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CONTENTS

PRE-COLUMBIAN CODEX-STYLE VESSELS FROM CENTRAL AND SOUTH MEXICO. A VIEW INTO ANCIENT RITUAL AND WORLDVIEW

Gilda Hernández Sánchez

Abstract

Presented here are the results of an iconographic study of the codex-style painted ceramics of the Mixteca-Puebla style, dating from the Late Postclassic period (A.D. 1250 -1521), found in the present-day Mexican states of Puebla, Tlaxcala, Oaxaca, Veracruz, and Mexico. The codex-style Mixteca-Puebla pottery was one of the most elaborate ceramics of Mesoamerica during late pre-conquest times. Discussed here is its use for ritual purposes, and the fact that painted images were more than mere decoration. Consequently, it is suggested that the analysis of the iconography painted on these fine artefacts give us a view into the ritual life and cosmovision of the ancient people of Central and South Mexico. Codex-style vessels are presented here as an example of the capacity of ceramics to furnish valuable insights into ritual and worldview.

Introduction

Ceramics are not simply the most archaeologically abundant artefact category; they also belong to the realm of material culture that has attracted the most attention of scholars since initial stages of Archaeology. In the early stages, ancient pottery was used to create chronologies or to trace cultural diffusion. Now, after decades of research, vessels and sherds represent more than chronological and stylistic markers. It is assumed that the manufacture, morphology and decoration of ceramics as well as the context in which these artefacts are found, reflect the available technology and their use. Also, it is believed that they are a rich and viable medium to explore social boundaries and socio-cultural behaviour (e.g., Gosselain 2000; Hofman and Jacobs 2000/2001; Stark 1998; van As 2004; van As et al. 2004). However, we are still somewhat sceptical about their ability to show ancient ritual practices and worldviews. In Mesoamerica, during the last centuries before the Spanish conquest, there were elaborate, fine ceramic vessels with painted iconography. These so-called codex-style artefacts are an example of the capability of ceramics to furnish valuable insights into ritual and worldview.

In ancient Mesoamerica ceramics were used in domestic contexts for cooking, serving, storing and transporting. They also played a major role in ritual activities as offerings, ritual equipment and even divine objects. They were also used as service ware

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for communal feasting. The codex-style pottery was one of the most elaborate ceramics in the area. Here it is considered that such pottery was used for ritual purposes, and that its painted images were more than mere decoration. It will be suggested that these fine artefacts allow us to have a view into the ritual life and cosmovision of the ancient people of Central and South Mexico.

The codex-style pottery from Central and South Mexico

Some of the finest and most elaborate ceramics of Mesoamerica is the polychrome codex-style Mixteca-Puebla pottery from central and south Mexico. It is called "codex-style" because it uses the same representational technique as the ancient native painted books from Mesoamerica, which are called codices today (Robertson 1961: 4). Specifically, its painted images are similar to those depicted on the so-called Borgia group and Mixtec codices, a cluster of books of ritual and genealogical content. The codex-style ceramic vessels, together with these codices and several mural paintings, were manifestations of a colourful artistic style and iconography called Mixteca-Puebla style. It was developed in the present-day Mexican states of Puebla, Tlaxcala, Oaxaca and Veracruz (Figure 1) during the last pre-Hispanic epoch, the Late Postclassic period (A.D. 1250-1521) (Nicholson 1966, 1982; Nicholson and Quiñones 1994).

The modern interest on codex-style vessels stems from the beginning of the twentieth century when Eduard Seler (1908: 522) recognized that the motifs depicted on these vessels were part of the iconographic corpus of the surviving Mixtec codices. Later, Hermann Beyer (1969: 469) proposed that the high quality and decoration of such artefacts suggested a ceremonial use. Both ideas continue to be supported in the literature until now (Chadwick 1971: 240; Contreras 1994: 12; McCafferty 1994: 72; Müller 1978; Nicholson 1982: 243; Pohl 2003; Quiñones 1994; Ramsey 1982; Smith and Heath-Smith 1980: 33). The first extensive study of these ceramics was conducted by Michael Lind (1994), who compared samples of vessels from different areas in the Mixteca-Puebla region.

Between 2000 and 2005 I studied a large sample of codex-style vessels in the context of my Ph.D. research at Leiden University in order to explore the meaning of their iconography (Hernández 2005). It consisted of 467 objects, which were all known, accessible codex-style vessels, or big fragments of them, from the Puebla-Tlaxcala valley (43.04%), the Mixtec region (6.21%), the central valleys of Oaxaca (10.71%), the central part of the state of Veracruz (12.85%) and the basin of Mexico (3.42%), which are the regions where these vessels were manufactured and used. information existed about the place or region of origin for most of the artefacts, but only in few examples there was detailed information about their depositional context.

Codex-style pottery is characterized by a very lustrous surface finishing, which is the result of several manufacturing steps (Castillo 1974: 7). First artisans finely polished the vessel's surface, and submitted it to a first firing. Then they covered the surface's area where they planned to depict images with a white matte slip. They painted on the slip

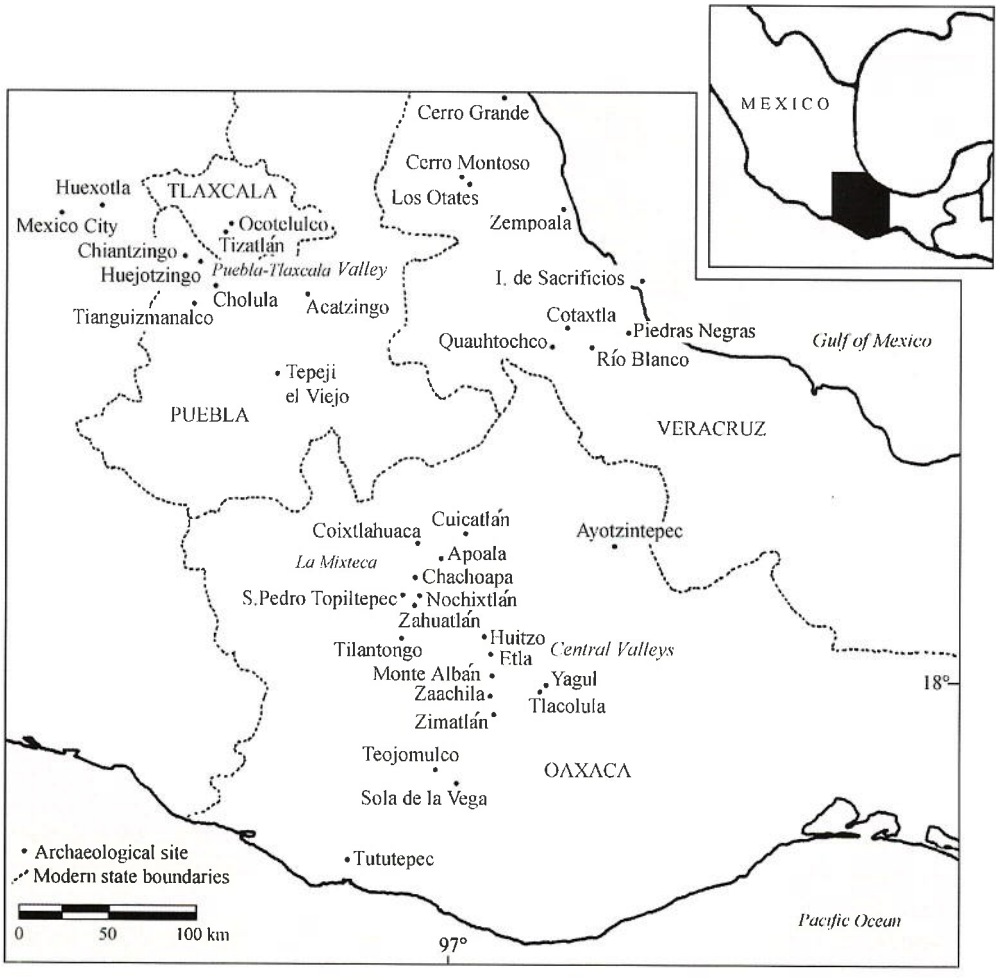

Figure 1. Map of central and south Mexico showing the region where the Mixteca-Puebla style appeared, and the sites of provenance of the vessels of the sample of study.

polychrome images with high quality paint, and delineated them with black colour. Afterwards, they polished again the vessel's surface until it became lustrous in appearance; then submitted it to a second firing. The artisans fired the vessels under oxidizing conditions, with a temperature not higher than 900°C, consequently the clay acquired a reddish colour and the surface, although it had a very lustrous appearance, was not glazed. The end product was a fine shining vessel with painted polychrome images (Figure 2).

In the regions where codex-style pottery appeared, it was more elaborate than other contemporary local pottery. In those areas during the Late Postclassic period there were

Figure 2. Codex-style tripod jar without provenance
(Photo Christopher Moser, courtesy of Michael Lind).

other monochrome and polychrome vessels, but they were not codex-style. That is, they did not show Mixteca-Puebla iconography, their quality was lower and they did not have the same shapes.

Codex-style pottery was scarce. Previous studies (Lind 1994: 86) report that in the Puebla-Tlaxcala valley and the Mixtec area, it represents between 2 and 5% of the ceramic artefacts recovered in domestic contexts. Their scarcity, however, does not necessarily imply that only a very restricted sector of the population had access to them. They have been recovered in excavations of public and ceremonial areas, in high-status domestic contexts of neighbourhoods in pre-colonial times, and also in household areas of the settlement's periphery (Hernández 2005: 43). Sherds of codex-style pottery have been found in construction fills and trash pits, and some vessels were offerings in burials.[1] Since they were present in public and domestic contexts, they had most likely various uses.

The shapes of codex-style vessels also represent different uses. A number of them are censers and god-effigies, both were well-known ritual paraphernalia in ancient Mesoamerica. In pre-Hispanic books and monuments and in colonial documents it is frequently shown that the smoke of burning resins was an essential part of the ritual practice (Figure 3). God-effigies are also represented in codices as ceremonial paraphernalia

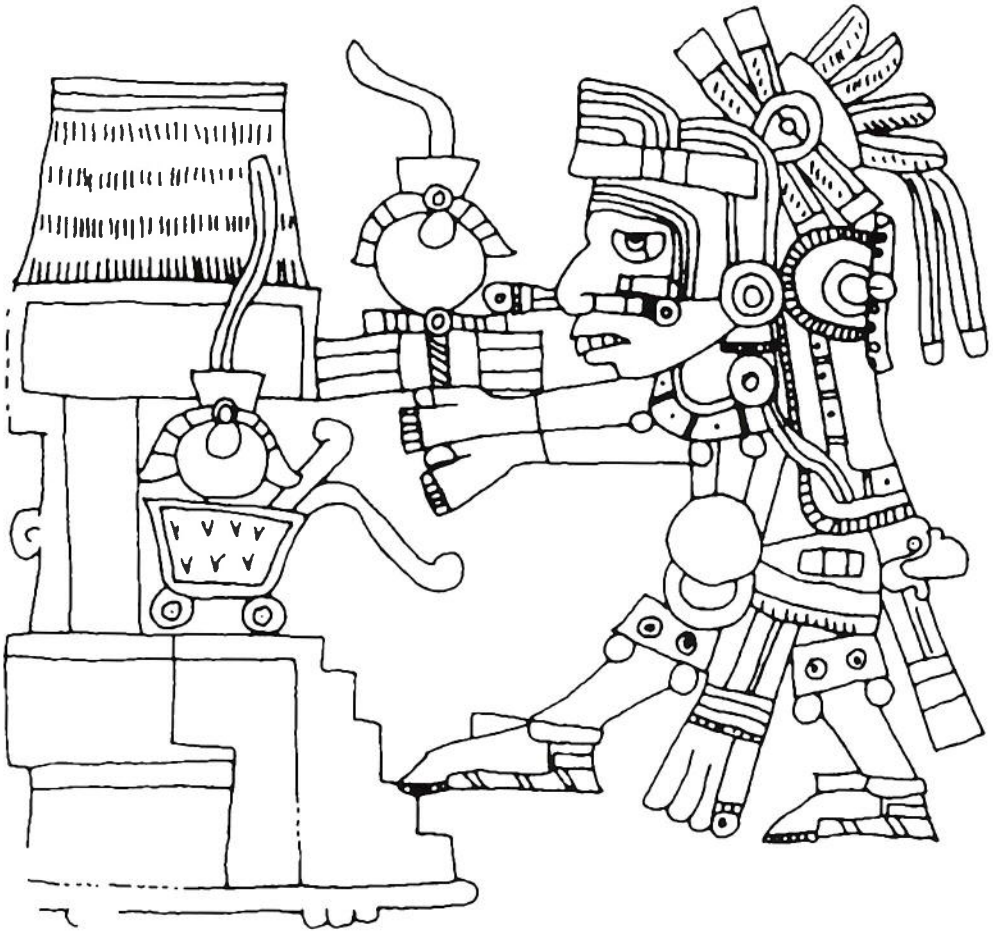

Figure 3. Image of the codex Borgia (1993: 14) showing a personage who offers burning rubber and wood sticks to make fire in front of a temple.

(e.g., codex Borgia 1993: 33, 38). However, the majority of the artefacts were designed as serving vessels (Figures 4 and 5). Some are appropriate for individual drinking like goblets, tripod jars, vases and hemispherical bowls; others for individual consumption such as plates, tripod bowls and hemispherical bowls, and some for collective serving of food and drink such as as pitchers, craters and big bowls with composite silhouette. Most of these shapes belonged exclusively to the codex-style vessels. Other contemporary pottery types from the same regions did not include goblets, tripod jars, vases, censers or craters in their inventory.

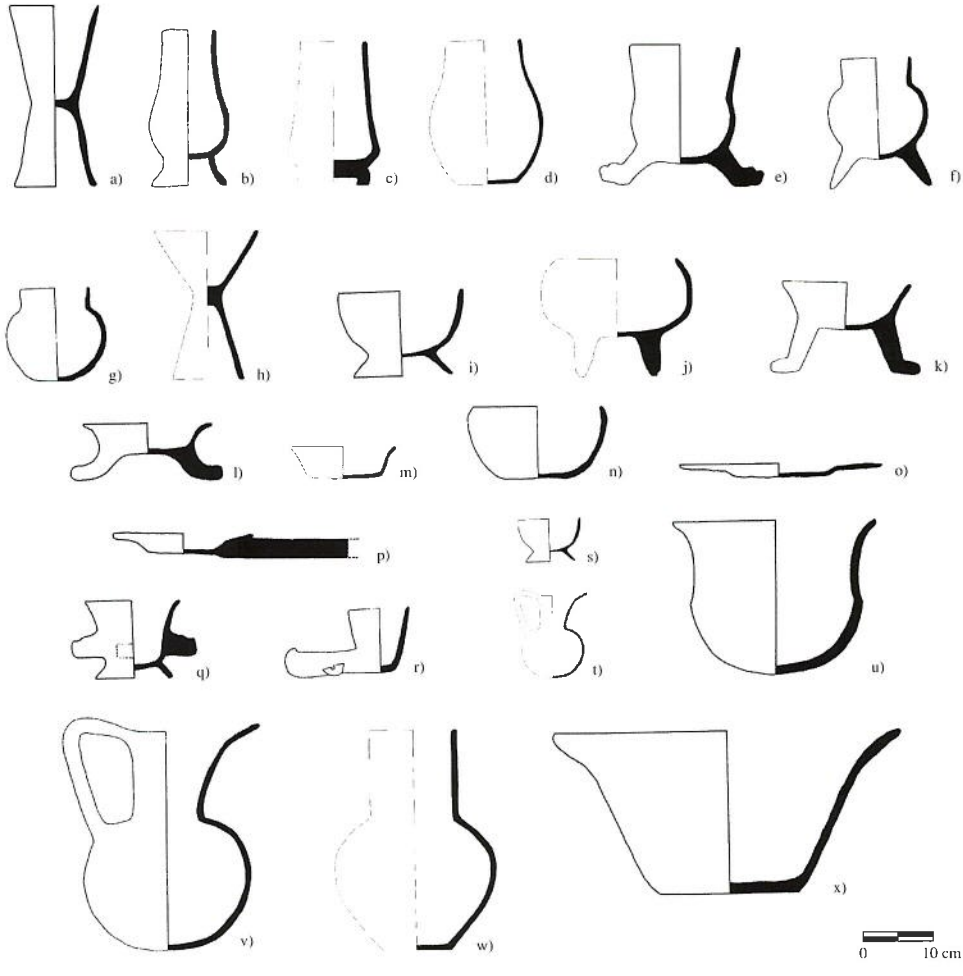

Figure 4. a. bi-conical vase; b, c. low-pedestal vase; d. vase; e. tripod vase; f. tripod jar; g. jar; h. bi-conical goblet; i. goblet; j. tripod hemispherical bowl; k, l. everted tripod bowl; m. everted bowl; n. hemispherical bowl; o. plate; p. frying-pan censer; q. censer; r. claw censer; s. miniature goblet; t. miniature pitcher; u. composite silhouette bowl; v. pitcher; w. long-neck bottle and x. crater.

From their shape and high quality, codex-style vessels were probably serving wares for feasting. Namely, ritualised events in which food and drink were the main means of expression (Bray 2003; Dietler 1996; Dietler and Hayden 2001: 3). As in many regions of the world, in Mesoamerica feasting was, and still it is, an essential element of community life. Early colonial documents describe that festivities of the ritual calendar, ceremonies of the government and other public celebrations included big communal dinners with special food, speeches, songs and other prescribed activities.

Form	Puebla-Tlaxcala	Mixtec region	Central Valleys	Other in Oaxaca	Veracruz	Basin of Mexico	U.a.p.*	Total
Goblet (Fig. 4i)	37	1	3	1	8		17	67
Everted tripod bowl (Fig. 4k, l)	20	8	16	5		1	6	56
Tripod Jar (Fig. 4f)		9	11	13	1		9	43
Plate (Fig. 4o)	31						7	38
Bi-conical vase (Fig. 4a)	17				11	2	4	34
Crater (Fig. 4x)	15			1	13		5	34
Censer (Fig. 4p)	20		1		3		7	31
Low-pedestal Vase (Fig. 4b, c)	16				6		2	24
Pitcher (Fig. 4v)	4	4	4	1		2	5	20
Hemispherical bowl (Fig. 4n)	14	1			5			20
Vase (Fig. 4d)	7				7	1	3	18
Frying-pan Censer (Fig. 4p)	6	1				5	1	13
Everted bowl (Fig. 4m)	4	2	1		2		1	10
Effigy pitcher	1	1	2	1		2	3	10
Tripod vase (Fig. 4e)	1	1	5				3	10
Bi-conical goblet (Fig. 4h)							9	9
Claw Censer (Fig. 4r)			5				1	6
Jar (Fig. 4g)			2		1		3	6
Effigy	4					1		5
Tripod hemispherical bowl (Fig. 4j)	1			1	2			4
Miniature goblet (Fig. 4s)	2				1			3
Composite silhouette bowl (Fig. 4u)	1					1	1	3
Miniature pitcher (Fig. 4t)		1					1	2
Long-neck bottle (Fig. 4w)						2		2

* U.a.p. = unknown archaeological provenance

Figure 5. Frequency and region of provenance of the vessel' shapes represented in the study sample.

The Spanish friar Bernardino de Sahagún, who collected enormous amounts of data on the pre-Hispanic Aztec life around 1570, wrote that most of the festivities of the pre-colonial religious calendar included communal meals. For example, for several days during the annual celebration of Uey Tecuilhuitl, the leader of a community offered a special beverage and food to the poor people of the region. Such drink was to be served in a particular kind of vessel, and those who dished up the food were to be attired in a certain way; afterwards there were songs and dances (Sahagún 1992: 121-122).

Codex-style vessels were, however, not only serving wares. It is also very possible that some were containers for offerings of food, beverages or other substances, given the fact that in codices, pre-Hispanic burials and present-day traditional communities, serving wares are used as receptacles for offerings during diverse ritual activities. In the codex Borgia, a pre-Hispanic book on prognostication and rituals in Mixteca-Puebla style, vessels with shapes similar to the codex-style ceramics appear as containers for food, burning resins, *pulque*[2], cacao beverage or blood in diverse ceremonies (Figure 6).

Thus, from the perspective of their shape and quality, codex-style vessels were used for ritual purpose, be it feasting or other ceremonial activities for offerings. The scarce information about their archaeological context does not provide extra support to this argument, but it indicates that people used these artefacts in public and domestic affairs.

The iconography of codex-style vessels

In many ancient cultures of the world artefacts existed decorated with iconographic motifs. Vessels with images were, as a rule, pleasant objects reserved for special functions. In Mesoamerica it was also the case, but what it is interesting here is that image and text were strongly intertwined. That is, images were media to preserve knowledge (Boone 1994: 3). On codex-style vessels motifs representing objects and actions were painted, which conformed to a system of images known as pictography (Dibble 1971: 324). It was the method to preserve information during the Late Postclassic period in Central and South Mexico.[3]

The Mixteca-Puebla style was one of the pictographic systems of that time; it was used to represent religious, ritual and historical data. Characteristic of this pictography, as the vessels show, is that the depicted motifs are standardized and their colour is meaningful. Also, many of them are iconic representations, although there are also abstract and geometrical elements. The painted images are mainly ideograms since they refer to qualities or ideas associated with the painted objects. They are not the illustration of a text through phonetic symbols; rather they transmit information through their associated meanings. For example, the illustration of an eagle on a vessel referred to notions linked to this bird, like the sun or the warriors, given that in the ancient Central Mexican worldview eagles nourished the sun and were celestial warriors (Seler 1963, I: 126).

Today it is possible to assign to many of the Mixteca-Puebla style pictographic motifs a specific word or meaning that corresponds to their original significance. This is due to the fact that several existing early colonial painted books and documents illustrate, in similar style, pre-Hispanic objects and activities with their explanations. For example, the codex Mendoza (1992), Aztec tribute lists created around 1540, shows lists of motifs with explicative glosses in Spanish or Nahuatl, the Aztec language. Also the codex Telleriano-Remensis (1995), an annotated Aztec ritual calendar with a historical narrative section produced around 1565 (León Portilla 1992: 155), represents personal names, images of deities and ceremonies with glosses and descriptive texts in Spanish (Figure 7).

