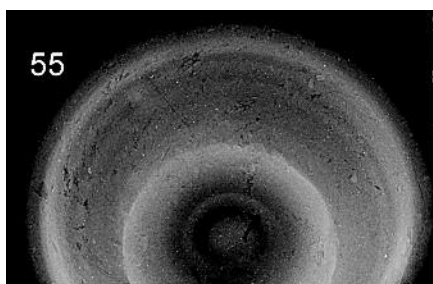
X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

Enhanced radiographs of catalogued MM II A vessels (44–48). The two fragment sections of 44 are shown in separate images.

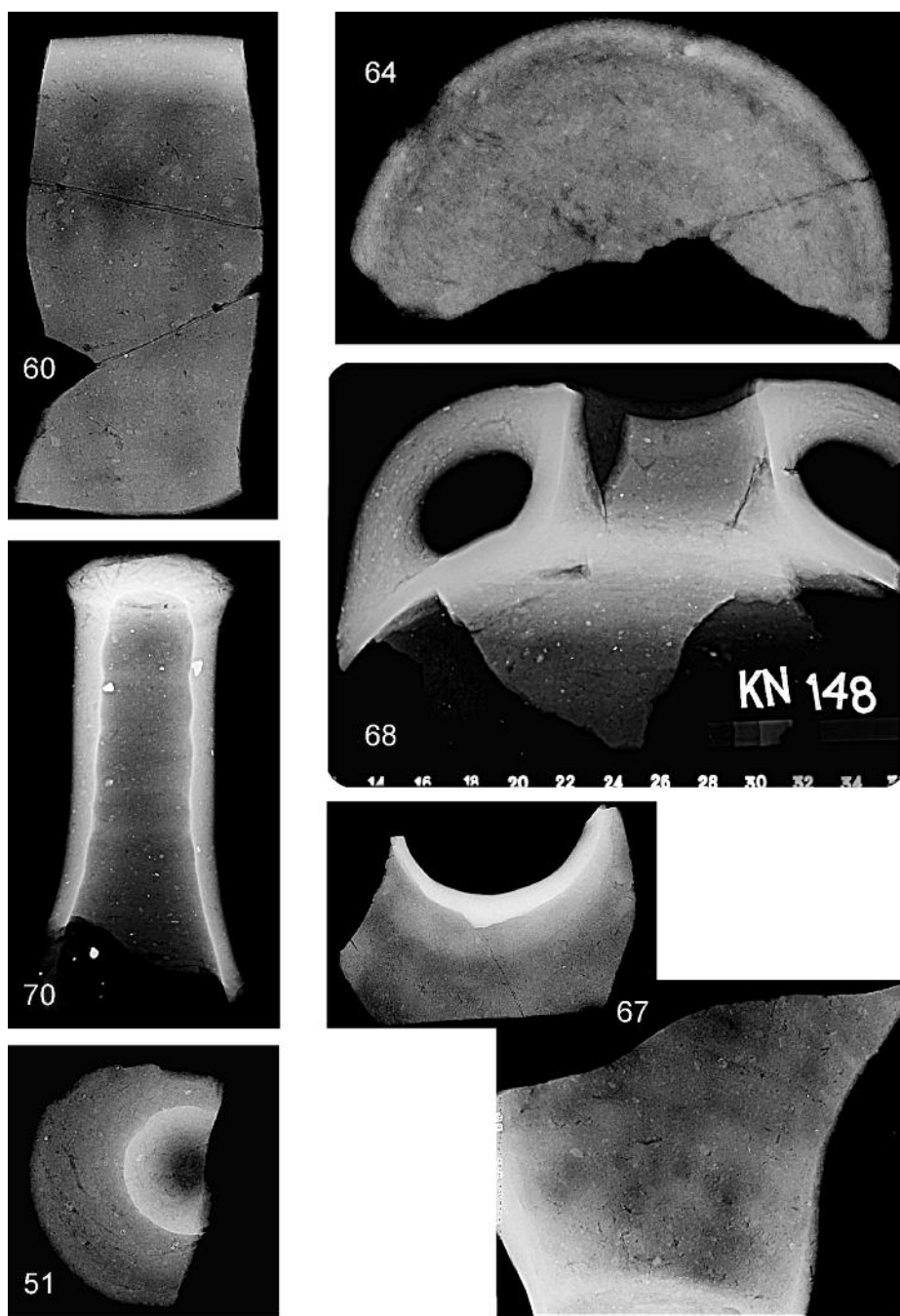


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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued MM II B vessels (50, 52-54, 56-59).