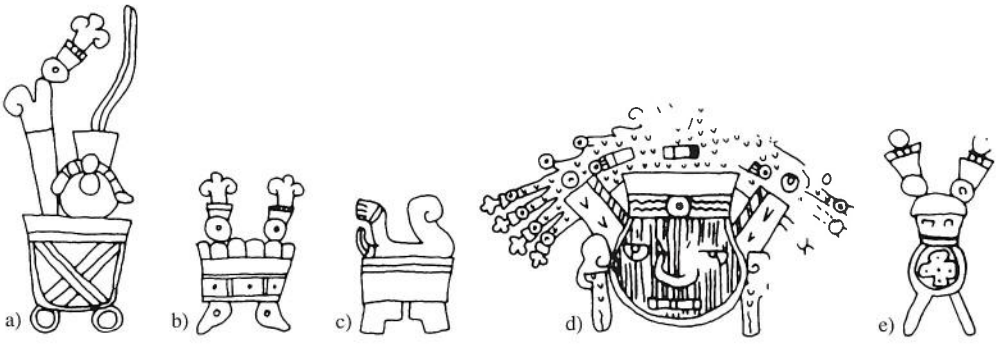

Figure 6. Vessels depicted on codex Borgia (1993: 8, 24, 45): a) bowl containing a bone awl and burning rubble, b) tripod bowl with flowers, ie., precious contents, c) tripod bowl with animal meat, d) jar containing *pulque*, and e) on codex Nuttall (1992: 12) tripod jar containing a cacao beverage.

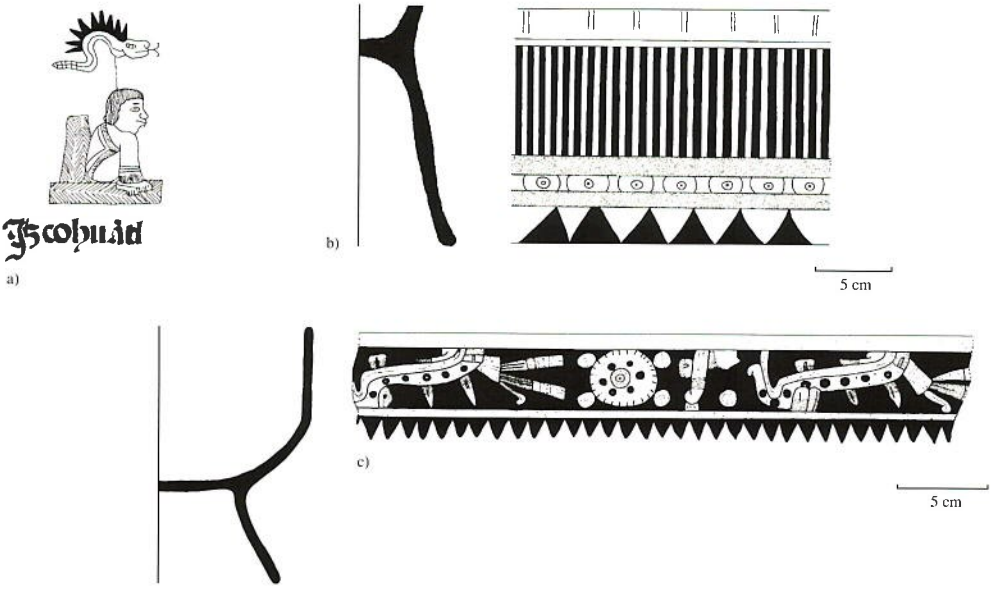

Figure 7. a) Name glyph and gloss of the king Izcoatl, obsidian snake in Nahuatl, in codex Telleriano-Remensis (1995: 31r). The black triangles on the snake indicate the particle *Itz*, obsidian in Nahuatl; b) codex-style bi-conical vase with a band of black triangles, which indicates obsidian and very possibly refers to its cutting power, from Cholula in the Puebla-Tlaxcala valley, and c) codex-style goblet with a band of black triangles from Cholula.

During the analysis of the sample allocated for this study, several groups of codex-style vessels were distinguished according to their painted decoration. Each of these groups shows a standard arrangement of signs[4], which are usually organized in bands around the vessel. These complexes of motifs are often associated with certain vessel shapes and/or with certain location on the vessel's surface and/or to certain geographical areas.

For example, the so-called complex of "Solar Band with Thorns and Bones", the cluster of signs most common in the sample, was always depicted close to the vessel's rim (Figure 8); it mostly appeared on plates, tripod bowls and craters, and it was associated with the Puebla-Tlaxcala region (Figure 9). In contrast, the complex of "White Flowers" appeared only on tripod bowls and jars, goblets and censers, and it was related to Oaxaca (Figures 10 and 11). Also, the complex of "Pray to Death" was represented on bands around the vessel in a standard arrangement (Figure 12), it mainly occurred on vases, goblets and censers, and it was more frequent in Puebla-Tlaxcala and Veracruz while it has not been found in Oaxaca (Figure 13). This implies that signs were systematically

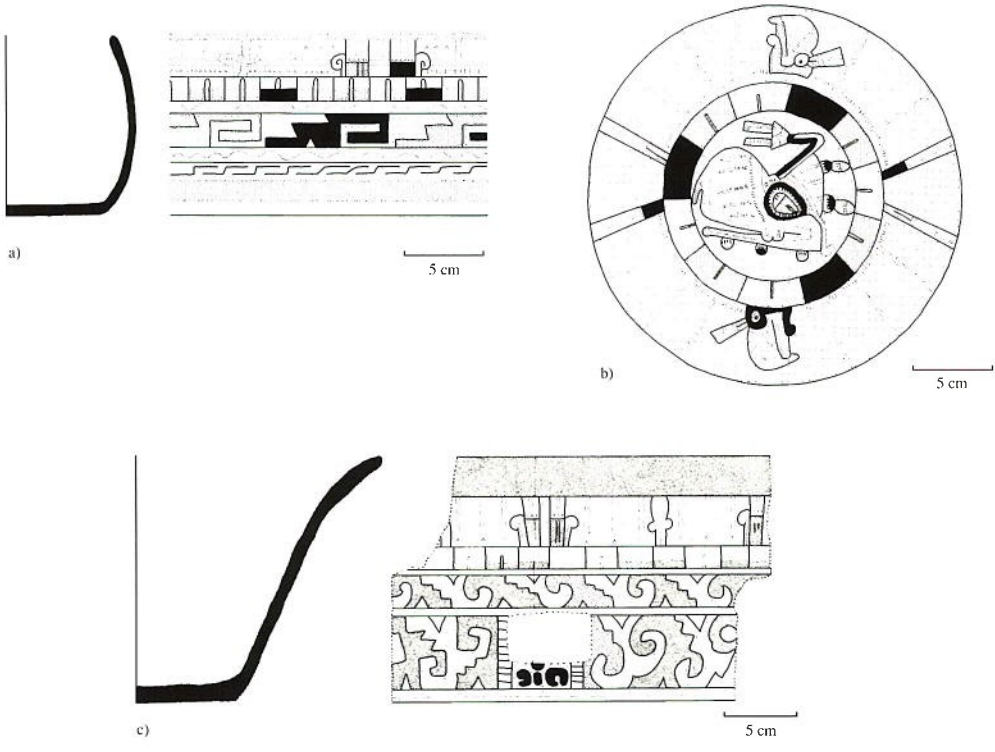

Figure 8. Codex-style vessels with the complex of Solar Band with Thorns and Awls from Cholula in the Puebla-Tlaxcala valley: a) hemispherical bowl, b) plate, and c) crater.

Site		Plate	Everted tripod bowl	Crater	Hemisphe-rical bowl	Goblet	Tripod jar
Cholula, P-T Valley		17	10	6	2	1	
P.e.* Cholula, P-T Valley		6	3			1	
Ocotelulco, P-T Valley		2					
Tizatlán, P-T Valley				2			
Huejotzingo, P-T Valley			1				
U.a.p.**	5	3				1	
Total	30	17	8	2	2	1	

* P.e. = per style ** U.a.p. = unknown archaeological provenance

Figure 9. Frequency per shape and provenance of codex-style vessels with the complex of Solar Band with Thorns and Awls.

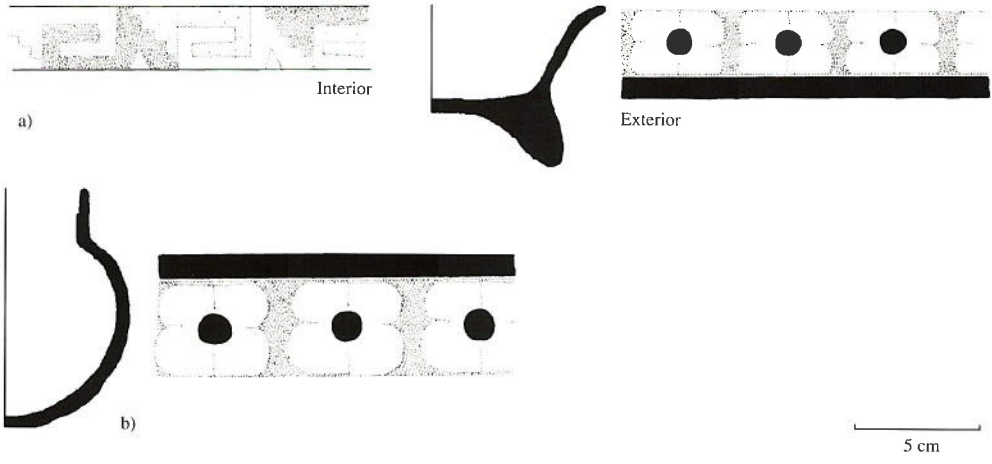

Figure 10. Codex-style vessels with the complex of White Flowers from Huitzo in the central valleys of Oaxaca: a) tripod everted bowl from Grave 1, and b) jar from the same grave.

Site	Tripod everted bowl	Tripod jar	Everted bowl	Goblet	Jar	Censer
Huitzo, Central Valleys	2	2	1		1	
Ayotzintepec, Other Oaxaca	2					
Cholula, P-T Valley				1		
U.a.p.*						1
Total	4	2	1	1	1	1

* U.a.p. = unknown archaeological provenance

Figure 11. Frequency per shape and provenance of codex-style vessels with the complex of Flowers.

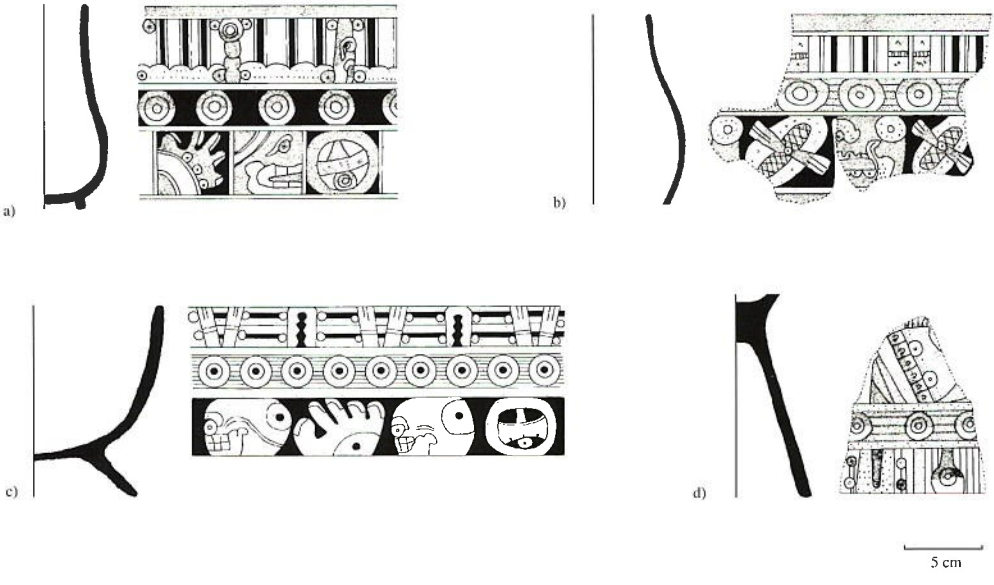

Figure 12. Codex-style vessels with the complex of Pray to Death: a, b) vases from Ocotelulco in the Puebla-Tlaxcala valley, c) goblet from Otates in central Veracruz, and d) base of a bi-conical vase from Cholula in the Puebla-Tlaxcala valley.

Site	Bi-conical goblet	Low-pedestal vase	Bi-conical vase	Censer	Everted tripod bowl	Goblet	Vase
HCholula, P-T Valley		1	1	1			
P.e.* Cholula, P-T Valley		1					
Ocotelulco, P-T Valley		2			1		
Tizatlán, P-T Valley		1					
Tlaxcala, P-T Valley		1					
Otates, Veracruz						1	1
Río Blanco, Veracruz		1					
Templo Mayor, Basin Mexico				1			
U.a.p.**	9	2					
Total	9	9	1	2	1	1	1

* P.e. = per style ** U.a.p. = unknown archaeological provenance

Figure 13. Frequency per shape and provenance of codex-style vessels with the complex of Pray to the Death.

depicted; and therefore, that complexes of signs were meaningful. It is important to note that vessels with the same complex of signs were not necessarily the product of a single workshop. A Neutron Activation Analysis conducted by Hector Neff and colleagues (1994: 120-121, 124) on a sample of codex-style pottery from several regions shows that vessels with similar complexes of signs were manufactured in different localities.

Although several vessels present similar complexes of signs, the signs are not identical; they show stylistic variation. That is, similar signs on several vessels show different attributes and variable quality of representation. Also, some signs are depicted in a simplified manner while others are the elaborate version, or some signs from a sequence or image composition are substituted with signs of similar/related meaning (Figure 14). All this reinforces the proposal that signs were meaningful.

These complexes of signs apparently formed iconographical themes. Groups of signs seem to refer ideographically to many ritual practices in Mesoamerica and related concepts (Hernández 2004b: 11). For example, agave thorns and bones awls frequently appear on the vessels together (see Figure 8). In the ancient religious codices they used to occur as a pair as well (e.g., codex Borgia 1993: 19) (Figure 15). Thorns and awls were the typical self-sacrificial instruments in Mesoamerica, thus they were very probably an ideographic reference to piety and ritual purification (Jansen 1998: 144; Nowotny 1961: 27).

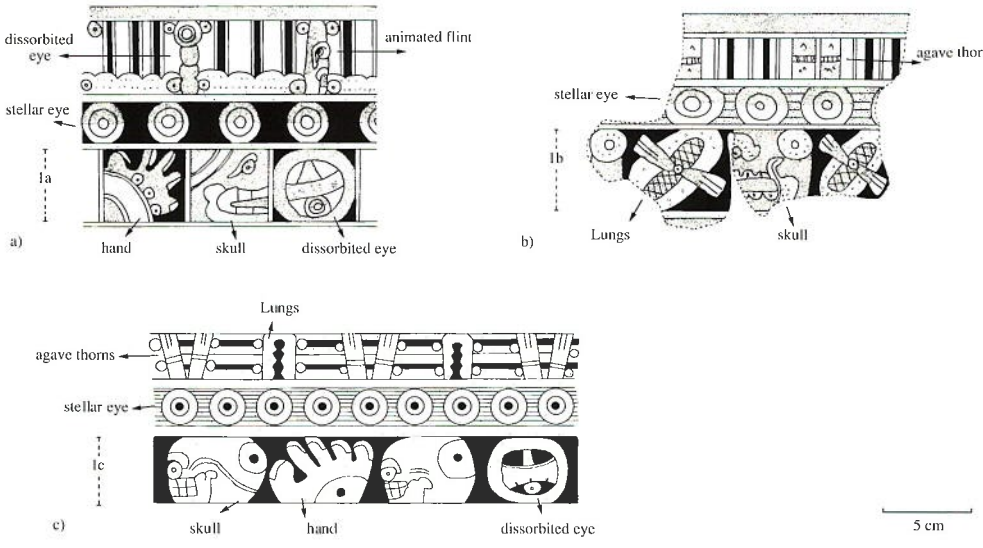

Figure 14. Pictography painted on three codex-style vessels with the complex of Pray to Death. The bands of signs around the vessels are similar in content and organization. Although the lower band (band 1) on the three vessels is not identical, the signs have a related meaning; all of them are typical signs of the iconography of death and death gods. (See provenance and shape of the vessels in Fig. 12).

Further, thorns and awls appear on the vessels on a solar band, a band representing the sun (Hernández 2004a). The sun in the Mesoamerican conception was the life principle; the energy that nurtured all living beings (Anders and Jansen 1993: 134). Other signs like ears or corn, precious stones, flowers, solar rays and pheasant heads in combination with thorns and awls often were depicted on the solar band (see Figure 8). In the pictography of the Late Postclassic period all of them were typical signs of preciousness or abundance (Anders and Jansen 1993: 120; Nicholson and Quiñones 1983: 37; Seler 1963, I: 72, 103). On the vessels, beneath this solar band usually appears a band of feathers and/or a band of step-frets. Feathers were widespread symbols of preciousness and nobility (Aguilera 1978: 18); step-frets appeared in contexts related to nobility and important lineages (Jansen and Pérez Jiménez 2000: 14; Sharp 1981: 7). Thus this complex of signs seems to refer to the sun, piety, preciousness and nobility; all notions highly esteemed in early Mesoamerica.

In comparison to codices and mural paintings of the Mixteca-Puebla style, vessels present few signs. These appear on the most visible place of the vessel's surface. They are represented in a standard manner, and are repeated several times around the vessel. It suggests that pictographic texts on vessels were codified in a simple manner, using and repeating easy to recognize elements, in order to make the message accessible to a big audience.

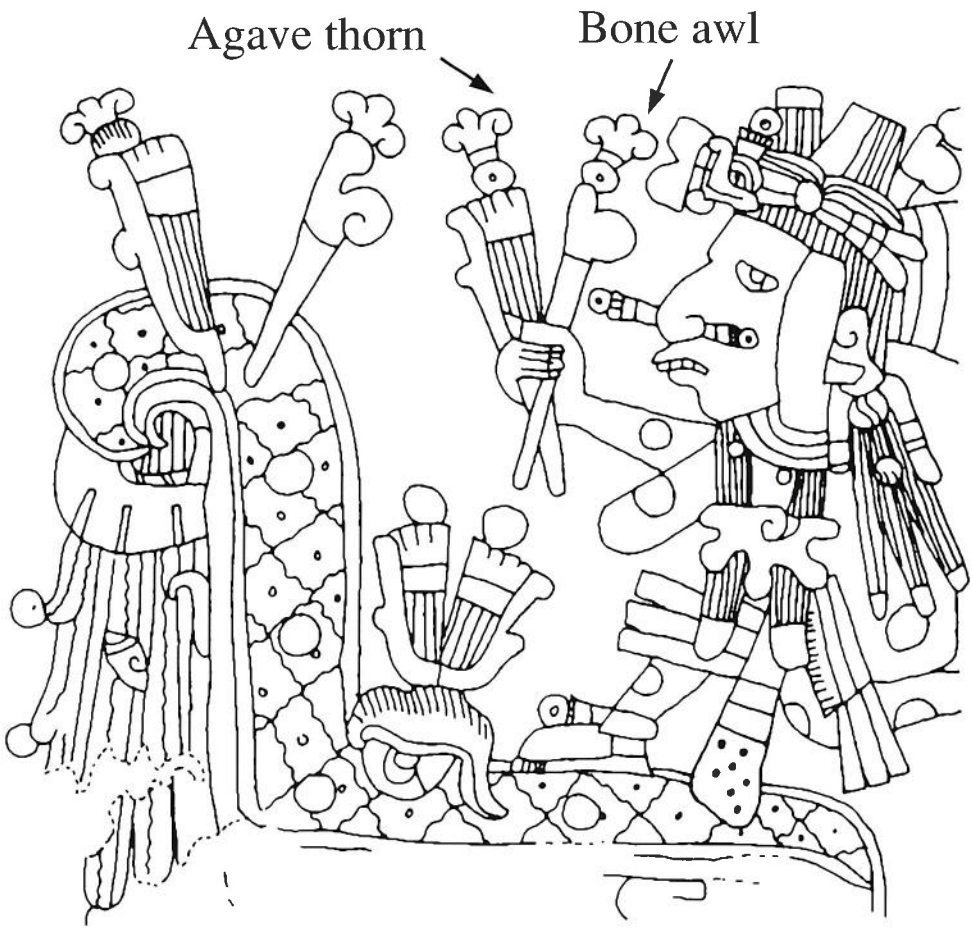

Figure 15. Image of the codex Borgia (1993: 22) showing a personage with an agave thorn and a bone awl in the hand. These signs when appear together seem to refer to notions associated to these self-sacrificial artefacts as piety and ritual purification.

Dates, calendarical data, geographical places or personal names, which are central components of historical accounts and ritual prognostication have not been identified on codex-style vessels. Consequently, it seems that vessels' painted information did not refer to those topics. In addition, there has not been any recognition of scenes describing events or referring to important episodes of Mesoamerican sacred history. However, many of the signs on the vessels were part of the religious iconographical corpus of the Postclassic period while others were well-known symbols of preciousness and nobility. Thus, the signs very probably represented important notions in the context where codex-style vessels were used, that is, in ritual activities.

The Late Postclassic period pictography depicted on other media communicated significant messages. In surviving pre-Columbian books, mural walls and carved stone monuments, pictography referred to prognostication, ritual practice and sacred and dynastic history. It is to be expected that the same occurred on codex-style vessels. Therefore, the analysis of the signs and themes depicted on them will possibly let us have a view into the concepts related to the ritual activities in which these artefacts were used.

The themes depicted on codex-style vessels

A variety of themes were represented on codex-style vessels. Interestingly, from the available samples, some complexes of signs appear on an orange-colour background while others were depicted on a black/dark background. According to my interpretation[5], those complexes of signs painted on orange background alluded ideographically to: (a) piety (see Figure 8), (b) nobility and luxury (Figure 16), (c) warriors' activities, (d) beings with extraordinary powers, (e) beauty, (f) fertility gods and the ceremonial beverage *pulque*, or (g) agricultural fertility. In contrast, complexes of signs painted on a black/dark background alluded to: (a) the death and the ancestors, (b) darkness, (c) penitence and purification, (d) several particular gods, or (e) smoke as a ceremonial mean to contact the deities and the other world.

In general, signs related to the sun, the light and festivity appear on an orange background, while signs associated with death and topics suggestive of darkness and mystery appear on a black background. Such pairing of contrasting concepts seems to correspond to the fundamental duality light/darkness pervasive in ancient Mesoamerican cosmovision. According to pre-Hispanic and early colonial documents, the world, the deities, history and ritual practice were organized according this duality. One well-known example is the transition from darkness to light as a metaphor for the beginning of the present human era. It is clearly shown in the sacred histories recounted in the Mixtec codex Vindobonensis (Jansen 1997: 14) and the ancient Maya book Popol Vuh (Tedlock 1996: 21).

The themes depicted on the vessels seem to be central concepts in the context of the Mesoamerican ritual practice. Some themes are directly related to ritual activities such as piety and penitence. Others seem to be associated with certain kinds of ceremonies like propitiation of agricultural fertility, the cult of death and the ancestors, or actions around warfare. Moreover, some themes represent common notions linked to ceremonial contexts like nobility, luxury, beauty, darkness and smoke. In ancient codices, stone monuments and mural paintings, similar notions were represented, although on the vessels they were more simplified and repetitive. Very probably these concepts corresponded to the main concerns of the Mesoamerican people.

Some of the complexes of signs on codex-style vessels were also represented on other contemporary media. For example, the complex of "Solar Band with Thorns and Awls" (see Figure 8) was also depicted on Aztec monumental stone carvings.[6] The complex "Pray to Death" (see Figure 12) was depicted on mural paintings, small altars

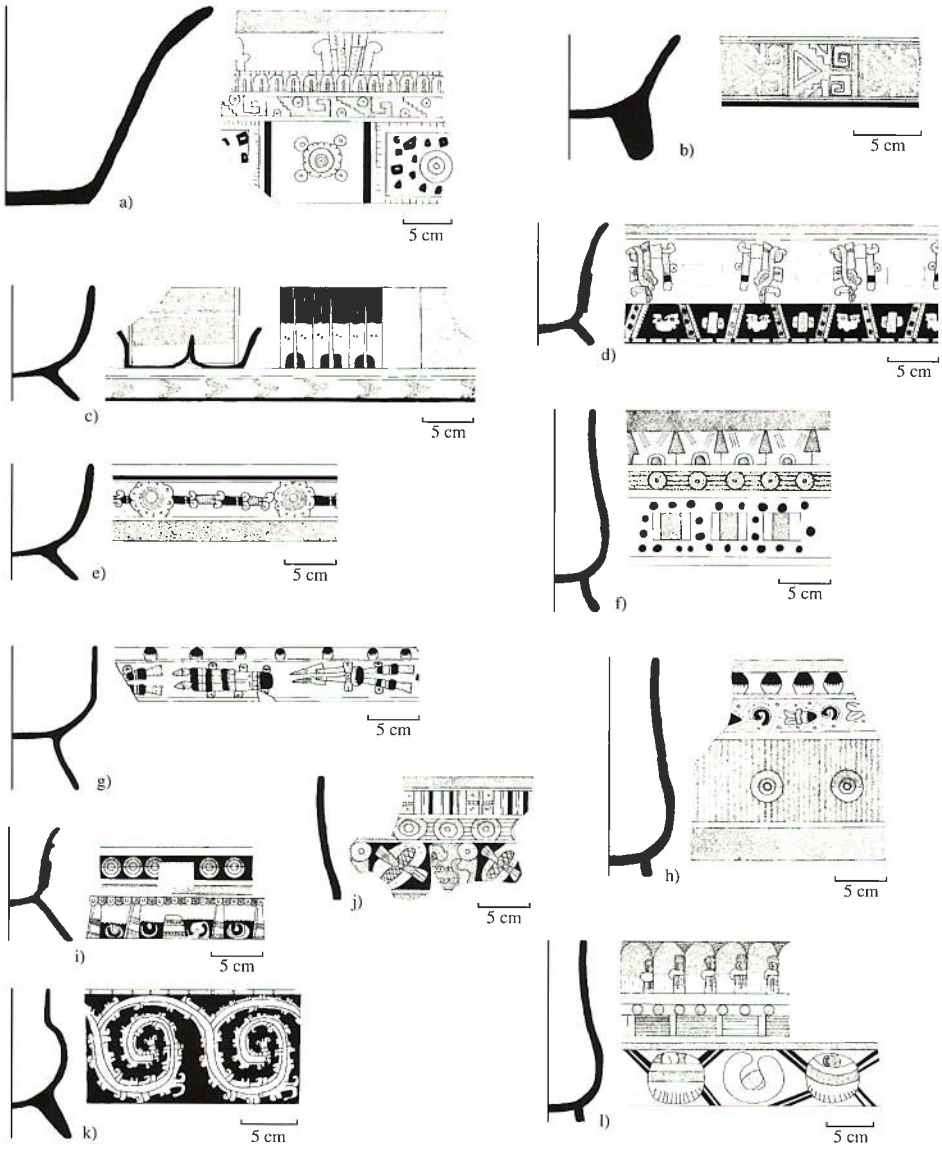

Figure 16. Complexes of signs identified in the study sample: a) complex of Solar band on a crater from Cholula in the Puebla-Tlaxcala valley, b) complex of Nobility and Luxury on a tripod everted bowl from Apoala in the Mixtec region, c) complex of Eagles and Sun on a goblet from Cholula, d) complex of Powerful Lords and Animals on a censer from Cholula, e) complex of Flowers on a goblet from Cholula, f) complex of Pulque on a vase with lower pedestal base from Piedras Negras in central Veracruz, g) complex of Warriors on a goblet from Cholula, h) complex of Agricultural Fertility on a vase with lower pedestal base from Ocotelulco in the Puebla-Tlaxcala valley, i) complex of Darkness on a censer without provenance, j) complex of Pray to the Death on a vase from Ocotelulco, k) complex of Smoke and Darkness on a tripod jar from Tututepec in the Mixtec region, and l) complex of Gods' Vessels on a vase with lower pedestal base from Piedras negras.

and blankets[7] as well. Thus, some of the complexes painted on the vessels were well-known visual compositions during the Late Postclassic period. The monuments, structures and artefacts with such images were part of ceremonial contexts, and by themselves they were ceremonial objects. It implies not only that codex-style vessels were painted with recognized symbols of Mesoamerican ritual practice, but also that they were ceremonial artefacts.

Conclusion

Codex-style vessels were not only fine artefacts. The motifs painted on them conformed to a pictography that referred to essential notions of Mesoamerican ritual practice. Most likely the meaning of the painted signs was related to the context in which the vessels were used. That is, vessels designed for feasting were painted with symbols of nobility and luxury, while vessels created for ceremonies of the warriors included well-known warfare motifs. Although the scarce archaeological contextual information does not support or negate this hypothesis, the association between signs and vessel's shapes suggests that the images were related to the use of the vessel.

Signs were depicted on the vessels in a standardized, simplified and repetitive manner, which suggest that the original users and beholders of the artefacts must have understood them. Apparently, the artisans, and also possibly the users, categorized the vessels following the fundamental Mesoamerican notion of duality. The pictography painted on them suggests that some vessels were associated with a day/light context while others were linked to a night/darkness environment.

Following Rappaport (1999: 141), the pictography shows that these vessels made visible abstract concepts difficult to communicate through speech or performance, such as offering, piety, preciousness or the searching of divine beings. For example, the representation of thorns and bones on the vessel's surface materialized piety, while feathers, step-frets and flowers make material preciousness and beauty. Therefore, the analysis and interpretation of the themes represented on codex-style vessels furnishes valuable insights into the ritual practice and worldview of the ancient Mesoamericans.

Codex-style vessels are an example of the possibility in approaching ancient ritual and cosmovision through archaeological artefacts. Certainly, we are not able to understand all the messages painted on the vessels. We are also not capable of recognising whether the users of the vessels understood all signs, or if the signs stimulated emotions or religious feelings. However, with the help of pre-Hispanic books and other documentary data we are able to approach the broad meaning of most of the signs painted on the vessels, and to place them in the context of Mesoamerican ritual practice.

Acknowledgements

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Notes

1. In ancient Mesoamerica the practice of placing ceramic vessels and other artefacts as funerary offerings was very common.

2. *Pulque* is a pre-Hispanic alcoholic beverage based on fermented juice of agave.

3. During the Postclassic period in Central and South Mexico the representation of information was pictographic. Writing systems highly based on phonetism existed in Mesoamerica, but not in this period and region.

4. Here the painted images are considered signs given that they are not isolated representations; rather they transmit information in combination with other signs (Goody 1991: 6).

5. A detailed identification and interpretation of the complexes of signs on the vessels is offered in Hernández (2005).

6. It appears on the well-known so-called Calendar Stone (Matos Moctezuma 1988: Photo 8) and the Tizoc's Stone (Townsend 1992: 95, Figs. 49 and 40), but also on other carved stone monuments.

7. This complex appears on the murals of Tizatlán (Caso 1927) and Ocotelulco (Contreras 1994), which are part of the Mixteca-Puebla style tradition. It occurs on altars in the Aztec region (Batres 1979; Palacios 1935: 300; Villagra 1971: Fig. 33) as well. On codices and colonial documents blankets are represented with the same pattern or signs. In one case it is being burned together with other "idolatrous objects" (Relaciones Geográficas 1984: Fig. 13). In two other cases the blanket is worn by a priestess (codex Nuttall 1992: 44; codex Tudela 1980: 50r).

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SEARCHING FOR POTTERS: DOING POTTERY RESEARCH IN THE MIXTECA ALTA

Isabel D.S. Houben

Abstract

Research on contemporary pottery traditions can not only provide useful information for archaeologists but can also be a source of information for future generations in the potters' villages whose traditions are rapidly disappearing. However, carrying out the actual research can be quite difficult. Even with a well designed research strategy, it can be hard to foresee all possible circumstances.

Introduction

From March 15th to July 14th 2003 I carried out research in the Mexican villages of Santa Maria Cuquila and Agua Zarca, Tlaxiaco[1]. The aim of the research basically was to document the complete production cycle of the ceramics that are being produced in these two Mixtec villages, as Cuquila[2] is said to have been producing ceramics for daily use for centuries. This tradition is rapidly dying out, as young people do not seem to be interested anymore in becoming potters because of its low profits. They prefer to earn money doing seasonal work in the United States of America or move away from the village to study and work in, for example, Mexico City.

The inspiration for this research came from Aurora Pérez Jiménez and Maarten Jansen. During one of their *Sahìn Sàu*[3] classes, they showed a number of pots that were made in the region. In response to questions about how they were made, they replied that that had not yet been investigated.

I planned to go to the village and become an apprentice to one of the potters. In this way I would learn how to make all the different pots, thus enabling a thorough description of the methods, materials and tools involved.

Geography and climate

The potter villages of Santa María Cuquila (S.M. Cuquila) and Agua Zarca are two Ñuu Savi or Mixtec villages in the Mexican state of Oaxaca (Figure 1). Both villages are part of the *municipio* (municipality) of Tlaxiaco in the Mixteca Alta region. The Mixteca Alta is the mountainous central area of the Mixtec region.

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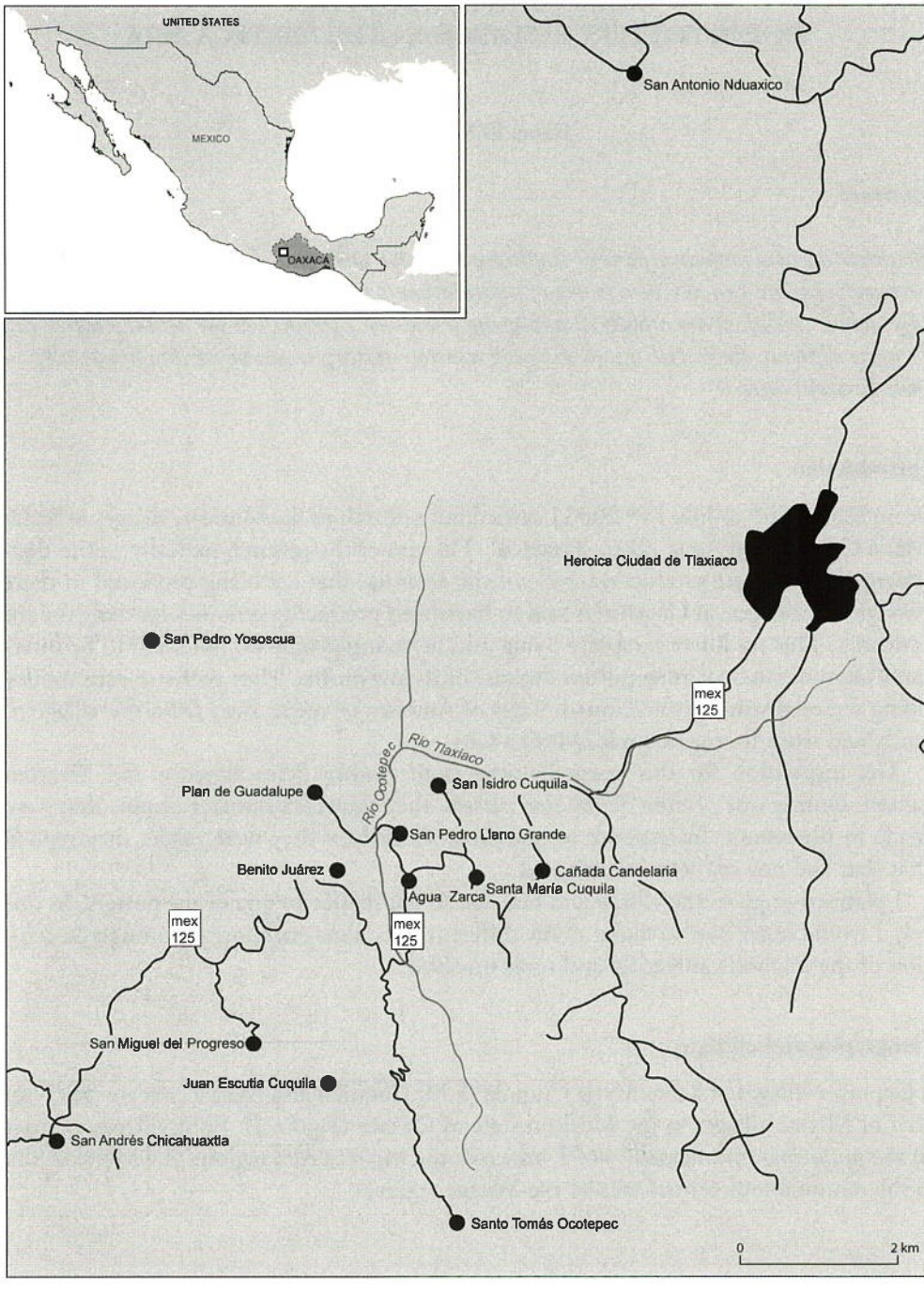

Figure 1. Map of the Cuquila area.

S.M. Cuquila is situated on an altitude of 2180 meters and Agua Zarca on 2100 meters above sea-level (INEGI Censo 2000) (Figure 2). The villages' territories spread over several mountain slopes. According to the XII General Census of Population and Housing in 2000, the total population of S.M. Cuquila was 682 people, while the total population of Agua Zarca was 336 people at the time the census was carried out (INEGI XII Censo 2000).

Agua Zarca, just like San Pedro Llano Grande, Cañada Candelaria, San Isidro Cuquila, Benito Juárez, Juan Escutia Cuquila and Plan de Guadalupe, is considered a *ranchería* or *rancho* of S.M. Cuquila by inhabitants of S.M. Cuquila, who see their village as the *cabecera municipal*. The *cabecera municipal* is the primary settlement; *ranchos* or *rancherías* are subordinate (Spores 1984: 168). Nevertheless, inhabitants of Agua Zarca say that the claim that their village is a *rancho* to S.M. Cuquila is nonsense because Tlaxiaco is their *cabecera municipal*, and consequently the villages are on an equal level. According to the INEGI all of the aforementioned villages are part of the *municipio* of Tlaxiaco. In the past however, Cuquila[4] used to be a *cabecera* with dependencies (Spores 1984: 213). Between the villages of S.M. Cuquila and Agua Zarca was a very perceptible kind of rivalry.

In the whole Mixtec area a dry and a wet season can be distinguished. The dry season begins around November and ends in April, and the wet season begins in May and ends in October. During the wet season most potters do not make ceramics because it is difficult to dry and fire the pots and also because access to the clay and sand mines becomes very complicated. The average monthly temperature is 18°C. In the winter temperatures can fall below 0°C. According to the inhabitants it was very hot and the rain came late in Santa María Cuquila during my stay. It did not rain until the end of May.

Research difficulties

Although my research strategy was well designed on paper, it proved to be more complicated to carry out in reality. The conditions that I will be addressing here are the ones that are more specific to the Mexican countryside and that made it difficult to find a (suitable) potter to work with over the course of my research.

The most obvious difficulty during my research was the fact that I am a woman. The position of women in Mexico is problematic. The social situation proved to be a bigger problem than I thought, especially since most of the potters in Cuquila turned out to be men. In order to avoid gossip it was quite impossible to visit them alone.

In part, the problem of going to a (male) potter to do research could be solved by finding someone who would accompany me. It would solve another difficulty at the same time, namely that of communicating with the potter. I do not speak *Tu'un Savi*. I learned only (part of) the basis of *Sahìn Sàu* in Leiden, and the Cuquila variant differed too much. Several of the potters are monolinguist *Tu'un Savi* speakers, the others do speak Spanish in different degrees[5]. I speak Spanish fluently but it is a second language. This meant that someone would have to spend time with me, instead of working

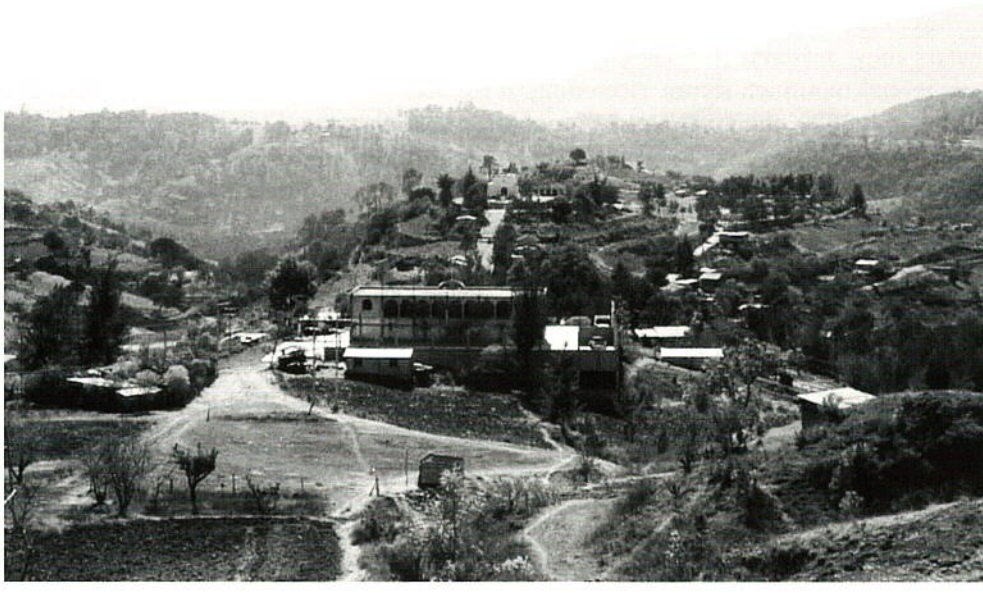

Figure 2. View on Santa María Cuquila: in the foreground the backside of the *municipio* and in the center the church.

the field or tending cattle[6]. With the wet season so close it proved nearly impossible to find someone to accompany me to the potters on a regular basis.

I had not considered how the *cargo*-system might influence my research. In Cuquila, all civil and religious offices – like *agente* (comparable to mayor), *secretario* (secretary) *tesorero* (treasurer) and *fiscal* (church caretaker) – are appointed every year to a different person. Such an office is called a *cargo* in Spanish. In both villages, men are appointed a *cargo* every two to three years, beginning at age 18, starting with a *cargo* considered easy. Several of the *cargos* are so time-consuming, especially those involving the municipal authority, that one does not have enough time to take care of his *milpa* or his animals, let alone his other profession. When I lived in S.M. Cuquila, two potters who lived not too far away and who spoke sufficient Spanish had very time-consuming *cargos* and therefore could not teach me their craft on a regular basis.

Another difficulty was caused by drinking problems. Also, preparations for the wet season started earlier than I had imagined[7]. Potters who work during the wet season go to the sand mines more often to lay in stock. Others decided to prepare their *milpa* for sowing maize, because the weather was changing.

In Agua Zarca however, I found more practicing potters than in S.M. Cuquila. I therefore moved to a house in Agua Zarca, where I was close to at least four potters. I could not, for various reasons, work with several of them but there were more possibilities. Although don Lucio was a man who lived alone, I could visit him since his house is next to the rough dirt track that leads to Agua Zarca's *agencia* (municipality of

a smaller village) and consequently a route where relatively many people passed. Don Lucio's door is always open when he is home. His workshop is in his single-room house (Figure 3) – he works next to his bed and his house altar (Figure 4).

I could not schedule regular meetings with don Lucio, since he had a *cargo* at the *CONASUPO*, the government-subsidized cooperative store (Monaghan 1995: 26-27). Nevertheless, since I would pass his house when I went to doña Tomasa and her husband don Euloguio[8], I could see when don Lucio was making his ceramics and was always welcomed by him. Don Lucio continued to make pots to earn money for food, because he does not grow maize or other vegetables.

The potter I worked with most was doña Tomasa, whose husband was constructing a house for their son, and therefore did not have time to teach me his craft. His wife used to be a potter too but had now changed to weaving the traditional *huipil* of Cuquila because she could earn more money this way. Besides, weaving with the backstrap-loom can be done while grazing the sheep, since the loom can be tied to any tree. Doña Tomasa went back to making pottery again for three weeks in order to show me how it is done (Figure 5). Doña Tomasa, like all women in Agua Zarca, had to go quite often to mandatory meetings at which she would learn how to read and write, and meetings which she had to attend because she would otherwise lose the financial support that she receives from the government. Sometimes we could not meet because all the inhabitants of Agua Zarca had to go to the *agencia* to listen to the political candidates that came to the village to talk about their plans.

Pottery tradition in the two villages

Cuquila certainly has a history of making pottery. At a nearby archaeological site pottery has been found dating to the Early Classic Period (300 B.C.–300 A.D.) and the Post Classic Period (900 A.D. –1500 A.D.) as well (Figure 6). In a document from 1791, written in Spanish by the priests of Tlaxiaco in response to a questionnaire from the Spanish Crown, Santa María Cuquila is mentioned as a village where the majority of the population occupies itself with making earthenware for daily use (Esparza 1994: 387). However, in the *Padrones de Contribuyentes* (Registers of Taxpayers) from 1880, 1891, 1937-1939 and 1940-1947 (1943) in the Archive of Tlaxiaco, no mention is made of potters. All men are said to be "*labradores*" (farmers) in the documents from 1880 and 1891 (ARM a and b) and in the other two documents all men are said to have the profession of "*peón del campo*" (agricultural labourer) (ARM c and d). Making ceramics was most likely not seen as the principal profession of people in this area, as is still the case today.