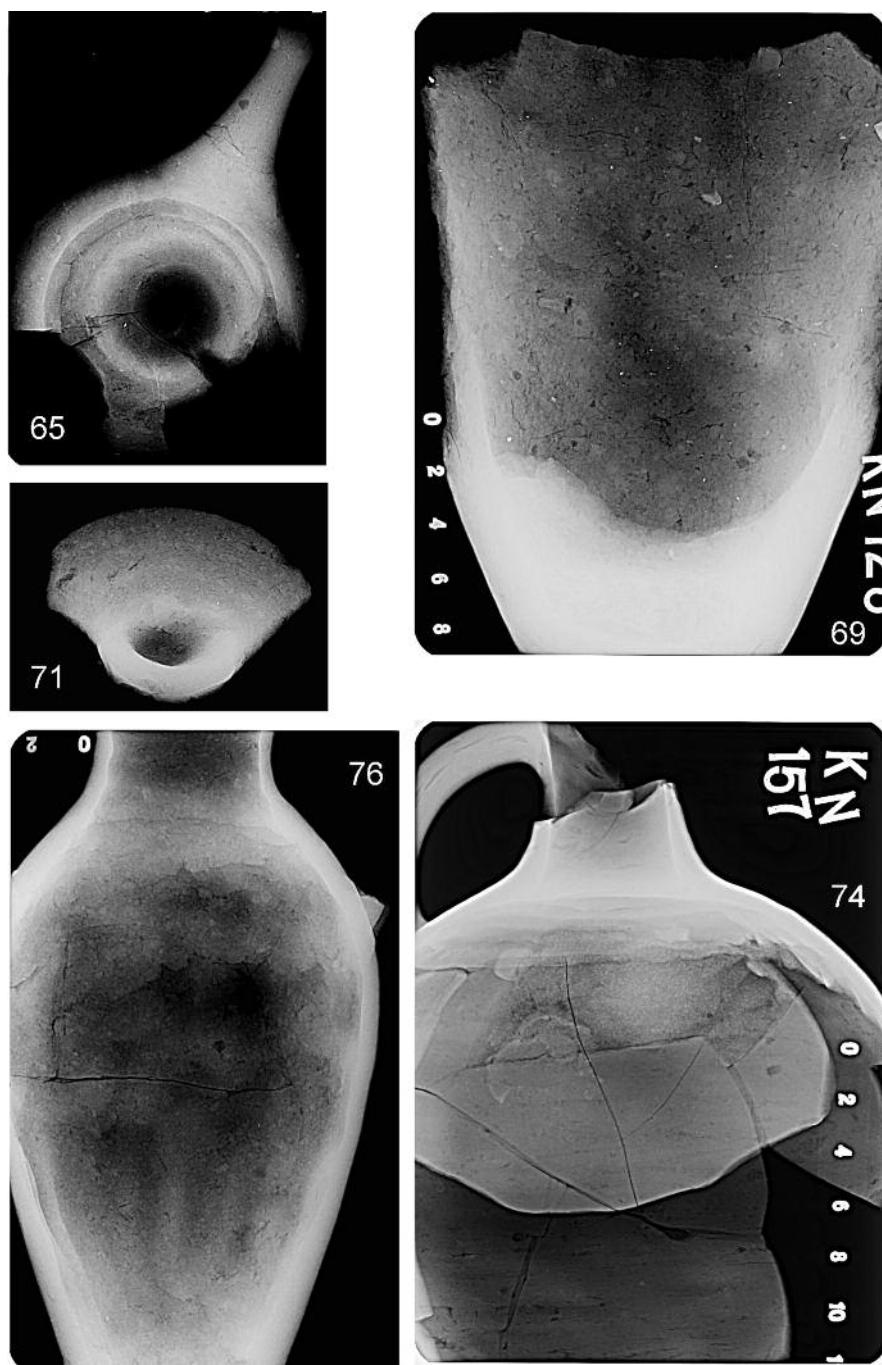




INA BERG  
X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued MM II B vessels (55, 61–63, 66).



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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued MM II B vessels (51, 60, 64, 67, 68, 70).