Contemporary pottery

Today, almost everyone is a farmer with his own *milpa* (field) to provide for his own maize, which is used for making tortillas. Besides that, if they have some time left, they

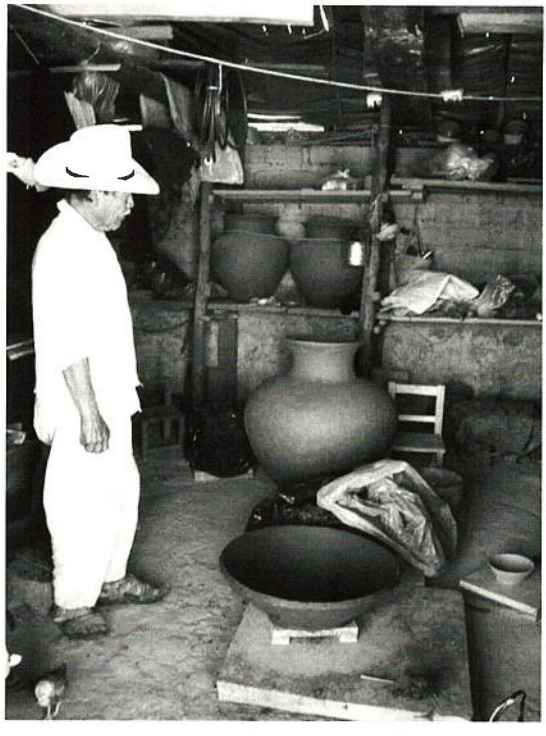

Figure 3. Don Lucio's house/workshop.

Figure 4. Don Lucio leveling the neck of a *kisii* in his workshop/house. Behind him is his bed.

Figure 5. Working with doña Tomasa in her (separate) workshop.

Figure 6. Several of the ceramics found on the site are exhibited in the communal museum.

make pots. Don Macedonio told me that he makes pots when he does not have to sow or tend to the maize or tend his animals. Don Evaristo said that whenever he has time left, making pots is his profession. The only exception is don Lucio, who says that making ceramics is his primary profession. He is also the only person I know of within both Agua Zarca and S.M. Cuquila who does not have a *milpa*, but lives exclusively on the profits earned by selling his ceramics and therefore continues to work during the wet season.

My research is focused on the documentation of the contemporary pottery tradition in the villages of S.M. Cuquila and Agua Zarca. There are male and female potters in Cuquila. In Santa María Cuquila, I have observed three potters working and was told that there were two other potters (all of them males). In Agua Zarca I know of seven people who are still working as potters (I have worked with six of them and only one of them is a woman) and doña Tomasa, who does not practice pottery making anymore, but made pots especially for me so I could see how it is done. Further I have spoken with don Macedonio and don Lorencio who live in San Pedro Llano Grande. Apart from those two potters, there is at least one more potter in San Pedro Llano Grande, according to don Lucio from Agua Zarca. The youngest potter was doña Tomasa, who was 50 years old at the time[9]. The oldest potter was don Ignacio, who was at that time 86 years old.

Shapes and functions of the pottery

The pots made in Cuquila, are mainly for daily use. The models made by almost all of the potters are: *ko'o*[10] (bowl), *kisii* (pot), *tindo'o* (jug), *kiyii* (pitcher for water), *tija'an* (casserole), *tindoita* (vase), *koñu'u* (incense burner) and *candelero*[11] (candlestick). Of those, the *ko'o,* the small and the medium size *kisii* and the small and medium size *tindo'o* can be found at the weekly Saturday market in Tlaxiaco or at the Monday market in Chicahuaxtla (Figure 7). The *kiyii* and the *tija'an* can also sometimes be found at the marketplace, but more often they are ordered by clients who come to the potter's homes. *Tindoita*, *koñu'u* and *candelero* are (as far as I know) always made to order. These latter ones are used in the (Catholic) church, at the cemetery in ceremonies and on the house altars that every Catholic family in Cuquila has (Figure 8).

In addition to this repertoire, there are also the big *kisii* that are used during feasts when meals are prepared for many people, and the *kisii* for *ndixi kua'a*, fermented pineapple juice. These large pots are made (mostly on demand) by only a few potters, like don Evaristo and especially don Lucio (Figure 9). Don Lucio is said by several sources to have once made a pot for a feast that measured 1.50 m in height (potters in Cuquila measure theirs pots following the shape of the vase) – don Lucio himself does not reach that height. He said that beforehand he carefully calculated the proportions of the vase. From the beginning he had to work very neatly because he would not be able to smooth the whole inner surface in the end. In order to be able to make the upper part of the pot, he put a chair inside it, because otherwise he could not reach its walls.

Figure 7. A *revendedora* is selling Cuquila-made *kisii* and *tindo'o* in different sizes at the market in Tlaxiaco.

Figure 8. House altar with on the right a *koñu'u*. In the foreground a small *tindoita* can be seen next to a medium size *kisii*.

Figure 9. Big *kisii* and *kisii* for *ndixi kua'a* (made by don Lucio) are drying.

Pottery manufacture

The ceramics in Cuquila are made of local clay (*ñunkixin*) that is tempered with local sand (*ñutin*) in a ratio normally of two to three. The *ñunkixin* can be found at several places; most potters are within half an hour's walk from a quarry. The sand quarry is located where the Río Ocotepec and the Río Tlaxiaco unite, on the eastern bank. It takes some potters ten hours to get home with sand, including all the activities in the quarry like excavating the sand, smashing (Figure 10) and then sifting it. Getting there takes most potters at least one and a half hours, but it is a descent. Returning home, uphill, with 35 kilograms of *ñutin* on their back costs considerable more time.

A square wooden board (*tukunu luli*) is used as a turntable, with the size of the board indicating the size of the pot. The most common size for the *ko'o* is ten by ten centimeters. The tools used in Cuquila are the *tikasii* (piece of gourd or coconut shell), the *sañii* (corncob) (Figures 11a,b), the *ñii* (piece of leather) and two kinds of *yuchi'i* (scrapers, both are made from metal). All of the tools are recycled items, leftovers from house construction (metal and wood) or from daily use (broken gourd, worn out shoes, corncob) (Figure 12). Nothing is wasted.

Figure 10. Don Evaristo in the quarry, smashing sand before sifting it.

The *ko'o* is the bowl-like shape which serves in different sizes as a base for most other pots unless the intention is to simply form a bowl. The bowl is made with a pinching technique, although the ball of clay is flattened first, which is then followed by a drawing technique with the fingers to raise the walls higher. This is followed by working the walls up and smoothing them at the same time with the *tikasii*. If the *ko'o* is the end product, then the outside surface is smoothed with the *sañii* and the brim is smoothed with a moistened *ñii* (Figures 13a-d). If the *ko'o* is the base for another pot, then it is left outside in the sun to dry for some time in order to become firmer. After that, the pot is made bigger by adding coils and pinching and drawing them up in the desired shape. These coils are not made on the table, but rolled in the air between the hands of the potter. Almost all the pots are created in this way.

Figure 11a. Using the corncob to smooth the connection of the neck of a *kisii*.

Figure 11b. Using the corncob to smooth and raise the interior wall of a *kisii*.

Figure 12. Tools used in Cuquila, from left to right: two *sañii*, two kinds of *yuchi'i*, two *tikasii* and a *ñii*.

Except for the *tindoita*, the pots are usually not decorated. Don Lucio sometimes adds a small adornment to a *kisii*, *tindo'o* or *kiyii*, because that will raise the price by five pesos[12]. Some of the potters paint their pots using a specific red earth, found locally. To paint the vessels, the earth is soaked in a pot with abundant water. The pigment is applied with a piece of cloth soaked in this colored water. This easy task can be done by the potter or by his wife and children.

After thoroughly drying (Figure 14), the pots are fired on a part of the *milpa*. Each potter fires his own pots on his own land, and always at the same place (Figure 15). The wood used is juniper (*Juniperus communis*) or pine (*Pinus teocote*). After firing the pots, they are sold directly from the house by the potter, or the potter sells them at the markets in Tlaxiaco and Chicahuaxtla. The potter can sell the pots directly to clients (especially the pots made on demand) or to so-called *revendedores*, middlemen.

Conclusion

In this article I have described the villages S.M. Cuquila and Agua Zarca and their pottery tradition in a nutshell, in order to sketch a background for the experiences I had

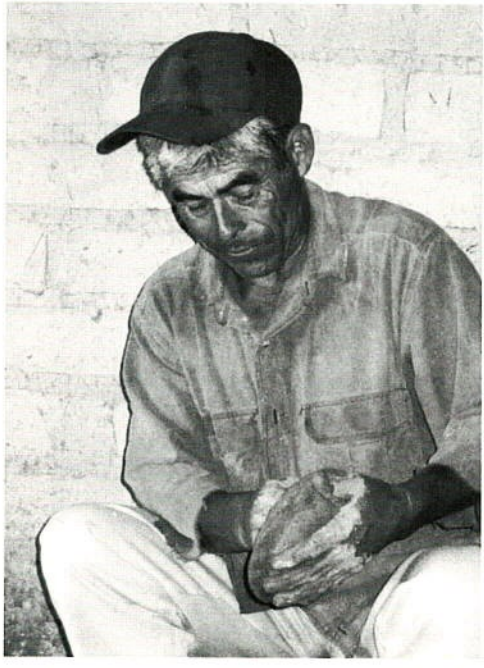

Figure 13a. Making a *ko'o*: don Euloguio making the base in the flattened ball of clay.

Figure 13b. Making a *ko'o*: don Euloguio levelling the brim.

Figure 13c. Making a *ko'o*: don Fidel smoothing the surface with a *sañii*.

Figure 13d. Making a *ko'o*: don Euloguio finishing the brim of the pot with a *ñii*.

Figure 14. Drying *ko'o*, *koñu'u* and *kisii*.

Figure 15. Don Nicolás firing pottery.

while doing research there. In the beginning it was sometimes quite frustrating not to be able to find one (single) potter to work with. It also meant that it would not be possible to actually learn how to make all the pots in the sense that we had intended. After all, to really learn how to make these pots in the exact way the potters make them, one needs to carefully observe how the potter constructs the pot and then one can start making them him- or herself, with corrections from the potter. In the end I worked with several potters making ceramics: with some I spend only a few hours, with others a number of days. This enabled me to observe more clearly the personal variations both in pottery making but also in living. In the end I had gathered sufficient information for my MA-thesis.

While in the field these circumstances, like male-female relationships, alcoholism, *cargo*-system etcetera, that were seemingly preventing me from getting any "results", actually were allowing me to see how potters in Cuquila live and how they make a living. They gave a much more authentic view of the life of potters in the Mixtec region.

Acknowledgements

I would like to express my gratitude to the inhabitants of Santa María Cuquila and Agua Zarca, who have received me very kindly in their homes and lives and who have allowed me to learn something of their impressive culture. I am very much indebted to the potters, especially doña Tomasa and don Euloguio, don Lucio, don Evaristo and don Nicolás, who have so kindly and patiently shown me how their ceramics are made. Special thanks are due to doña María de la Luz and her family, who provided me with a home in Agua Zarca. Thanks are also due to don Emiliano, who accompanied me at several occasions, and to maestro Pedro who taught me the basics of the Cuquila variant of *Tu'un Savi*. I am grateful to the *agencias* of Santa María Cuquila and Agua Zarca for their authorization of the research. Thanks are due to Mischa van Sluis and Megan Hershey for their careful reading and corrections of this text. For the drawing of figure 1 I thank Medy Oberendorff. Lastly I would like to express my appreciation to Bram van As and Loe Jacobs for their support and suggestions.

Notes

1. Several people, from both Leiden University and universities in the United States of America, had been to Santa María Cuquila in the past in order to research ceramic production, but for a variety of reasons no research was ever concluded or published. Because of my own interest in ceramics – I have been a hobbyist potter since September 1999 – Maarten Jansen and I decided that this would be the subject for my MA-thesis (Houben in prep.).

2. Whenever the name Cuquila is used in this article, it refers to both Santa María Cuquila and Agua Zarca, especially when pottery is involved. When referring to one of the villages specifically, the name of this village is mentioned.

3. *Sahìn Sàu* is the Mixtec word the people in Chalcatongo use for the Mixtec language. In Cuquila the Mixtec language is called *Tu'un Savi*. The Chalcatongo variant is different from the Cuquila variant of Mixtec, though people can understand each other. This is not the case with all the Mixtec variants. When visiting the marketplace with the daughter of the family I lived with in S.M. Cuquila, she could not communicate with an elderly woman from San Juan Mixtepec, because they could not understand each other's variant of the Mixtec language.

4. The Cuquila mentioned in Spores' work is most likely Santa María Cuquila. The prefixes are never mentioned when talking about the village, though in other cases, (San Juan Ñumi, San Antonio Nduaxico) prefixes *are* mentioned. In the same book on page 217 (Figure 9.3), a photo of a sixteenth century map shows a church next to the name Cuquila. Santa María Cuquila was, until some years ago, the only village bearing the name which had a church. Also, people (in and outside of S.M. Cuquila) say Cuquila whenever they mean S.M. Cuquila. All in all, this shows that whenever Cuquila is mentioned in the book, it is probably S.M. Cuquila that is meant.

5. Of the population in S.M. Cuquila who are 5 years and older, 570 speak the indigenous language. Within this group, 70 people do not speak Spanish (INEGI XII Censo 2000). In Agua Zarca, 274 people 5 years and older speak the indigenous language, 52 of whom do not speak Spanish (INEGI XII Censo 2000).

6. I arrived in Cuquila at the end of the dry season while people were making preparations for the wet season. They had to prepare their *milpa* for sowing or take their cattle to graze on pastures on the mountain slopes. Cattle in Cuquila are fed with hay. At the end of the dry season and at the beginning of the wet season, people's stock of hay runs out. In order to feed their animals, they then take them to graze on the pastures on the mountain slopes.

7. The research period was primarily determined by time constraints put forward by grants that I received. If I had not wanted to travel (partially) in the wet season I would have had to wait for at least six more months.

8. Don Euloguio's name is pronounced as "Eulogio" (without a "u"), but is written *with* a "u".

9. Her son, Tomás, about 25 at the time, told me that he had been working as a potter when he went to secondary school in Tlaxiaco, earning his daily passage to the village. He does not practice the craft anymore since he is working and studying in Mexico City.

10. For the writing of *Tu'un Savi* I follow the method of the *Ve'e Tu'un Savi* (Academy of the Mixtec Language) (1999), because this is the method the people in Cuquila (the ones that have learned to write their language) use. However, I use the method with one exception. Students from Cuquila at the *Ve'e Tu'un Savi* are taught to write a "t" whenever a "t" (occlusive alveolar voiced consonant) is pronounced, but also whenever a "d" (dental, occlusive, voiced consonant) is pronounced. I believe this does not do justice to the pronunciation in Cuquila and therefore I prefer to write a "d" in those cases.
Furthermore, *Tu'un Savi* is a tonal language, but since its tonal system is extremely complex this was left outside the scope of the investigation.

11. No *Tu'un Savi* name was given for the *candelero*.

12. During my stay in Mexico, the exchange rate of the peso for the Euro fluctuated between 11.5690 pesos (18 March 2003, sources: Banamex, Bursamétrica y Banco de México) and 11.7670 pesos (14 July 2003). At some point I received over 12 pesos for one Euro at an exchange office in Oaxaca de Júarez.

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Documents from Archives and abbreviations:

ARM: Archivo Regional de la Mixteca, Tlaxiaco, Oaxaca
Exp.: expediente = file
C: caja = box

ARM a Sección Tesorería/ Padrón de Contribuyentes/ Santa María Cuquila: 1880-1885, Exps. (1-30) 00018, C-4

ARM b Sección Tesorería/ Padrón de Contribuyentes/ Santa María Cuquila: 1891, Exp. 00004, C-8

ARM c Sección Tesorería/ Padrón de Contribuyentes/ Santa María Cuquila: 1937-1939 (1937), Exp. 00004, C-27

ARM d Sección Tesorería/ Padrón de Contribuyentes/ Santa María Cuquila:1940-1947 (1943), Exp. 00003 (1-32), C-28

AN INTERVIEW WITH POTTERS IN THE SOUTHERNMOST PART OF MALAWI

Karsten Wentink

Abstract

As a student participating in the 2003 archaeological field campaign of the research project of Menno Welling in Malawi the author had a chance to interview two potters working in a village on the Mwanze River in the district of Chikwawa. The short interviews of which this contribution is a report deals with some cultural and social aspects of the clays used by the potters, the function of the different types of pottery and the meaning of decoration.

Introduction

On the fourth of September 2003, during an archaeological excavation campaign in Malawi under the direction of Menno Welling[1] the author, together with mr. Beston Kayira and mr. Benjamin Lopanda from the Malawi Department of Antiquities, paid a visit to two potters in the small village of Kanzimbi on the south bank of the Mwanze River, in the district of Chikwawa (Figure 1). Earlier interviews conducted by others had yielded some information about the technical aspects of pottery production (Heckroodt 1985; Saunders 1986; Welling pers. comm.). Our aim for these interviews was to find out more about the cultural and social aspects of both the pottery production process and the pottery itself. We interviewed Malita Samuel (the senior potter), together with three of her apprentices, Emelesi Genesis, Evita Pite and Mwaiwano Theka. A series of different pots was placed in front of us as an example of the different types of pots all produced by them. Behind us lay a pit with the still smoking remains of yesterdays fire, in which a series of new handmade pots had been fired.

The clay

The first point of focus was the origin of the clay, which is used for the pottery production and the rituals involved in the digging process. The anthills on the village commons were the source of the clay. This clay is mixed with water and kneaded in a shallow pit in the ground to form the clay body. Throughout the process of obtaining the clay, it is forbidden to sleep with one's husband. Sex during this time this would result in cracked pottery. Tradition dictates that the anthills are the source for clay, given that the ancestors used these same sources. Ephita Loni, the potter who we interviewed later that day,

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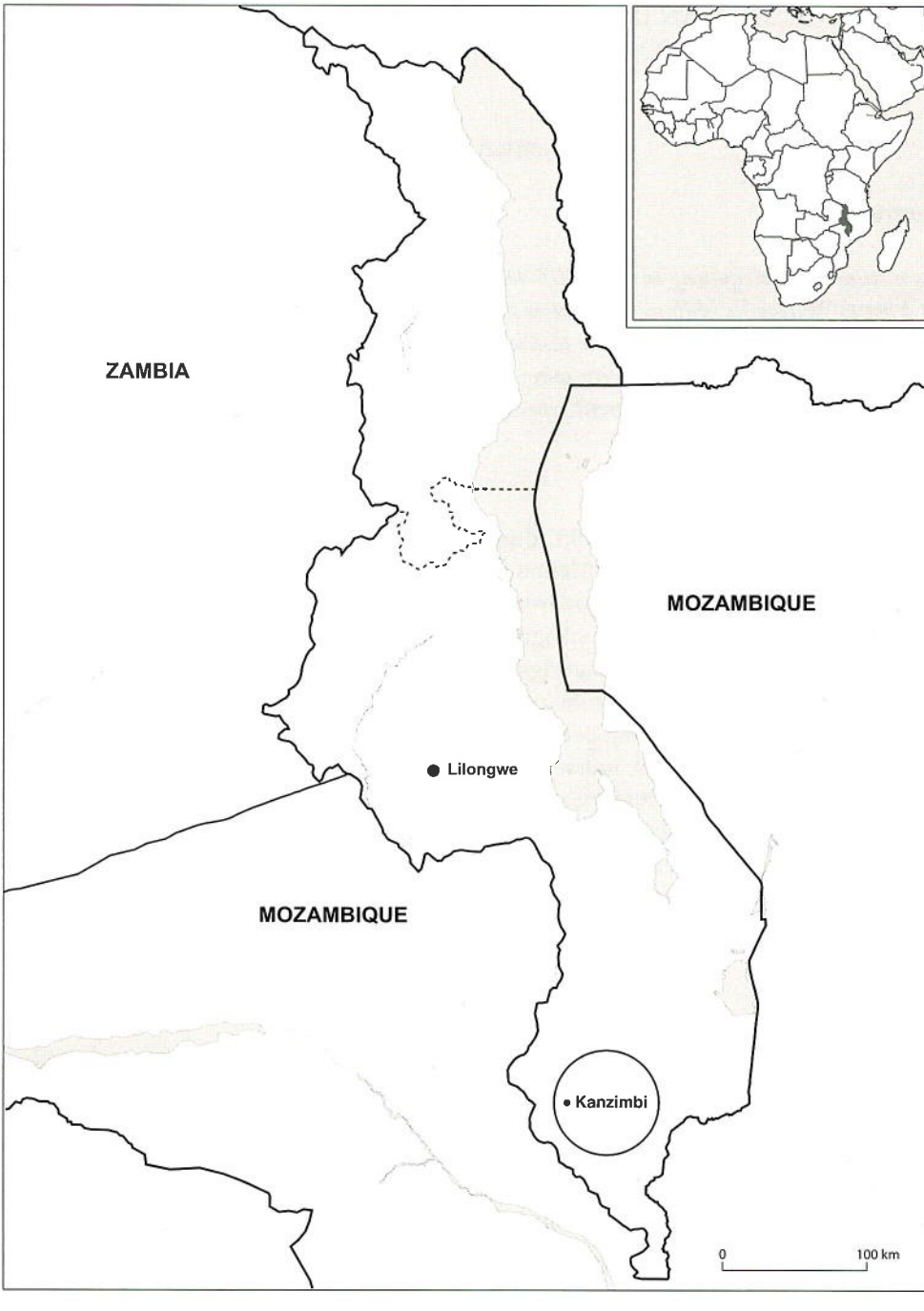

Figure 1. Map of Malawi, showing the location of Kanzimbi on the south bank of the Mwanze River, in the district of Chikwawa.

added that this clay possesses the best physical qualities needed for pottery production (Figure 2). According to her the clay from the gardens does not have the right texture for pottery production. This information explains both the current and the ancestral preference for this clay. Also, she explained that besides abstinence during the process of obtaining clay and while producing pottery, one can use a special medicine to avoid cracked pottery. It is her mother who prepares the medicine, but when we tried to find out more about this medicine we were informed that her mother lived very far away. This evasive answer might be related by her unwillingness to reveal this secret knowledge to outsiders. The sexual prohibition and the medicine are, in all likelihood, related to the prevention of tsempho, a disease prone to all processes of (re)production (Welling pers. comm.).

The function of the pottery

The senior potter explained the function of the different types of pottery placed before us. Most of the pots are used for profane things like cooking or storing food or water. However, two pots, one rather big, the other quite small, have a special meaning. These two pots were placed a bit separate from the other pots and are called *nkhate*. The meaning of these pots could not be discussed in public. The senior potter tried to scare away

Figure 2. One of the interviewed potters, Epitha Loni, sitting next to some of her vessels.

the children who were sitting around us. When this did not work she sat somewhere else with us, in relative solitude. She started to explain that these pots have a sexual-related function. The *nkhate* is used by newly wed couples. The big *nkhate* is primarily used for heating water to wash the whole body. The small *nkhate* is used for heating water used for washing hands and face. However, this small *nkhate* is also used for heating water to wash the private parts of the newly weds after having had intercourse. Due to the sexual-related meaning of these pots, they are placed in the bedroom away from the children, concealed by a newly purchased cloth.

The decoration

When we came to the meaning of decoration we could distinguish eight different motives, all grooves placed at, or just below the pot rim. When we asked directly about a meaning of the decoration we were told that there was none. The potters insisted that they just applied decoration in a random way based upon individual choice and creativity. However, after asking around a bit we found out that these specific motifs were also used for decoration on women's bodies in the form of scarification. Although this custom is no longer in use, some of the elderly women still carried broad zones of decorative scars on their chests, arms and waists. The scars were applied during the initiation rites after having their first period when they were still young girls. Several of the elderly women showed us their scarifications. When we looked at them we saw some of the same motives used on the pottery. Striking was that the women had different patterns on their bodies. The women explained that they belonged to different ethnic groups. The senior potter, with decoration type D (see Figure 3) scarred on her chest belonged to the Mang'anja people whereas the women with type C belonged to the Sena people.

The Mang'anja people were the first agrarian people in Malawi and therefore claim ownership of the land (Schoffeleers 1992). The Sena is a group of later immigrants that now live mixed with the Mang'anja, but who apparently have their own set of decorative motives. Although we did not learn anything about the meaning of the motives used for decorating pottery, we now know that these motives were also used to decorate women's bodies in the form of scars. Besides the clear link these motifs have with women, who produce the pottery, there also appears to be a link with ethnicity. Based upon this information, some incised pattern seem to be associated with the Mang'anja people (type D) and others appear to have a relation with the Sena people (type C). We should however be careful interpreting this observation since it is based upon only two individuals. Further research is needed in order to substantiate these findings.

We were also told that certain decorations were preferably applied to specific parts of the body. Decoration types H and D were mainly applied on or near the belly, whereas type G was only applied on the fore-arms. Since there were only three women present who still had scars we could get information on only a few motives. We were unable to

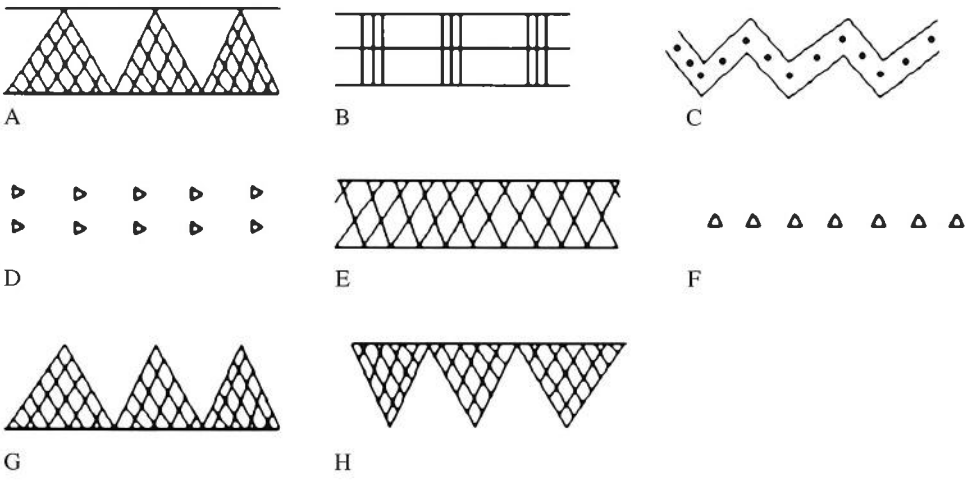

Figure 3. The eight different types of motives found on pottery in the village of Kanzimbi.

establish whether patterns other than D and C had a relation with ethnicity. Nor could we determine the existence of a preference for other types than H, D and G in relation to location on the body.

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Many thanks are due to Beston Kayira and Benjamin Lopanda from the Malawi Department of Antiquities who served as translators during the interviews. The author also wishes to thank the potters Malita Samuel and Ephita Loni for their hospitality. The author is indebted to Menno Welling for his critical reading and useful comments.

Notes

1. The excavation took place as part of the NWO-funded research project entitled "Landscapes of trade, production, and sacred power – an interdisciplinary inquiry into the identity of the Lundu Atate in the Lower Shire Valley, 1500 – 1863 A.D.".

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CULTURAL TRANSMISSION AND CHANGE IN TRADITIONAL PALESTINIAN POTTERY PRODUCTION

Hamed J. Salem

Abstract

This article discusses the learning frameworks and socio-economical processes that mainly affect the process of cultural transmission and cultural change in the production of traditional Palestinian pottery. By presenting ethnographical observations and ethno-historical data, an attempt is made to provide a model of pottery tradition for archaeologists involved in ceramic analysis. The data was collected in the ingoing project with the Palestinian potters, started in the mid 1980s.

Introduction

The two extant pottery traditions in Palestine include a tradition of handmade pottery and a tradition of wheel-made pottery. Both traditions descend from pottery making cultures in a remote past. In their present form, they are the result of cultural transmission, cultural change and social interaction. Two factors will be discussed that affect the process of cultural transmission and cultural change: (1) the learning frameworks, which are closely connected with the potters' freedom of mobility and (2) the socio-economical processes, which are motivated by the market demand and the political situation in the surrounding regions of the potters.

Learning frameworks

The process of cultural transmission of Palestinian handmade and wheel-made pottery is influenced by three major learning frameworks: (1) the genealogical framework (patriarchal and matriarchal), (2) the neighbourhood or co-operative framework and (3) the institutional framework.

Genealogical framework

In the genealogical learning framework, pottery traditions are transmitted from one member of a family to another over two or more generations. If the pottery tradition is transmitted from father to son, we call it a *patriarchal network*. In a *matriarchal network*, on the contrary, the tradition is transmitted from mother to daughter.

Leiden Journal of Pottery Studies 22, 2006: 51-64.

Patriarchal network

The patriarchal network is the most dominant learning framework in the workshop mode of production in Palestine. It is a family network headed by the oldest male member of the family. This can be the father or the grandfather. Usually, the potters' sons learn the craft when they are young because of economic necessity or failure to continue their school education. Following are some examples of the patriarchal network.

Abu Ahmed is the last potter of Jaba', a village near Jenin (Figure 1). He learned to make pottery from his father, who in turn inherited the craft from his father. Abu Ahmed started to work in the old workshop owned by his family, where seven of his uncles were also active. After a while, there was not enough space for all of them. Therefore, Abu Ahmed's father and his sons moved to another workshop. During the 1940s, Abu Ahmed and one of his brothers built the present workshop. During the 1960s, his cousin, Abu Munir, stopped working in the pottery industry and moved to Kuwait,. About thirty years later, he re-established a new pottery workshop. More recently, however, he closed his workshop and opened a small restaurant (Salem 1999).

It took Abu Ahmed about five years to master the potter's craft. Like most of the potters, he began early when he was fourteen years old. Assisting his father in collecting clay, loading and unloading the kiln and carrying the finished products were among his major tasks. Later on, before he fully mastered the craft himself, he imitated his father's products in miniature.

Abu Ahmed taught the craft to two of his sons. One of them became a potter in his workshop (Figure 2). The other son became a bank employee. However, he also works part-time in a new workshop established on the main road.

In the town of Hebron, the potters expressed various opinions with regard to craft transmission. There are those men who prefer to give their sons a future through school education. Others consider pottery making a tradition that should be maintained within their family. One hundred potters were active in some eleven workshops until the mid 1970 (Rye 1976). Hebron workshops were and still until today are the most active pottery centres in the region. The number of workshops clearly creates an educational atmosphere for new generations of potters. All of them belong to one family called *el Fakhouri*, which means 'a pottery maker'. Pottery making is a family business inherited from their grandfathers. Their fathers taught them to make pottery. Almost all potters' sons learn how to make pottery and cooperate with their fathers. One potter declared that, since his sons failed at school, he decided to let them work with him in the workshops. Another potter reported that he was not willing to transmit the craft to his sons, because pottery making is a hard job. In order to keep the secrets of the craft in their own hands, the potters generally prefer their sons to become their assistants. Today, two of Abu Shwakat's (one of the major potters of Hebron who belonged to el Fakhouri family) sons are working in their father's workshop. Two of his grandsons are engaged in preparing the clay plus loading and unloading the kiln (Figures 3, 4, 5).

In many Palestinian workshops especially in Gaza and Hebron three generations of potters are active. This was observed in Gaza, where A'ttallah learned the potter's craft

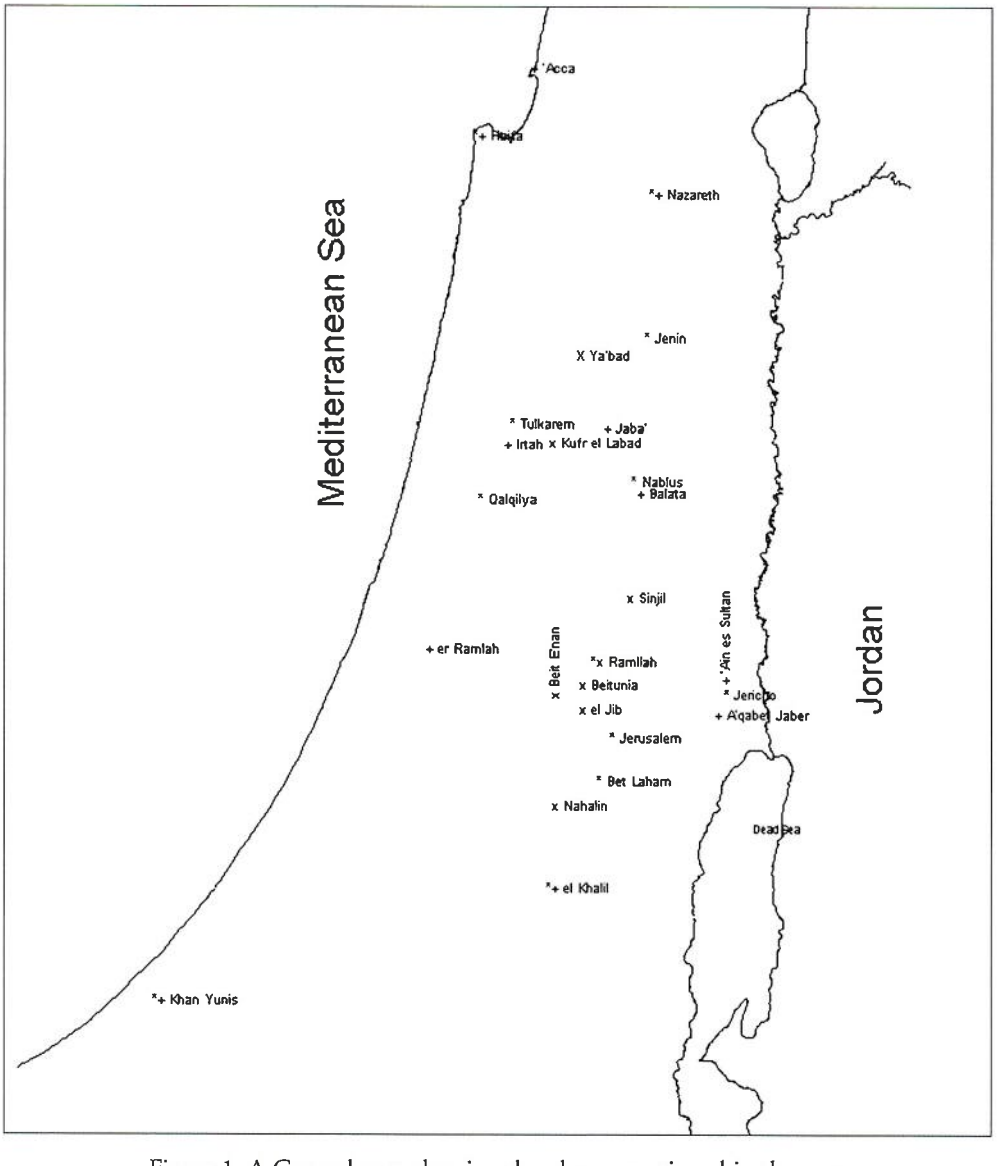

Figure 1. A General map showing the places mentioned in the text.

Figure 2. The potters of Jaba', Abu Ahmed and his son.

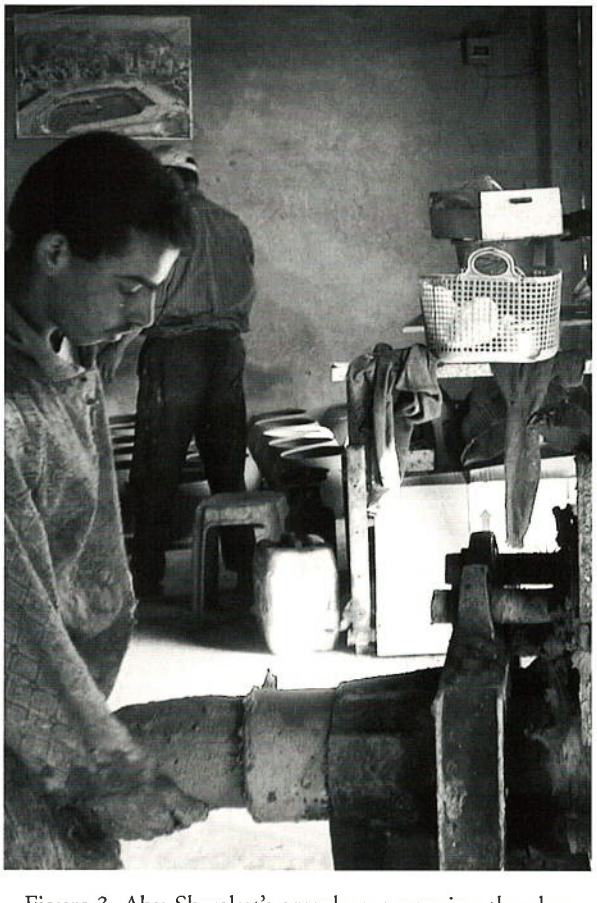

Figure 3. Abu Shwakat's grandson preparing the clay.

Figure 4. Another grandson of Abu Shwakat unloading the kiln.

Figure 5. Abu Shwakat in the wheel.

from his grandfather and by working in other workshops as well. His father was not a potter. However, A'ttllah taught all of his four sons to make pottery. Only one of them prefers to work as a potter, although he holds a BA degree from Cairo University (Figure 6). He considers pottery production as a free and well-paid job which is certainly more profitable than the low salary of an average employee. The other sons left the craft to do other jobs.

Abu Ali, the potter of A'qabet Jaber, represents a good example of a movable Palestinian cultural pottery tradition (Salem 1986). He belongs to a generation of potters, who originally lived in the city of Er Ramla. Abu Ali and his brothers learned the craft from their father. The 1948 war forced the family to move to the village of Balata. In the early 1950s they moved to a refugee camp at A'qabet Jaber. One of Abu Ali's brothers ceased his potter's work and became a taxi driver. Because of the 1967 war, the other brother immigrated to Jordan, where he established a potter's workshop. Abu Ali, however, remained in the refugee camp, where he re-established the current workshop (Figure 7). His sons provided part-time assistance. They helped him to knead the clay and to fire the pottery. However, none of them was willing to make pots. Given that the benefits were very low if compared with the hard efforts and energy expended. Instead, one of his sons chose to work in nearby Israeli factories. Another son eventually decided still to work in his father's workshop, as a result of the limited opportunities to obtain more productive employment.

It is remarkable, that Abu Ali, even though he moved from one place to another, did not alter much of his father's pottery tradition. He continued to make the same pottery forms in the same techniques handed down from generation to generation.

Like the other potters, Abu Shawki, the potter of the village of Irtah, learned to make pottery from his father. Later on, he practiced the craft in other workshops in Haifa, Acco and Nazareth, until he ceased production. Recently, however, he re-opened his workshop for lack of jobs.

Matriarchal network

In a matriarchal network, the ceramic tradition is transmitted from mother to daughter. The pottery is produced for household consumption and market distribution alike. The household pottery is made by one single potter. The pottery for market distribution, on the contrary, is produced on the basis of a 'potters network'. This means that the various tasks are divided among several potters, but mainly under a master potter supervision. For example, more potters will prepare the clay and crush the non-plastics, the master potter will do the forming and another potter will do the decoration. All of them may do the firing.

Hajah A'mneh of el Koom, a village near Hebron, learnt the craft from her mother. It was necessary for her to learn the craft in order to be able to make her own household utensils before her marriage. The village women make very limited earthenware forms, which can be used in the daily activities of the farmers.[1]

Figure 6. The potter of Gaza and his retired father.

Figure 7. Abu Ali the potter of Jericho.

In her teens, the potter of Ya'abad learnt the craft from her mother by assisting her in making pots. She stayed unmarried and continued to contribute to the family economy. Hajah A'mneh persisted in making without changing the tradition she had learnt from her mother (Figure 8), so learnt by using the same clay resources, forming techniques, surface treatment and produced the same forms though with less quality than her mother's cooking pot. Her pottery, however, is made as a tourist object and not for household consumption.

Neighbourhood and cooperative framework

The neighbourhood and co-operative framework is a very common learning framework for the female villagers who produce handmade pottery. Usually the potters' network consists of relatives and neighbours. Two kinds of networks coexist within this framework: the *qadarat* network and the *hashashat* network.

At el Jib, pottery is produced by a potters' network called *qadarat* or cooking pot makers. The network involves a system of labour division based on specialised skills, such as crushing the non-plastic tempering material or firing. The preparation of the clay and forming of the vessels was done by the women. Their husbands were responsible for the firing.

The potters learn and develop their skills by watching each other. Umm Hamdan, for instance, learnt the craft by helping and watching an older master potter. "Whatever she did, I did the same", she explained in an interview that took place in the early 1990s. She worked in a potters' network of which she could remember at least twenty names. The potters' network produced primarily for sales in the market, rather than for use within the household. However, the potters use containers they themselves fabricate, including the defective cooking pots, as well as pieces they especially make pottery for their own household consumption.

In the network system, the final products are divided into three equal parts: one each for the potter, her husband (who fired the kiln), and the distributor.

Umm Hamdan considers pottery making to be a hard life. Her daughters did not help her and they were not willing to learn the craft. Her son's wife claimed that she is ready to learn the craft. However, she finds it very difficult and thinks that at the present there is not much need for potters. Umm Hamdan has expressed that the new generation is spoilt by new technologies and is not willing to work hard. This is one of the reasons why the pottery craft is no longer practiced in the village. For Umm Hamdan, however, to live is to labour. In her opinion, a first-class female is the one who produces 'real' food rather than market 'junk'. Today, Umm Hamdan has ceased to make pottery on a regular basis. She only makes pottery on special request while she continues to cultivate the land and sell the products of the rented olive or fig trees.

The other network is formed by a group of women who make jars (*hesha*). The group is named *hashashat* or jar makers (Figure 9). Such a network lead by a master potter was observed in the villages of Sinjil and Beit E'nan. In Sinjil, the network is lead by Hajah

Figure 8. The potter of Ya'abad (Courtesy the Palestinian Institute of Archaeology Archive).

Figure 9. The network of Beit E'nan potters firing the pots
(Courtesy the Palestinian Institute of Archaeology Archive).

Zu'l, a specialised master potter. Because the manufacture of storage jars requires more efforts than making cooking pots, the potters ask their husband or the people who want to acquire a storage jar to help her in collecting the raw materials and in crushing grog to be used as tempering material. The potter's daughter, and sometimes her husband, helps in decorating the jars. At Beit E'nan, Umm A'bdalla learnt the craft by helping the Hajah Wasnah, the master potter. She only made pottery on a seasonal basis and for her own consumption (Salem 1999).

Institutional or workshop framework

In general, a pottery workshop is a family institution. The workshop became an educational framework for potters who are not members of the family, but work as waged labourers. Some became members of the family by marriage. Others became after a long time working in the workshop, a kind of relatives. In this case they become close and treated like 'potters' sons', for they had themselves became exposed to the craft secrets.

Sabri, the potter who lives in the refugee camp at A'in es Sultan learnt the craft during his stay with potters in Hebron. He later established his own workshop in the camp.

After his workshop was closed because of the hazardous smoke emanating from the kiln during firing, he moved to Syria. As time went by, he returned to Palestine and opened a workshop at A'in es Sultan.

Other learning frameworks

As we have seen above, pottery making is a craft of a closed social group that is not easily inclined to change. The transmission of the craft remains within a specific social context. However, there are also potters who, forced by socio-economic needs, begin a new kind of pottery production. They develop new techniques and vessel forms through experimentation and by using new clay resources. New techniques can also be learnt through communication with other potters or by imitating vessel forms made by potters elsewhere. This is the case noticed by the son of Gaza potter who bought an electric kiln to fire small lamps and imitation of ancient objects.

During visits to each other's workshops, potters might have the opportunity to exchange knowledge about advanced skills and techniques. Abu Ahmed, the potter of Jaba', told that the potters of Hebron advised him to add quartz sand to the clay. He employed this strategy for the manufacture of the water containers because of the increase of the permeability, which helps to keep the water cool during use. Many potters reported that quartz sand creates pores on the walls and so increases their permeability. Quartz sand was also added to the clay used to make pottery for the tourist market, because of the increase of strength. Abu Ahmed was a highly skilful potter, who could make any pot whose form he observed, including pottery forms he once saw on the Syrian TV. He did not keep his techniques secret and was willing to teach them to others.