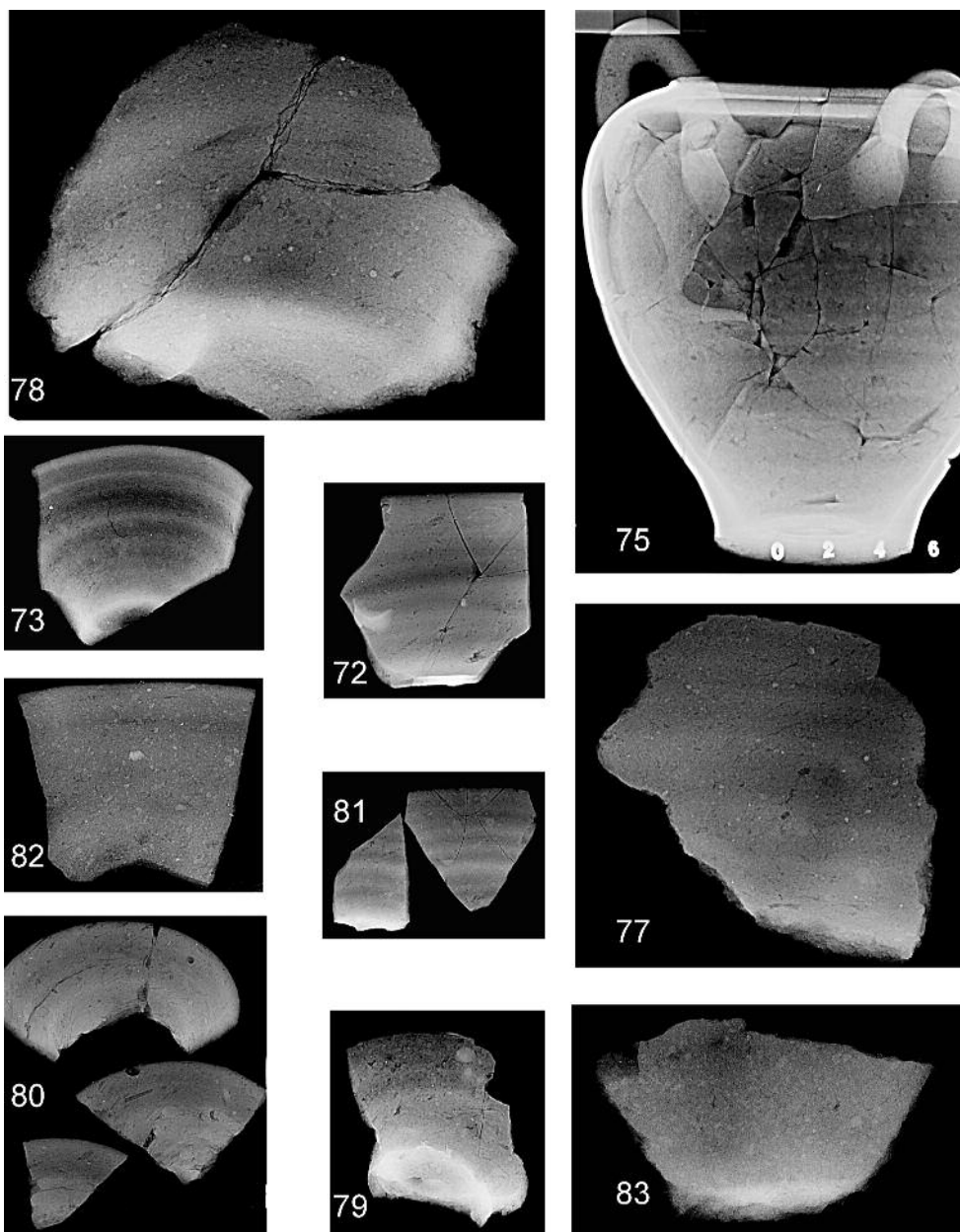


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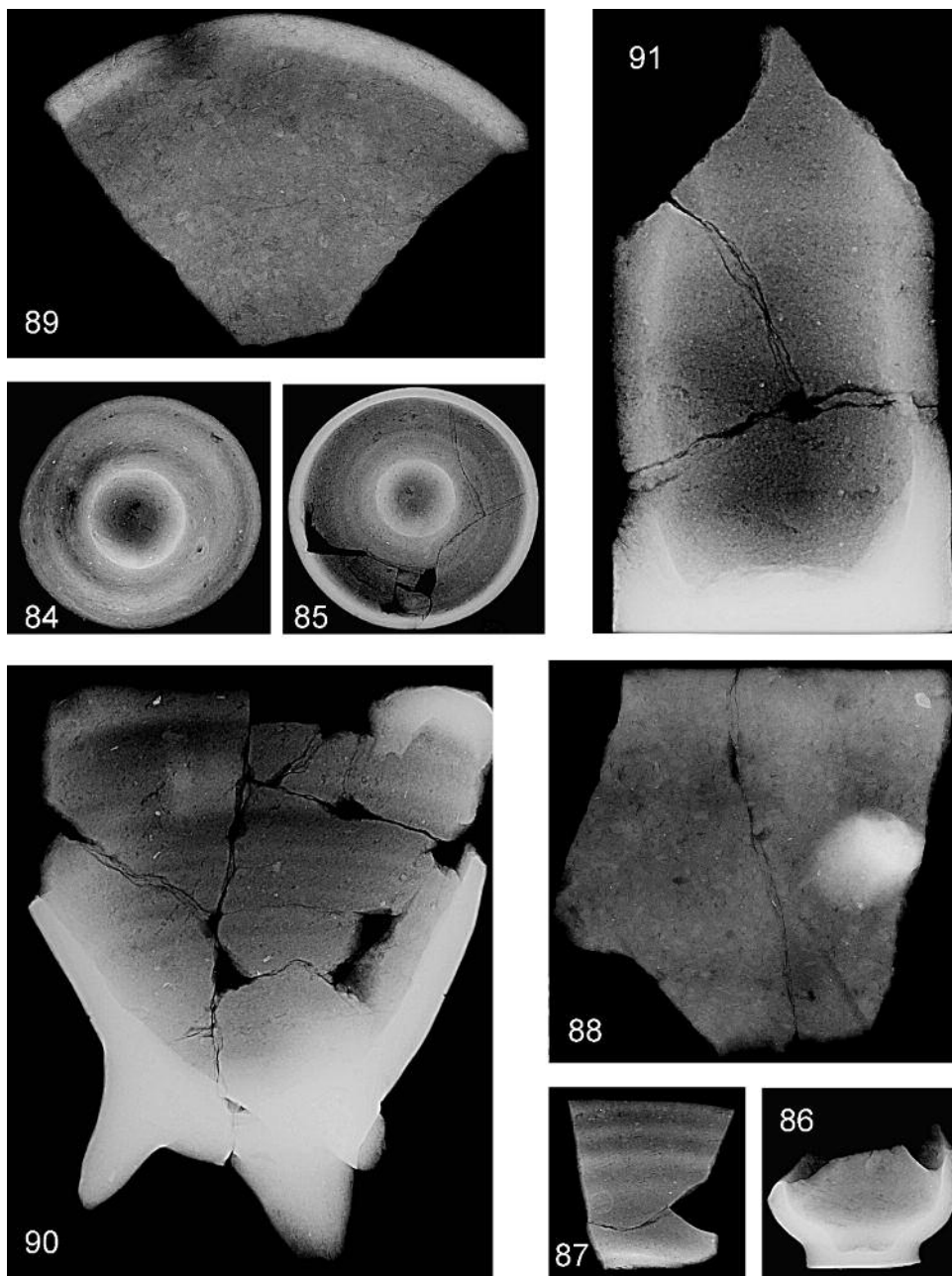
X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS

Enhanced radiographs of catalogued MM II B (65, 69) and MM III A vessels (71, 74, 76).

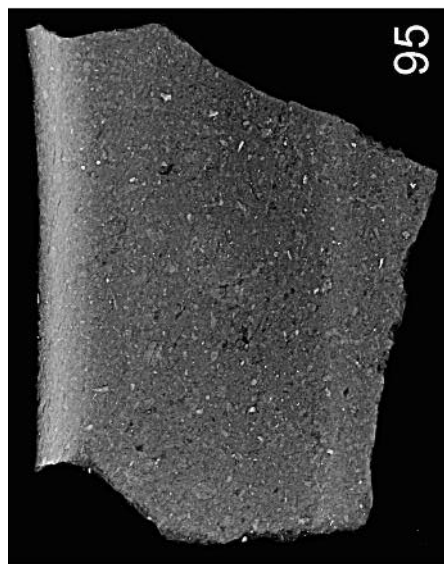
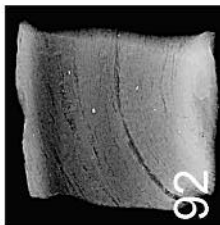
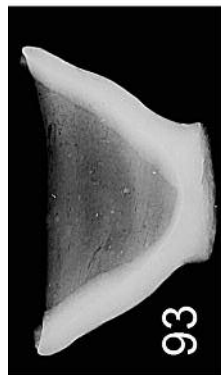
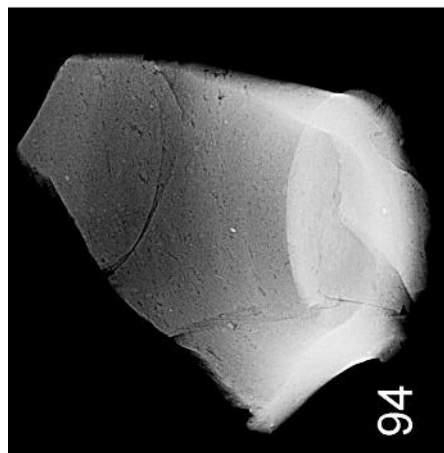




INA BERG  
 X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
 Enhanced radiographs of catalogued MM III A (72-3, 75, 77-8) and MM III B vessels (79-83).



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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued LM I A vessels (84-91).



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X-RADIOLOGY OF KNOSSIAN BRONZE AGE VESSELS  
Enhanced radiographs of catalogued LM II vessels (92-95).



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MYCENAE REVISITED PART 1

Reconstruction of Head 1 from Shaft Grave VI: frontal and profile views.





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MYCENAE REVISITED PART 1

Reconstruction of Head 2 from Shaft Grave VI: frontal and profile views.