Another example of the introduction of a new technique is the appearance of white pottery in the early 1960s at Gaza. During his visits to Haifa and Lebanon, the potter of Gaza had learnt this technique in Haifa and Acco, which were the only places where this technique was known. The tradition of making white pottery was introduced at Gaza and was accepted by the local market. Gradually, the white pottery replaced the black pottery. The potter of Gaza said that he transmitted some of his techniques to Egyptian potters as well.

Today it is known that potters are willing to make any form accepted by the market. Some potters mentioned that they often copy pottery forms represented on pictures and drawings. Many potters think that a master potter always needs further training in order to develop new techniques. However, the market demand is the major force to change or maintain a pot making tradition.

Socio-economical processes

The major motives for change in pottery production are the market demand and the political situation in the production area. Palestinian pottery is made for distribution on the local, Israeli markets, and other regions like Jordan. Due to the current political

situation, pottery is distributed in the local market only. However, some potters used to make vessels that are sold as art pieces to the Arab world and Europe. The political instability causes many workshops to cease their production, especially after the closing of the Israeli markets. Furthermore, since the 1980s, pottery production has to face an enormous competition of plastic and aluminium objects. This was a major effect on limiting the pottery production.

Gaza was and still is famous for its black pottery. As mentioned above, A'ttallah introduced the white pottery tradition from both Haifa and Lebanon to Gaza. Other potters began to produce white pottery. However, morphological changes were governed by different factors than changes in clay preparation or surface treatment. Only a few potters took the initial risk to invent new forms. The potters' individual skill and creativity is the major force leading to change. In another case, Sabri, the potter in the refugee camp of A'in es Sultan, found that although the Palestinian clay was much heavier than the clay he had used in Syria, he was able to make the same pottery forms. To make this 'Syrian' pottery in Es Sultan, he mixed local clay with clay from el Jib.

It must also be noted that the political situation in the West Bank and Gaza had forced many potters gradually to stop their work. The taxes imposed on the pottery products forced many of them to close their workshop. During my visits in early 1990s, the potters of Gaza complained about similar difficulties regarding taxes and the marketing situation. After the signing of the Oslo accord, when it was still difficult to find a job, some potters in Gaza reopened their workshops because of the improvement of the marketing situation and increased access to Israeli markets. At the present, however, Gaza border is closed for pottery to be distributed in the neighbouring countries. Some potters however, reopened their workshops because of the job limitations created from this closure.

The potters of el Jib and Irtah gave another reason for ceasing to make pottery:: closing of access to the clay resources. The *Mattain* area (natural clay basin) is the major clay source not only for the surrounding potters in Beit E'nnan, el Jib, and Beitunia, but also for other places like Hebron and A'qabat Jaber. According to Umm Hamdan, the land was confiscated after building the settlement of Phizgat Za'v. Following construction of her site, access to the clay resource was forbidden. Abu Shawki, the potter of Irtah, also said that after the 1948 war the clay resources were resituated outside the West Bank. For this reason, the potters were unable to reach the clay sources. The potters had to obtain their clay from el Jib. Experiments with other nearby clay sources failed.

Conclusions

Three major conclusions can be drawn.

(1) The transmission of pottery traditions is usually a conservative social process. The tradition is transmitted with little change from one generation to another. It is usually limited to the family or neighbourhood network. The labour force involves family members. Only in some cases, potters seek external labourers. Potters with unique skill and creativity will take the risk to change their grandfather's techniques.

(2) An individual potter produces very limited forms for household consumption. The household pottery is often made by a master potter, who in general avoids any innovation in forms and techniques. The decorated handmade pottery is a piece of art by itself. It has not to be changed. In Beit E'nnan, however, a female potter mentioned that when she tried to imitate the wheel-made pitchers, but her attempts failed. This aspect will maintain the pot making traditions unchanged though generations.
(3) There is a relation between the environment (clay sources), the political and economic situation on the one side and the transmission and change of pottery tradition on the other side. Potters exchange knowledge through direct contact with each other. Limitation in freedom of movement causes conservatism. On the other hand, freedom of movement and travel possibilities can enable innovation inspired by other pottery traditions. The transmission of a pottery tradition apparently needs no verbal language. In Hebron, a deaf taught by a master potter became a potter himself. Imitation by a direct contact proved to be the best mean of transmitted innovation.

In contrast, the market demand is the major force leading to change. The distributor knows the demands of his clientele. Potters are willing to stamp their pottery with any logo given to them by the distributor. In Hebron, for instance, the potters stamp their pottery for the Israeli market. The middleman usually provided them with the stamp.

Finally, the data above attempted to provide a general framework to archaeologists involved in ceramic analysis. A pottery tradition is more than an abstract form of culture. A pot making tradition may survive a harsh political and economic situation. To remain unchanged for many generations.

Acknowledgements

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Notes

1. The el-Koom data were presented by Ahmad el Rojoub in a mid-term paper (1995) at the Birzeit University.

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ANALYSIS OF POTTERY SHERDS FROM THE KARAK PLATEAU, CENTRAL JORDAN: SHIFT IN CaO/SiO_2 COMPOSITION THROUGH TIME

Robert Reynolds

Abstract

Pottery sherds from the Karak Plateau, in central Jordan, were analyzed via X-ray fluorescence to determine elemental compositions to answer questions raised by the Karak Resources Project (KRP). KRP is a multidisciplinary research team which aims to describe the history and cultures of a region that has experienced almost continual occupation from prehistoric times to the present. For this study, potsherds were identified as coming from the Early Bronze, Iron, Roman, Byzantine, or Islamic periods, on the basis of typology. Petrographic analysis showed great similarity among sherds from all periods. All were composed of aluminum oxides, silica oxides, and calcium oxides, along with many accessory elements; this suggests that materials from the local region were utilized in pottery-making. Potsherds from different chronological periods did show significant differences in elemental composition, particularly in the relative abundance of Al_2O_3, CaO, and SiO_2. Investigation of chemical composition related to different types of pottery vessels and geographic regions within the Karak Plateau showed no discernable pattern. Chemical variation is understood as a result of different firing technologies that changed over time.

Introduction

The Karak Resources Project (KRP) is a multidisciplinary research team that utilizes methodologies to collect information from central Jordan's Karak Plateau. [See http://www.vkrp.org.] The Karak Plateau is located east of the Dead Sea in Jordan and is defined by the Wadi al-Mujib (ancient River Arnon) canyon on the north and the Wadi al-Hasa (ancient River Zered) canyon on the south; the city of Karak is located in the central part of this region (Figure 1).

KRP conducted fieldwork in the summers of 1995, 1997, 1999, and 2001. The KRP regional survey collected pottery sherds from many sites during this time. During the last three field seasons, part of the KRP team conducted excavations at the Iron Age site of Khirbat al-Mudaybi', located to the southeast of Karak. This study compares pottery from 17 different sites. During the field seasons, pottery sherds were assigned a number for their location (site number), a number for their order of collection, a function, and the relative age. The function – or type of vessel – for each sherd was determined by

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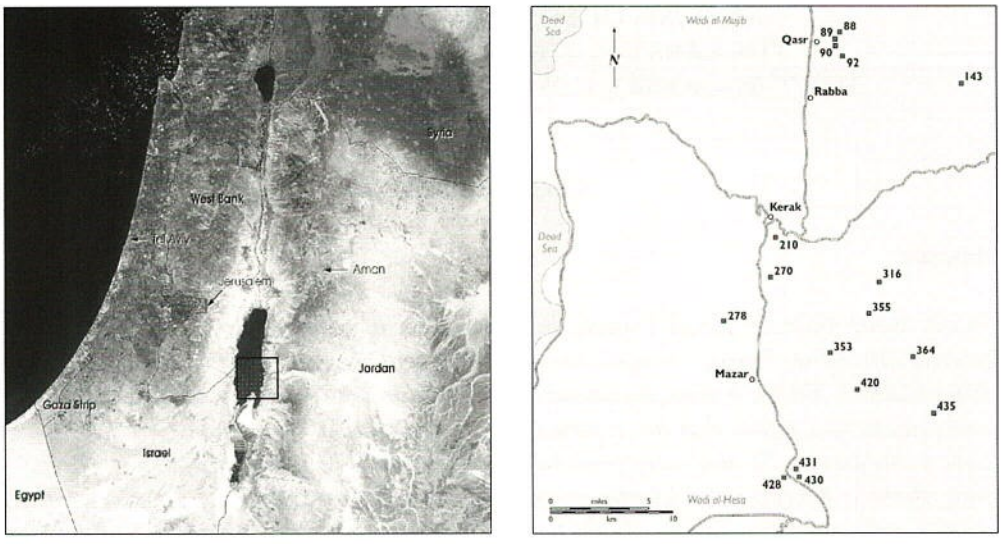


Figure 1. (a) Middle East Satellite photo of the area of the Jordan; (b) Karak Plateau.

experts on the basis of physical features (cf. Sherds Classification Example) (Figure 2). KRP staff also dated the sherds through typological analysis and assigned them to Early Bronze, Iron, Roman, Byzantine, or Islamic periods. The Project transported materials back to Knoxville, Tennessee, for additional study at Johnson Bible College – where the KRP coordinator, Dr. Gerald Mattingly, teaches. We thank him for encouraging our analysis, which required the destruction of fragments of these sherds.

Methods

In preparation for geochemical analysis at the University of Tennessee (Knoxville), we cleaned sherds from this study collection of external organic matter, lead glaze, or paint by scraping them with a metal spatula. Next we broke samples into smaller pieces by hand. Approximately four grams from each sherd were set aside for further processing, and we returned any surplus to labeled bags for petrographic analysis. Geochemical splits were crushed in a mortar and pestle until the sherd fragments were no larger than 3-5 mm in diameter; we powdered this material in a shatter box for six minutes. Before the shatter box was sealed, several drops of freon were added to assure disaggregation of matrix components. To remove excess water, the resultant powder was sealed in an aluminum cup and placed in an oven at over 100° C for 24 hours. After desiccation, we pressed the four grams of sample powder into pellets and encapsulated them within forms that are composed of 5 grams of powdered boric acid. We positioned the composite XRF pellet in a hydraulic press and compressed it to 1000 psi for 30 seconds and then to 3000 psi

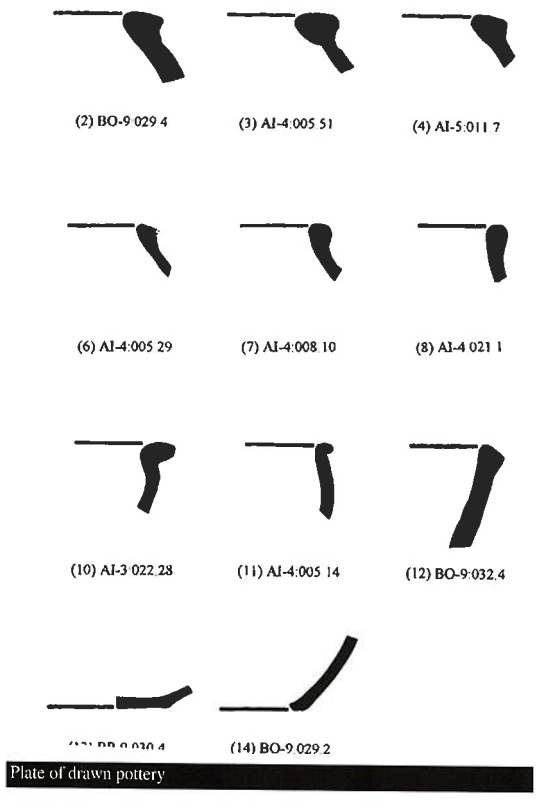


Figure 2. Sherd Classification Example.

for another minute. Pellets were analyzed on a Phillips MagiX Pro XRF at the University of Tennessee's Department of Earth and Planetary Sciences. Table 1 provides the raw data. Raw data were then normalized to the concentration of the three main components in all of the samples – Al_2O_3, SiO_2 and, CaO. Table 2 displays the processed data.

Data preparation

We plotted normalized oxide percentages for each sample on ternary diagrams by means of the Sigma Plot program. Each corner of the diagram represents 100% of the respective oxide. We discarded two of the study samples because of mislabeling and missing information. The samples were divided into three broad chronological categories (Early Bronze, Iron, and Post-Iron periods), five functional groups (bowls, handles, jars/jugs, plates/platters, and kraters), and three Karak regional groups (Northern, Central and Southern). These divisions allowed us to plot smaller sub-groups while still relating the entire set of study samples to one another.

Table 1

XRF RUNS FOR OTTO KOPP - COMPLETE LISTING
CALIBRATION USED: CALSOILS_090204
EXCEL FILE SAVED AS: kopp_complete_list

Sample	Sum	Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2
	of cone.	Al	Ca	Fe	K	Mg	Mn	Na	P	Si	Ti
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
RMS		**0.37**	**0.07**	**0.18**	**0.06**	**0.11**	**0.01**	**0.06**	**0.02**	**1.33**	**0.03**
KPR-88-21	75.26	7.44	21.82	4.51	1.32	1.85	0.13	0.29	0.77	35.97	0.87
KRP-88-24	69.31	5.95	27.86	3.68	1.20	1.15	0.06	0.40	0.67	27.37	0.74
KRP-88-59	79.21	13.10	20.29	4.45	1.07	1.33	0.05	0.35	0.72	36.87	0.69
KRP-88-83	71.39	6.94	24.96	4.18	1.64	1.43	0.07	0.42	0.38	30.27	0.87
KRP-88-98	79.89	11.90	19.80	4.74	2.54	1.61	0.05	0.24	0.52	37.47	0.80
KRP-88-107	72.66	6.51	27.58	3.79	0.90	1.89	0.06	0.21	0.49	30.23	0.77
KRP-88-117	92.43	19.10	9.01	7.00	2.40	2.31	0.04	0.26	0.18	51.07	0.93
KRP-88-126	69.17	5.67	27.79	3.42	1.22	1.45	0.10	0.25	0.46	27.92	0.72
KRP-88-128	81.03	12.72	16.01	5.00	2.12	2.53	0.06	0.30	0.47	40.84	0.78
KRP-88-130	79.44	15.00	19.36	4.61	1.22	1.31	0.05	0.44	0.82	35.63	0.70
KRP-88-132	66.17	8.25	30.63	3.36	0.94	0.69	0.06	0.19	0.80	20.59	0.43
KRP-88-139	68.95	7.60	29.98	4.27	1.04	0.87	0.05	0.20	0.84	23.39	0.51
KRP-88-140	76.00	11.54	22.52	4.65	1.26	1.31	0.10	0.32	0.81	32.43	0.74
KRP-88-141	79.93	9.79	21.21	5.19	1.50	2.46	0.07	0.31	0.76	37.50	0.90
KRP-88-159	70.16	6.38	27.20	3.84	1.31	1.51	0.07	0.41	0.43	28.04	0.80
KRP-88-159	70.56	6.42	27.38	3.86	1.31	1.51	0.07	0.42	0.43	28.17	0.81
KRP-88-173	64.56	6.97	32.66	3.05	0.92	0.66	0.05	0.19	0.84	18.48	0.37
KRP-88-174	72.12	6.21	24.75	3.70	1.87	1.51	0.08	0.24	0.53	32.22	0.72
KRP-88-243	92.69	16.29	8.30	6.85	3.42	2.10	0.04	0.46	0.24	53.75	1.08
KRP-88-254	96.05	16.83	4.00	4.66	2.01	1.66	0.04	0.26	0.27	65.07	1.08
KRP-88-274	74.68	11.27	24.41	5.38	1.08	1.54	0.09	0.59	0.75	28.45	0.89
KRP-89-6	93.48	17.80	6.73	6.23	2.65	2.86	0.06	0.31	0.34	55.42	0.90
KRP-89-13	95.44	17.26	5.75	5.78	2.81	2.35	0.07	0.25	0.29	59.90	0.84
KRP-89-15	95.76	15.51	6.03	5.85	2.10	1.98	0.03	0.33	0.23	62.78	0.77
KRP-90-1	93.28	16.66	6.75	5.39	2.04	2.59	0.03	0.16	0.14	58.65	0.74
KRP-90-9	97.77	15.73	3.28	3.69	1.07	1.06	0.05	0.25	0.20	71.04	1.22
KRP-90-11	78.59	12.39	21.02	5.24	1.55	1.05	0.06	0.41	1.23	34.51	0.69
KRP-92-1	83.70	14.15	16.01	7.45	1.53	3.05	0.08	0.56	0.43	39.18	1.05
KRP-92-3	84.09	14.32	17.24	7.23	1.13	3.00	0.07	0.68	0.62	38.26	1.19
KRP-92-4	81.76	12.90	17.93	6.91	1.64	2.83	0.07	0.57	0.58	36.95	1.04
KRP-143-5	89.42	16.45	13.11	8.38	1.87	3.41	0.10	0.85	0.29	43.29	1.48
KRP-143-12	82.69	14.64	18.05	6.50	1.30	1.92	0.09	0.82	0.54	37.24	1.01

Sample	Sum	Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2
	of cone.	Al	Ca	Fe	K	Mg	Mn	Na	P	Si	Ti
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
RMS		**0.37**	**0.07**	**0.18**	**0.06**	**0.11**	**0.01**	**0.06**	**0.02**	**1.33**	**0.03**
KRP-143-25	85.81	15.40	15.62	8.20	1.76	3.24	0.12	0.42	0.65	38.77	1.27
KRP-143-27	82.74	12.28	18.45	6.53	1.81	3.20	0.08	0.76	0.83	37.53	0.97
KRP-143-28	81.52	11.30	17.15	7.88	1.31	1.82	0.06	1.19	2.09	36.63	1.65
KRP-210-17	88.87	15.65	13.04	8.01	1.85	2.15	0.08	0.60	0.68	45.18	1.43
KRP-270-70	88.52	14.09	12.28	9.02	1.43	2.94	0.13	1.02	0.35	45.24	1.84
KRP-270-112	95.51	17.54	8.11	4.04	1.73	2.30	0.04	0.26	0.40	58.22	1.10
KRP-278-20	89.49	18.06	6.09	6.80	3.27	2.86	0.09	0.24	0.43	50.57	0.93
KRP-278-26	94.80	16.08	2.89	6.12	1.57	1.81	0.08	0.55	0.36	63.80	1.33
KRP-278-31a	91.59	21.41	10.08	3.51	1.20	0.55	0.02	0.13	0.17	52.54	1.39
KRP-278-31b	97.53	21.94	10.52	2.85	1.23	0.51	0.02	0.15	0.17	54.38	1.51
KRP-316-7	78.51	9.70	21.22	6.11	1.62	1.34	0.05	0.75	2.01	34.25	1.18
KRP-316-54	92.45	15.98	6.84	6.04	2.88	2.76	0.06	0.21	0.23	56.50	0.80
KRP-316-56	93.72	19.21	7.66	6.57	3.43	4.35	0.06	0.38	0.32	50.65	0.94
KRP-316-60	93.89	21.20	4.39	6.32	2.65	1.87	0.04	0.33	0.58	55.33	1.02
KRP-316-79	93.76	18.22	7.64	7.12	2.61	2.29	0.06	0.30	0.27	54.19	0.89
KRP-316-83	83.99	13.03	14.03	6.36	2.22	3.70	0.07	0.60	0.36	42.24	1.13
KRP-316-91	94.97	19.38	1.44	5.97	2.76	1.40	0.02	0.22	0.13	62.19	1.33
KRP-316-144	89.28	16.54	7.93	6.99	3.18	3.30	0.08	0.88	0.17	49.10	0.88
KRP-316-171	90.33	19.11	1.96	6.53	2.34	1.62	0.01	0.23	0.18	57.21	0.98
KRP-353-7	76.56	10.87	21.43	4.81	1.38	1.44	0.01	0.37	2.67	32.39	0.70
KRP-353-11	83.32	9.76	18.25	4.38	1.44	3.26	0.08	0.52	0.57	44.10	0.76
KRP-353-13	93.05	16.37	4.87	6.13	2.08	1.68	0.06	0.33	0.30	59.98	1.06
KRP-353-39	91.69	18.35	6.26	6.70	3.17	3.11	0.08	0.26	0.41	52.26	0.93
KRP-353-44	84.88	13.58	12.75	5.64	2.51	3.12	0.07	0.26	0.31	45.66	0.79
KRP-355-2	75.88	8.44	25.43	4.03	0.98	0.93	0.03	0.43	2.84	31.82	0.63
KRP-355-8	94.02	20.29	4.19	6.45	2.71	1.94	0.03	0.34	0.16	56.85	0.91
KRP-355-31	78.86	9.28	23.06	5.84	1.27	1.56	0.06	0.76	1.86	33.63	1.13
KRP-355-41	74.24	8.92	23.83	5.96	1.36	1.43	0.04	0.71	1.64	28.75	1.24
KRP-355-42	89.57	16.92	6.93	6.87	2.97	3.00	0.07	0.34	0.41	50.99	0.86
KRP-355-59	83.00	8.57	18.02	5.52	1.58	1.52	0.07	0.76	3.60	41.90	1.16
KRP-364-1	94.81	16.93	8.32	6.05	2.29	3.32	0.05	0.24	0.20	56.40	0.85
KRP-420-71	85.13	9.21	15.44	4.89	2.18	2.02	0.09	0.93	0.53	48.65	0.92
KRP^20-79	87.04	13.16	13.29	5.93	2.36	1.86	0.09	0.65	0.32	48.14	1.04
KRP^20-80	78.43	9.65	21.67	6.26	1.26	1.28	0.06	0.80	1.51	34.43	1.19
KRP-420-141	96.45	14.42	3.53	5.69	1.93	2.06	0.05	0.37	0.18	67.28	0.78
KRP-428-3	86.62	15.03	12.91	6.36	2.83	3.30	0.07	0.24	0.55	44.19	0.82
KRP-428-10	86.22	14.18	15.58	5.98	2.26	2.27	0.09	0.31	0.36	44.16	0.83

Sample	Sum	Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2
	of cone.	Al	Ca	Fe	K	Mg	Mn	Na	P	Si	Ti
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
RMS		**0.37**	**0.07**	**0.18**	**0.06**	**0.11**	**0.01**	**0.06**	**0.02**	**1.33**	**0.03**
KRP-428-14	92.64	17.22	8.07	6.49	3.28	2.54	0.06	0.27	0.39	53.31	0.85
KRP-428-18	89.57	15.38	10.14	6.04	2.38	2.77	0.04	0.29	0.26	51.31	0.78
KRP-428-37	90.26	14.38	9.81	5.57	2.56	3.12	0.06	0.23	0.42	53.13	0.74
KRP-430-3	73.19	6.27	25.04	3.70	1.18	1.23	0.06	0.30	0.26	34.24	0.75
KRP-430-17	90.12	16.80	11.69	6.06	2.72	2.96	0.07	0.44	0.30	48.12	0.81
KRP-430-24	88.73	15.53	11.51	6.22	2.60	3.81	0.07	0.34	0.32	47.25	0.91
KRP-431-2	92.74	19.85	5.14	6.95	3.06	2.83	0.04	0.47	0.29	53.01	0.96
KRP-431-22	89.70	15.00	10.24	6.52	3.27	3.64	0.08	0.33	0.35	49.30	0.80
KRP-431-33	88.29	15.61	11.88	6.03	2.34	2.29	0.05	0.44	0.48	48.01	0.94
KRP-435-6	87.01	11.51	12.75	7.51	1.64	1.79	0.11	0.94	1.18	47.80	1.55
KRP-435-15	90.01	14.53	10.36	5.70	2.28	3.68	0.08	0.70	0.53	51.15	0.81
KRP-435-16	83.59	10.14	19.65	6.88	1.62	1.83	0.09	1.00	0.95	39.67	1.46

XRF RUNS FOR OTTO KOPP - COMPLETE LISTING
CALIBRATION USED: CALSOILS_090204
EXCEL FILE SAVED AS: kopp_completejist

Sample	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.002**	**0.004**	**0.001**	**0.005**	**0.003**	**0.002**	**0.001**	**0.003**	**0.006**	**0.006**	**0.049**	**0.002**
KPR-88-21	14	1090	29	90	24	6	17	52	-9	25	521	251
KRP-88-24	17	683	37	68	29	4	13	33	2	23	466	311
KRP-88-59	14	1098	13	148	24	5	16	75	-10	37	497	346
KRP-88-83	14	817	3	73	27	9	14	34	-13	29	563	308
KRP-88-98	14	314	15	81	11	6	12	30	-10	58	753	387
KRP-88-107	14	796	7	71	20	7	13	36	-9	19	677	310
KRP-88-117	15	199	52	121	18	4	15	42	-3	86	204	201
KRP-88-126	14	521	9	72	21	7	12	43	-11	16	368	249
KRP-88-128	14	645	19	89	20	3	11	36	-9	44	520	297
KRP-88-130	14	1259	12	159	40	4	16	79	-8	36	653	355
KRP-88-132	13	595	7	121	20	5	8	54	-14	27	527	538
KRP-88-139	14	480	7	110	23	6	10	59	-12	23	387	418
KRP-88-140	14	1119	11	139	28	6	15	88	-8	31	707	388
KRP-88-141	15	832	39	108	25	8	17	56	-4	36	431	307
KRP-88-159	14	496	3	73	23	6	12	37	-13	30	381	307
KRP-88-159	14	507	3	73	24	6	12	37	-13	30	386	310
KRP-88-173	14	898	26	153	27	3	12	11	-11	26	643	546

Sample	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.002**	**0.004**	**0.001**	**0.005**	**0.003**	**0.002**	**0.001**	**0.003**	**0.006**	**0.006**	**0.049**	**0.002**
KRP-88-174	14	979	16	66	17	6	13	40	-9	21	799	284
KRP-88-243	15	303	57	100	30	8	23	33	-4	67	216	230
KRP-88-254	15	316	37	94	15	9	20	26	1	63	281	156
KRP-88-274	14	755	16	165	26	4	17	108	-12	29	346	607
KRP-89-6	15	265	76	107	28	6	16	42	2	79	178	253
KRP-89-13	15	293	52	102	22	4	14	37	1	81	227	146
KRP-89-15	14	192	65	97	19	6	14	34	-5	63	161	213
KRP-90-1	14	150	52	96	14	4	11	34	-7	60	211	114
KRP-90-9	15	326	54	98	15	11	26	24	0	40	181	196
KRP-90-11	17	2092	13	260	42	5	12	128	5	38	905	452
KRP-92-1	15	545	30	189	39	4	14	93	-6	46	355	410
KRP-92-3	14	1136	46	243	32	7	23	158	-11	43	376	748
KRP-92-4	14	1296	37	208	26	4	18	124	-9	45	611	613
KRP-143-5	14	302	44	104	32	5	15	48	-9	51	566	384
KRP-143-12	14	2585	23	187	37	6	17	109	-9	41	1577	634
KRP-143-25	15	1210	40	222	45	4	19	112	-8	54	818	519
KRP-143-27	15	758	30	215	48	3	13	106	-7	45	908	583
KRP-143-28	15	1328	49	361	81	5	18	120	-1	23	695	678
KRP-210-17	14	449	38	161	36	6	16	56	-8	52	311	326
KRP-270-70	13	565	38	88	34	5	15	43	-13	33	414	356
KRP-270-112	1198	221	43	92	39	6	21	33	15349	15	276	273
KRP-278-20	16	276	21	108	29	5	12	47	2	90	333	160
KRP-278-26	15	393	41	113	28	10	26	39	0	53	162	211
KRP-278-31a	430	338	187	81	132	6	22	27	3475	30	377	247
KRP-278-31b	1920	378	36	88	743	-4	30	24	38430	-39	358	299
KRP-316-7	17	324	27	319	70	5	13	133	5	27	694	588
KRP-316-54	15	266	24	95	15	6	10	36	-4	67	379	214
KRP-316-56	15	343	42	115	29	6	15	47	-3	102	386	192
KRP-316-60	15	218	49	135	30	6	15	54	2	69	258	189
KRP-316-79	15	207	64	114	21	5	15	46	-3	68	468	197
KRP-316-83	17	262	24	85	28	6	12	38	11	49	1184	408
KRP-316-91	14	236	27	130	13	8	18	37	-5	66	132	57
KRP-316-144	41	520	47	111	92	4	13	58	164	126	267	199
KRP-316-171	14	219	14	103	36	5	13	32	-5	41	427	225
KRP-353-7	22	1573	9	505	93	3	9	202	34	33	1072	605
KRP-353-11	14	498	8	88	28	7	13	35	-10	61	586	413
KRP-353-13	15	350	24	111	24	7	16	44	-2	65	443	213
KRP-353-39	15	375	50	110	31	4	14	44	-1	85	345	174

Sample	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	As	Ba	Co	Cr	Cu	Hf	Nb	Ni	Pb	Rb	S	Sr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.002**	**0.004**	**0.001**	**0.005**	**0.003**	**0.002**	**0.001**	**0.003**	**0.006**	**0.006**	**0.049**	**0.002**
KRP-353-44	15	345	27	84	22	5	8	35	-4	62	716	232
KRP-355-2	17	514	7	403	75	5	10	124	5	25	1114	478
KRP-355-8	15	178	56	125	29	5	13	46	-3	71	184	139
KRP-355-31	16	708	32	306	78	3	14	119	0	24	1462	598
KRP-355-41	16	861	50	351	83	5	13	126	-2	20	693	658
KRP-355-42	15	395	42	110	26	3	13	50	1	75	584	241
KRP-355-59	16	621	52	181	36	5	16	84	-1	27	824	378
KRP-364-1	14	272	76	100	18	4	15	32	-6	67	312	156
KRP-420-71	14	429	27	91	25	10	19	37	-5	49	1092	367
KRP-420-79	14	326	22	98	24	9	18	38	-5	52	595	278
KRP-420-80	17	668	32	293	65	7	15	114	6	25	744	471
KRP-420-141	14	255	61	87	17	7	12	29	-6	48	365	108
KRP-428-3	16	421	27	99	20	5	11	44	1	76	1663	366
KRP-428-10	15	272	29	87	18	5	13	34	-6	64	798	312
KRP-428-14	14	371	37	104	20	6	12	39	-9	81	240	244
KRP-428-18	14	274	37	96	21	5	11	40	-6	61	650	211
KRP-428-37	14	269	33	96	19	6	10	36	-7	62	1349	186
KRP-430-3	14	398	14	72	18	8	13	32	-12	27	395	222
KRP-430-17	14	255	34	100	23	5	12	42	-8	65	329	214
KRP-430-24	15	263	29	97	20	4	13	39	-7	63	543	219
KRP-431-2	15	335	50	119	26	3	14	40	-5	77	261	138
KRP-431-22	15	154	31	91	21	6	12	37	-5	78	836	185
KRP-431-33	14	385	36	113	24	6	15	44	-7	59	1023	241
KRP-435-6	15	363	34	160	39	8	21	67	-5	33	552	314
KRP-435-15	16	390	33	110	22	7	12	42	7	63	450	289
KRP-435-16	15	654	40	221	53	7	17	84	-2	31	739	484

XRF RUNS FOR OTTO KOPP - COMPLETE LISTING
CALIBRATION USED: CALSOILS_090204
EXCEL FILE SAVED AS: kopp_complete_list

Sample	V	W	Y	Zn	Zr
	V	W	Y	Zn	Zr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.003**	**0.003**	**0.000**	**0.001**	**0.002**
KPR-88-21	101	327	28	75	206
KRP-88-24	81	335	19	77	158
KRP-88-59	138	135	30	211	123

Sample	V	W	Y	Zn	Zr
	V	W	Y	Zn	Zr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.003**	**0.003**	**0.000**	**0.001**	**0.002**
KRP-88-83	99	39	23	70	198
KRP-88-98	76	146	21	45	113
KRP-88-107	101	85	23	57	178
KRP-88-117	83	209	23	41	146
KRP-88-126	85	178	24	51	170
KRP-88-128	87	147	23	51	103
KRP-88-130	142	112	31	168	100
KRP-88-132	79	182	28	113	41
KRP-88-139	74	16	30	130	84
KRP-88-140	130	85	31	202	133
KRP-88-141	119	57	28	88	209
KRP-88-159	88	-6	21	95	172
KRP-88-159	79		21	97	174
KRP-88-173	78	1184	30	86	30
KRP-88-174	106	270	22	58	167
KRP-88-243	87	228	21	43	211
KRP-88-254	80	361	29	44	324
KRP-88-274	95	15	31	128	74
KRP-89-6	88	350	30	78	142
KRP-89-13	73	248	28	70	146
KRP-89-15	75	341	22	46	173
KRP-90-1	69	251	20	33	123
KRP-90-9	77	344	29	40	417
KRP-90-11	166	24	34	227	116
KRP-92-1	110	49	28	95	113
KRP-92-3	134	119	29	175	116
KRP-92-4	126	87	27	137	105
KRP-143-5	137	96	24	77	144
KRP-143-12	208	30	30	139	135
KRP-143-25	146	154	33	113	123
KRP-143-27	110	93	26	184	108
KRP-143-28	200	517	43	262	123
KRP-210-17	143	118	30	115	155
KRP-270-70	161	51	25	79	157
KRP-270-112	68	230	-265	40	284
KRP-278-20	97	44	32	90	139
KRP-278-26	94	331	32	89	374
KRP-278-31a	81	123	-69	41	248

Sample	V	W	Y	Zn	Zr
	V	W	Y	Zn	Zr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.003**	**0.003**	**0.000**	**0.001**	**0.002**
KRP-278-31b	86	160	-465	64	379
KRP-316-7	122	77	39	262	153
KRP-316-54	91	119	22	42	120
KRP-316-56	95	148	30	46	144
KRP-316-60	101	189	29	73	153
KRP-316-79	87	269	25	63	142
KRP-316-83	104	43	24	48	136
KRP-316-91	68	234	24	36	276
KRP-316-144	105	163	20	167	125
KRP-316-171	106	49	17	44	116
KRP-353-7	224	21	46	504	102
KRP-353-11	83	58	24	98	194
KRP-353-13	92	127	28	70	246
KRP-353-39	104	143	31	87	145
KRP-353-44	87	65	24	46	110
KRP-355-2	101	2	43	269	139
KRP-355-8	83	200	22	56	134
KRP-355-31	120	101	37	277	160
KRP-355-41	146	219	39	250	98
KRP-355-42	107	132	30	98	143
KRP-355-59	161	184	29	359	163
KRP-364-1	76	345	23	34	138
KRP-420-71	84	115	28	77	361
KRP-420-79	81	88	27	64	323
KRP-420-80	147	121	39	224	176
KRP-420-141	72	316	22	38	205
KRP-428-3	106	65	29	72	124
KRP-428-10	66	100	24	50	136
KRP-428-14	95	152	25	50	133
KRP-428-18	84	141	23	48	121
KRP-428-37	86	125	23	52	127
KRP-430-3	58	78	22	54	213
KRP-430-17	80	105	25	100	135
KRP-430-24	73	77	27	50	142
KRP-431-2	85	162	26	71	148
KRP-431-22	93	112	30	49	137
KRP-431-33	89	117	25	67	190

Sample	V	W	Y	Zn	Zr
	V	W	Y	Zn	Zr
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
RMS	**0.003**	**0.003**	**0.000**	**0.001**	**0.002**
KRP-435-6	144	107	34	171	302
KRP-435-15	91	142	25	55	148
KRP-435-16	166	142	32	221	203

Table 2

EB = Early Bronze, IR = Iron Age, BYZ = Byzantine, ROM = Roman, IS = Islamic
N = Northern, C =Central, S = Southern
J = Jars/Jugs, P = Plates/Platters, BO = Bowls, H = Handles, K = Kraters.

Complete Listing of Al/Ca/Si%100			sortedbysiteandregion		X	Y	Z
Sample	Age	Site	Site Area	Function	Ca%100	Si%100	Al%100
KRP-88-21	EB IV	88	N	J	34	55	11
KRP-88-24	EB	88	N	J	45	45	10
KRP-88-59	EB	88	N	BO	29	52	19
KRP-88-67	BYZ	88	N		14	68	18
KRP-88-83	EB	88	N	J	40	49	11
KRP-88-98	EB	88	N	J	29	54	17
KRP-88-107	EB	88	N	J	43	47	10
KRP-88-117	BYZ	88	N	J	11	65	24
KRP-88-126	EB II-III	88	N	J	45	46	9
KRP-88-128	EB II-III	88	N	J	23	59	18
KRP-88-130	EB II-III	88	N	P	28	51	21
KRP-88-132	EB II-III	88	N	P	51	35	14
KRP-88-140	EB II-III	88	N	P	34	49	17
KRP-88-141	EB	88	N	BO	31	55	14
KRP-88-158	BYZ	88	N	J	12	67	21
KRP-88-159	EB	88	N	J	44	46	10
KRP-88-163	ROM	88	N	H	14	66	20
KRP-88-168	IR2	88	N	J	21	60	19
KRP-88-173	EB II-III	88	N	P	56	32	12
KRP-88-174	EB II-III	88	N	P	39	51	10
KRP-88-243	LIS	88	N	J	10	69	21
KRP-88-254	EIS	88	N	J	5	76	19
KRP-88-270	ROM	88	N		3	78	19
KRP-88-274	IR1	88	N	P	38	44	18

Complete Listing of Al/Ca/Si%100 sortedbysiteandregion					X	Y	Z
Sample	Age	Site	Site Area	Function	Ca%100	Si%100	Al%100
KRP-88-293	IR2	88	N	K	20	59	21
KRP-89-6	IR	89	N	H	9	69	22
KRP-89-9	EB	89	N	J	16	63	21
KRP-89-13	BYZ	89	N	J	7	72	21
KRP-89-15	BYZ	89	N	H	7	75	18
KRP-90-1	BYZ	90	N	P	8	72	20
KRP-90-9	BYZ	90	N	H	4	79	17
KRP-90-11	LIS	90	N	K	31	51	18
KRP-92-1	EB	92	N	J	23	57	20
KRP-92-3	EB	92	N	P	25	55	20
KRP-92-4	EB	92	N	P	26	55	19
KRP-143-5	IR1	143	N	BO	18	59	23
KRP-143-12	IR1	143	N	H	26	53	21
KRP-143-25	IR1	143	N	BO	22	56	22
KRP-143-27	IR1	143	N	H	27	55	18
KRP-143-28	IR1	143	N		27	56	17
KRP-210-17	IR	210	C	H	18	61	21
KRP-210-22	ROM	210	C		15	72	13
KRP-210-29	IR2	210	C	K	18	67	15
KRP-210-42	LIS	210	C	BO	17	64	19
KRP-270-2	BYZ	270	C	P	15	66	19
KRP-270-17	LIS	270	C	BO	12	64	24
KRP-270-22	BYZ	270	C	BO	13	69	18
KRP-270-38	EB	270	C	J	34	50	16
KRP-270-70	EB	270	C	H	17	63	20
KRP-270-112	LIS	270	C	J	10	69	21
KRP-278-20	ROM	278	C	BASE	8	68	24
KRP-278-26	BYZ	278	C	H	4	77	19
KRP-278-31	LIS	278	C	BO	12	63	25
KRP-278-43	ROM	278	C	J	22	63	15
KRP-278-46	LIS	278	C	J	3	69	28
KRP-278-54	BYZ-EIS	278	C	BA	33	50	17
KRP-316-5	IR2	316	C	BO	39	48	13
KRP-316-7	IR1	316	C	J	33	52	15
KRP-316-33	ROM	316	C	BO	4	75	21
KRP-316-54	IR2	316	C	P	9	71	20
KRP-316-56	BYZ	316	C	H	10	65	25
KRP-316-60	BYZ	316	C	H	6	68	26
KRP-316-79	LIS	316	C	J	9	68	23

Complete Listing of Al/Ca/Si%100			sortedbysiteandregion		X	Y	Z
Sample	Age	Site	Site Area	Function	Ca%100	Si%100	Al%100
KRP-316-83	BYZ	316	C	J	20	61	19
KRP-316-91	ROM	316	C	BO	2	75	23
KRP-316-130	IR2	316	C	K	38	49	13
KRP-316-144	ROM	316	C	BO	11	67	22
KRP-316-152	LIS	316	C	J	21	64	15
KRP-316-163	BYZ-EIS	316	C	BO	3	72	25
KRP-316-164	ROM	316	C	BO	1	77	22
KRP-316-168	IR	316	C	J	38	50	12
KRP-316-171	BYZ-EIS	316	C	J	3	73	24
KRP-353-7	LIS	353	C	J	33	50	17
KRP-353-11	LIS	353	C	J	25	61	14
KRP-353-13	ROM-BYZ	353	C	J	6	74	20
KRP-353-39	ROM	353	C	BO	8	68	24
KRP-353-44	ROM-BYZ	353	C		18	63	19
KRP-355-2	IR2	355	C	K	39	48	13
KRP-355-8	LIS	355	C	J	5	70	25
KRP-355-31	IR2	355	C	K	35	51	14
KRP-355-41	IR2	355	C	BO	39	47	14
KRP-355-42	ROM	355	C	J	9	68	23
KRP-355-59	IR2	355	C	K	26	61	13
KRP-364-1	IR	364	C		10	69	21
KRP-420-40	LIS	420	C	BO	21	66	13
KRP-420-71	LIS	420	C	BO	21	66	13
KRP-420-79	LIS	420	C	BO	18	64	18
KRP-420-80	IR2	420	C	K	33	52	15
KRP-420-94	BYZ	420	C	BO	7	73	20
KRP-420-138	LIS	420	C	BO	25	58	17
KRP-420-141	BYZ	420	C	H	4	79	17
KRP-428-3	IR2	428	S	K	18	61	21
KRP-428-10	IR2	428	S	K	21	60	19
KRP-428-14	IR1	428	S	J	10	68	22
KRP-428-18	IR1	428	S	BO	13	67	20
KRP-428-37	IR1	428	S	BO	13	69	18
KRP-430-3	IR	430	S	J	38	52	10
KRP-430-17	LIS	430	S	J	15	63	22
KRP-430-24	LIS	430	S	BO	15	64	21
KRP-431-2	LIS	431	S	J	7	68	25
KRP-431-22	ROM	431	S	J	14	66	20
KRP-431-33	LIS	431	S	J	16	63	21

Complete Listing of Al/Ca/Si%100			sortedbysiteandregion		X	Y	Z
Sample	Age	Site	Site Area	Function	Ca%100	Si%100	Al%100
KRP-435-4	LIS	435	C		7	73	20
KRP-435-6	IR2	435	C	BO	18	66	16
KRP-435-15	BYZ	435	C	J	14	67	19
KRP-435-16	IR2	435	C	K	28	57	15
KRP-88-139		88	N		49	38	13

We also made and examined petrographic thin sections of the study collection's sherd samples. The inhomogeneous nature of the ceramics made modal estimates of composition difficult. Relative amounts were derived from petrographic analysis. In particular, petrographic analysis focused on the identification of shell material, lithic fragments (of limestone, basalt, quartz and chert), recycled pottery, and organic matter. We examined these components because they can bias XRF results in unpredictable ways – and because they helped us compare sherds from the various periods. Table 3 records modal estimates from the petrographic analysis.

Discussion of age plots

The ternary diagrams were essential in analyzing and understanding the shifts that we sought in this study. First, we plotted the common ceramic minerals. The minerals that comprise the matrix – smectites, alkali feldspars, quartz and other common minerals – appear in Diagram 1. The majority of the minerals fall between 80%-50% SiO_2, below 50% Al_2O_3, and below 25% CaO. These are the basic proportions of pure minerals, and the pottery is composed primarily of these same constituents.

The next diagram is a plot of all sherds examined in this study, along with sherds from previous studies. All 106 samples fall within a narrow field of about 15%-31% Al_2O_3 (Diagram 2). This is different from the mineral composition, suggesting that although the ceramic sherds are made from pure mineral constituents, their compositions are independent from that of their core components. This plot gives an overall view of the entire study. However, it is much too cluttered to discern the subtle changes and divisions between the various ages and different groupings.

We began by examining samples from the various chronological periods. Diagram 3 displays the Early Bronze Age (EB II-III, EB IV, and undifferentiated EB) samples, which date to the third millennium B.C. Our study samples from this broad period do not show a very even distribution. Early Bronze Age samples have the highest CaO percentage of any age group in this study. Petrographic analysis indicated that the two samples with the highest CaO content were made from very calcareous rich marl; this explains the abnormally high percentage of CaO not seen in any other samples. The Bronze Age sherds also show a gradual shift in the sub-periods from high to low CaO

Table 3: Petrographic Analysis Table

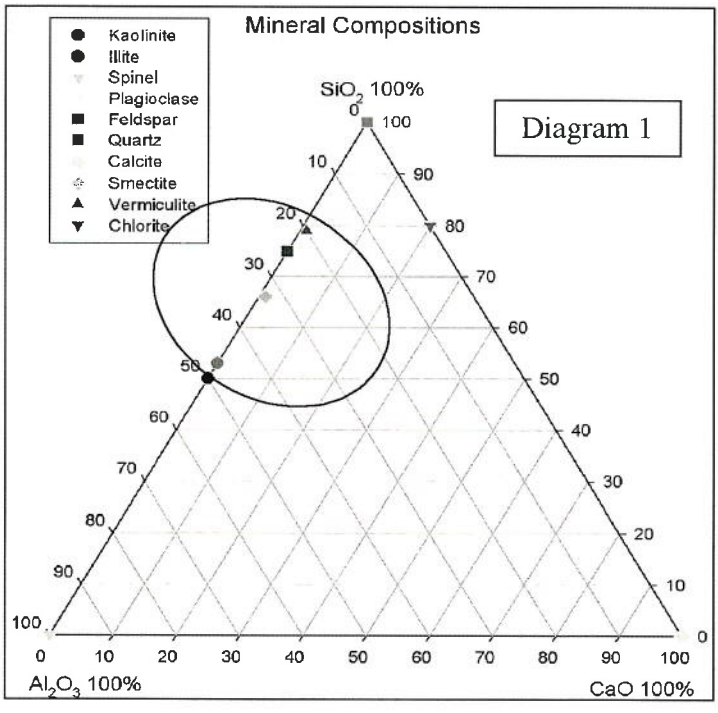
Sample number	Age	Function	Ls.	Shells	Basalt	Quartz	Chert	Recycled pottery	Organic Matter
92-4	Early Bronze	Pithos	VA		A			VA	
92-1	Early Bronze	Jar	A		VA	R		A	
89-9	Early Bronze	Jar				A		A	
88-24*	Early Bronze	Jar Rim	R	VA	R	VA		A	
270-70	Early Bronze	Ledge Handle			VA			A	
270-38	Early Bronze	Jar					VA	VA	
88-274	Iron 1	Pithos	VA		R			A	
428-37	Iron 1	Bowl	A		R	VA		A	
428-18	Iron 1	Bowl	A			A	A	R	
428-14	Iron 1	Jar				A		A	A
316-7	Iron 1	Jar	A		VA	R	VA		
143-5	Iron 1	Bowl			VA		A	R	
143-28*	Iron 1	Body Frag.	A		VA	R		A	
143-27*	Iron 1	Handle Frag.	A		VA	R		VA	
88-293	Iron 2	Krater			A	R		R	
210-29	Iron 2	Krater			VA	A		A	
355-41	Iron 2	Bowl			VA		R	A	
420-80	Iron 2	Krater			A	A	VA	R	
355-2	Iron 2	Krater	A		VA	VA		A	
355-31	Iron 2	Krater			VA	VA		A	
428-3	Iron 2	Krater				R	R	A	R
435-16	Iron 2	Krater			VA		A	A	
89-6	Iron Und.	Handle	R			VA		A	R
88-270	Roman	Not Identified	R			VA		A	
210-22	Roman	Not Identified	R			VA		R	
316-164	Roman	Bowl Base	R			VA		A	
316-91*	Roman	Bowl Base	R			VA		R	
316-181*	Roman	Plate Rim	R			VA		R	
355-42	Roman	Jar	A			VA		A	
420-42*	Roman	Bowl				A			R
420-90*	Roman	Plate Base	A			R		R	
420-93*	Roman	Bowl Rim	R			VA		A	R
431-22	Roman	Jar	A			VA		A	
353-13*	Roman-Byz.	Jug Body	R			VA		R	R
353-44*	Roman-Byz.	Body Frag.	R			VA		R	
88-139	Byzantine	Basin				A	VA	R	
89-15	Byzantine	Handle				VA		R	R

Sample number	Age	Function	Ls.	Shells	Basalt	Quartz	Chert	Recycled pottery	Organic Matter
90-1	Byzantine	Pithos				VA		VA	
270-2	Byzantine	Pithos				VA		A	
278-26*	Byzantine	Cup-Handle	R			VA			R
316-83	Byzantine	Basin (Jar)		R		R		R	
420-141	Byzantine	Handle				VA	R	R	
316-163*	Byzantine-Isla.	Bowl Rim				VA			VA
316-171*	Byzantine-Isla.	Jar Body				VA		A	R
88-243	Late Islamic	Jar				A	R	VA	
90-11	Late Islamic	Krater	VA			R		VA	
270-112	Late Islamic	Jar	A					VA	
316-79	Late Islamic	Jar				VA	A		
355-8	Late Islamic	Jug				A	R		
420-71	Late Islamic	Bowl	A			VA		R	
420-79	Late Islamic	Bowl				VA		A	
431-2	Late Islamic	Jar	R			A		A	A
435-4	Late Islamic	Not Identified				VA		R	
431-33	Late Islamic	Jug	VA			A		A	A

Samples with numbers ending with an asterisk had been selected at an earlier time and used for several students' senior theses. Visual abundance estimates are based on presence of inclusions in ten random fields of view at 100X magnification: VA / Very Abundant = two or more particles in each field; A / Abundant = at least one particle observed in at least five fields of view; R / Rare = at least one particle observed in less than five fields of view; Blank / Absent = no particles observed in any of the ten fields of view.

and from low to high SiO_2 contents. The lack of a balanced sample range for this particular age does not permit a more detailed interpretation of the data.

Next, we examined the Iron Age (ca. 1200-600 B.C.) sherds according to sub-periods (Diagram 4). This set includes a larger number of samples, which are more evenly distributed between the subdivisions. The plot shows that the older Iron Age samples have a higher amount of CaO/SiO_2 when compared with amounts in the younger samples. The Iron Age II samples show the largest variation in composition and contain both the highest and lowest CaO/SiO_2 values. This spread suggests that, over time, potters were able to create pottery designed for more specialized use and were, perhaps, utilizing new firing technologies. The earliest Iron Age subdivision has a high CaO/SiO_2 average, unlike the Bronze Age before it – while the Iron II is more CaO rich like the Bronze Age. This probably means that the potters experimented with available raw materials and found out what would or would not work in the kilns. Samples from each of the chronological periods show a wide range, but all still fall within a tight common field.


Mineral Compositions
Kaolinite
Illite
Spinel
Plagioclase
Feldspar
Quartz
Calcite
Smectite
Vermiculite
Chlorite
Diagram 1
SiO2 100%
Al2O3 100%
CaO 100%

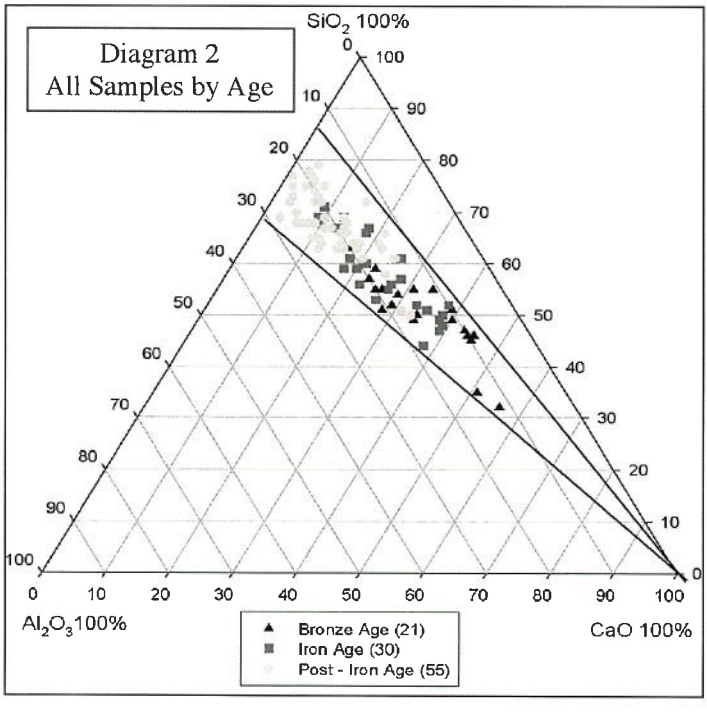


Diagram 2
All Samples by Age
SiO2 100%
Al2O3 100%
CaO 100%
Bronze Age (21)
Iron Age (30)
Post - Iron Age (55)

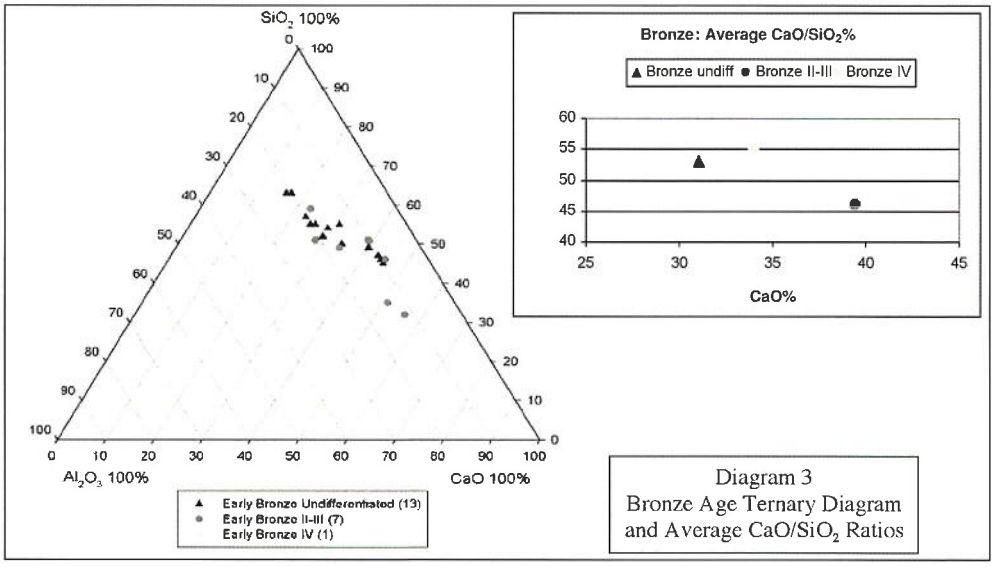


Diagram 3
Bronze Age Ternary Diagram
and Average CaO/SiO_2 Ratios

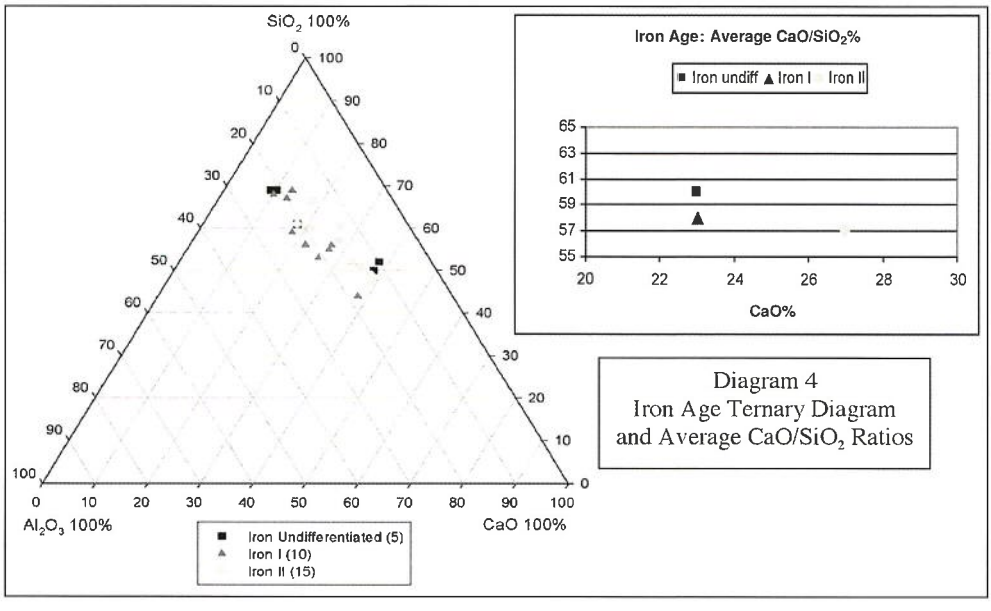


Diagram 4
Iron Age Ternary Diagram
and Average CaO/SiO_2 Ratios

The Post-Iron Age samples include sherds from the Roman, Byzantine, and Islamic periods. Although these are distinctive periods and have their own historical subdivisions, the pottery displays no drastic change in firing technology that calls for finer subdivisions. As such, the Post-Iron group is simply broken down into the three individual ages. Each age includes a wide range of samples to give a more complete picture of what is going on from period to period. The Roman Age samples plot the highest on the diagram in terms of SiO_2/CaO concentrations relative to the total range that is present (Diagram 5). Even though this is a long span of time, there is no definite gap in the composition of samples from one age to another. Only in the averages is there any noticeable change between sherds from the Roman, Byzantine, and Islamic periods. The gap from Islamic to Byzantine is only 5% between both the SiO_2 and CaO averages. Elemental analyses suggest that the potters in later times began using more calcium rich materials, instead of more refined clays for the pottery. Of course, it is possible that potters in the Islamic period simply had access to more calcium rich resources.

Time periods probably reflect more distinction in relation to firing technologies. When examined as a whole, individual samples seem to show little patterning or any sort of separation, but the averages of all periods show a clearer separation (Figure 3). As true elsewhere, these separations indicate changes in firing technologies used in each time period.

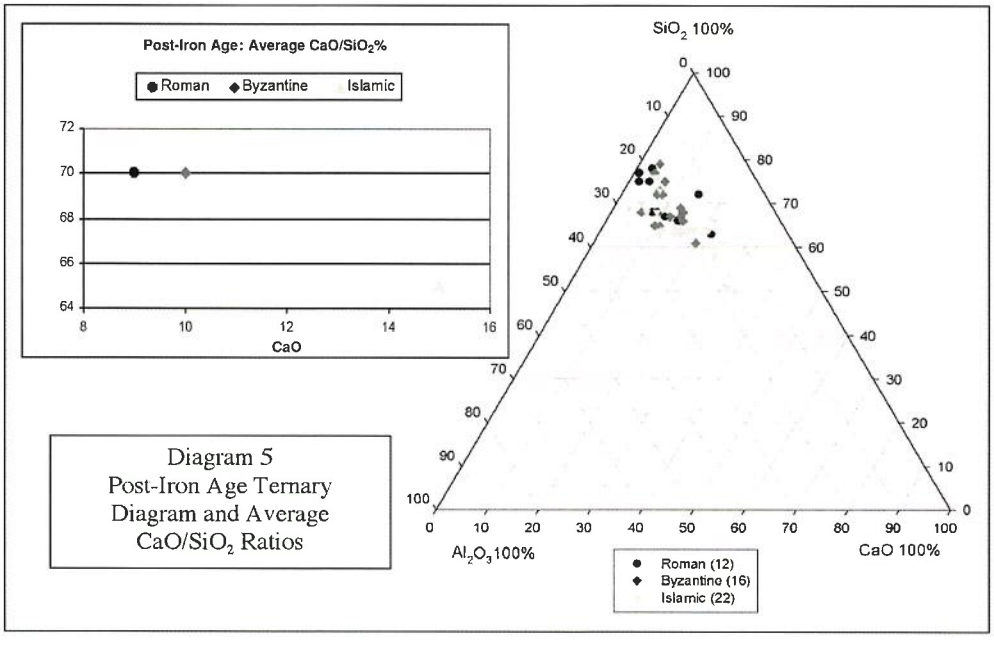


Diagram 5
Post-Iron Age Ternary Diagram and Average CaO/SiO_2 Ratios

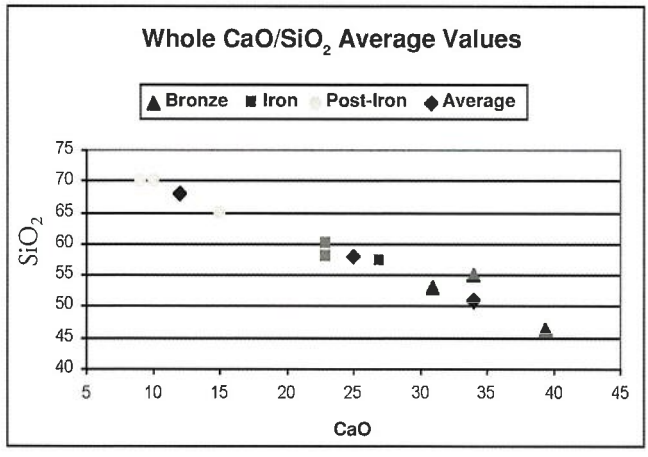


Figure 3. Whole CaO/SiO_2 average values.

Function and regional distribution

Once we detected a compositional shift in samples from different time periods, we were curious to see if a discernable pattern would show up in the other criteria. We examined the function of individual sherds (i.e., kinds of vessels from which they came) to see if they revealed patterns of their own. Put simply, we want to see how the function of samples from this study collection relates to the composition of the raw materials that the potters used for those vessels..

As expected, the plot of bowls shows a shift through time, but there is not a clear subdivision that can be designated for bowls alone. Jars/jugs also show the SiO_2/CaO shift over time and have a high to medium Al_2O_3 compositional range, but there is not sufficient evidence to draw a decisive conclusion about jars and jugs. Plates/platters follow the same chemical shift pattern through time but do not fall within any clear region of the overall field. The older samples tend to be high in Al_2O_3 in the margin, but the younger samples do not follow the same high Al_2O_3 window along the edge. Handles and kraters do not have enough variation selection in the samples to make any conclusions, and the small sampling size may strongly bias the observations.

Perhaps we can explain the lack of compositional variation in relation to function with reference to the manufacturing process. Sometimes a potter might prepare a large quantity of clay in advance and use it to create several vessel types at the same time. On other occasions, of course, the potter might prepare a different clay matrix to produce a specific type of vessel. Naturally, the heat of the kiln always played the decisive role. It was simply a matter of the vessel's ability to withstand firing without being broken or cracked. We need more comparative studies to understand the relation of composition to function/vessel type.

Next, we considered the relation between pottery composition of the sherds and their geographic distribution. How much impact did the site's location on the Karak plateau have on the sherd compositon? We recognize that the distribution of our samples was not ideal. The "Northern Area" showed the entire range of periods but was the predominant area and detracted from a more balanced sampling. The "Central Area" lacked the diversity in the samples according to age, and the "Southern Area" simply lacked enough samples to make any meaningful observations. The ternary diagrams of each area by ages and location show no additional distinctions in components beyond the noticeable shift in time. This does not lend itself to any conclusion but does reinforce the assumption that all pottery in this sample collection is local to the Karak Plateau and not brought in through trade or commerce.

The final question raised in this study is the effect of weathering on the collection's samples. Naturally, we expect sherds that are centuries or thousands of years old to reflect the weathering process. Unfortunately, we do not know the exact degree or nature of weathering that these sherds experienced. One of the ways we tried to look at weathering was through the comparison of two sites – # 88 and # 316. These sites have the largest number of samples in our study and are located within 30 km of one another. Because these sherds came from surface collections, we cannot determine how long they were buried (in whole or in part!) or how long they have been fully exposed on the surface. Weathering can occur in both cases, of course. In comparing the two sites, the ternary diagram appears to have a slight line of separation from 17% Al_2O_3 in the window range. The weathering process can leach the samples of Al_2O_3 and replace it with other minerals. Variations and uncertainties about pottery from surface collections make it impossible to draw any clear conclusion about the specific effect of weathering on these samples. We need to remember that weathering must be considered when research calls for the chemical analysis of pottery.

Conclusion

The composition of potsherds reflects the raw materials and firing technology used to produce the vessels from which the samples in this study came. Potters had a wide range of possible flux and employed creative firing fluxes when resources were limited. But they learned what amounts to mix together to manufacture vessels that held their properties through firing. The XRF and petrographic analyses in our study of pottery from Karak demonstrate that the raw materials came from local sources and that the composition of workable clay was the same for all kinds of ceramic vessels. We could not pinpoint the effects of weathering on sherd samples with any degree of certainty. Potters changed the composition of clay as they developed better kilns and achieved higher firing temperatures.

Acknowledgements

I completed this preliminary study as a senior project in the undergraduate program in geology at the University of Tennessee (Knoxville). I am grateful to the late Dr. Otto

Kopp, a clay mineralogist on the faculty of that institution for many years, for helping me and for investing his own time in this project – a reflection of Professor Kopp's commitment to students. He was generous with his time, technical advice, and encouragement. I would also like to thank Dr. Gerald Mattingly for allowing me to conduct this small research project, and I hope we have contributed something to the base of knowledge about ancient technology in the Karak region. Only through such ventures can our understanding grow beyond its narrow horizons.

PERSIAN PERIOD POTTERY IN TRANSJORDAN: TOWARDS A CHARACTERISATION OF CERAMIC TRADITIONS OF AN OBSCURE PERIOD

Niels C.F. Groot and Joris Dik

Abstract

This article introduces the study of the Iron Age III/Persian period (539-332 B.C.) pottery from Tell Deir 'Alla in Jordan. The question of continuity and change is central in the current research by the Centre of Art and Archaeological Studies (Delft University of Technology/Leiden University). It has been suggested that the Persian period ceramics from Transjordan are a continuation of the repertoire of the previous period. A review of Transjordanian sites shows that the extent of ceramic continuity is in fact almost unknown. This article also presents the method for the study of the Deir 'Alla pottery and how it is suited to approach this question of continuity and change.

Introduction

In the year 539 B.C. the Persian King Cyrus II took control over the entire Babylonian empire, including Transjordan. This event marks the beginning of the Persian period in Transjordan, which lasted until 332 B.C., when Alexander the Great conquered the Southern Levant. The Persian period in Transjordan, which is also called Iron III, is historically and archaeologically poorly understood.

This lack of knowledge prevails for the pottery of this period. The current hypothesis is that the pottery from the Persian period (539-332 B.C.) is an almost direct continuation of the repertoire of the previous period, Iron IIC (Herr 1991, 1995; Sauer 1994; London 1999). However, the validity of this hypothesis remains to be documented and hampers the study and recognition of Persian period pottery, a problem that we encountered in the current study of Iron Age II and III pottery from Tell Deir 'Alla (stored in the Archaeological Centre of Leiden University and in Jordan) (Figures 1 and 2). The first goal of this article is to present an overview of the sites with stratified Persian period pottery in order to assess the evidence we have to conclude that the ceramics are a direct continuation of the previous period.

To address the issue of ceramic continuity requires an approach that goes beyond the stylistic analysis of pottery, based on shape alone. In the second part of this article we outline in some detail the research design we have devised to systematically study the Deir Alla pottery, phases X to III, This approach is based on H.J. Franken's method of

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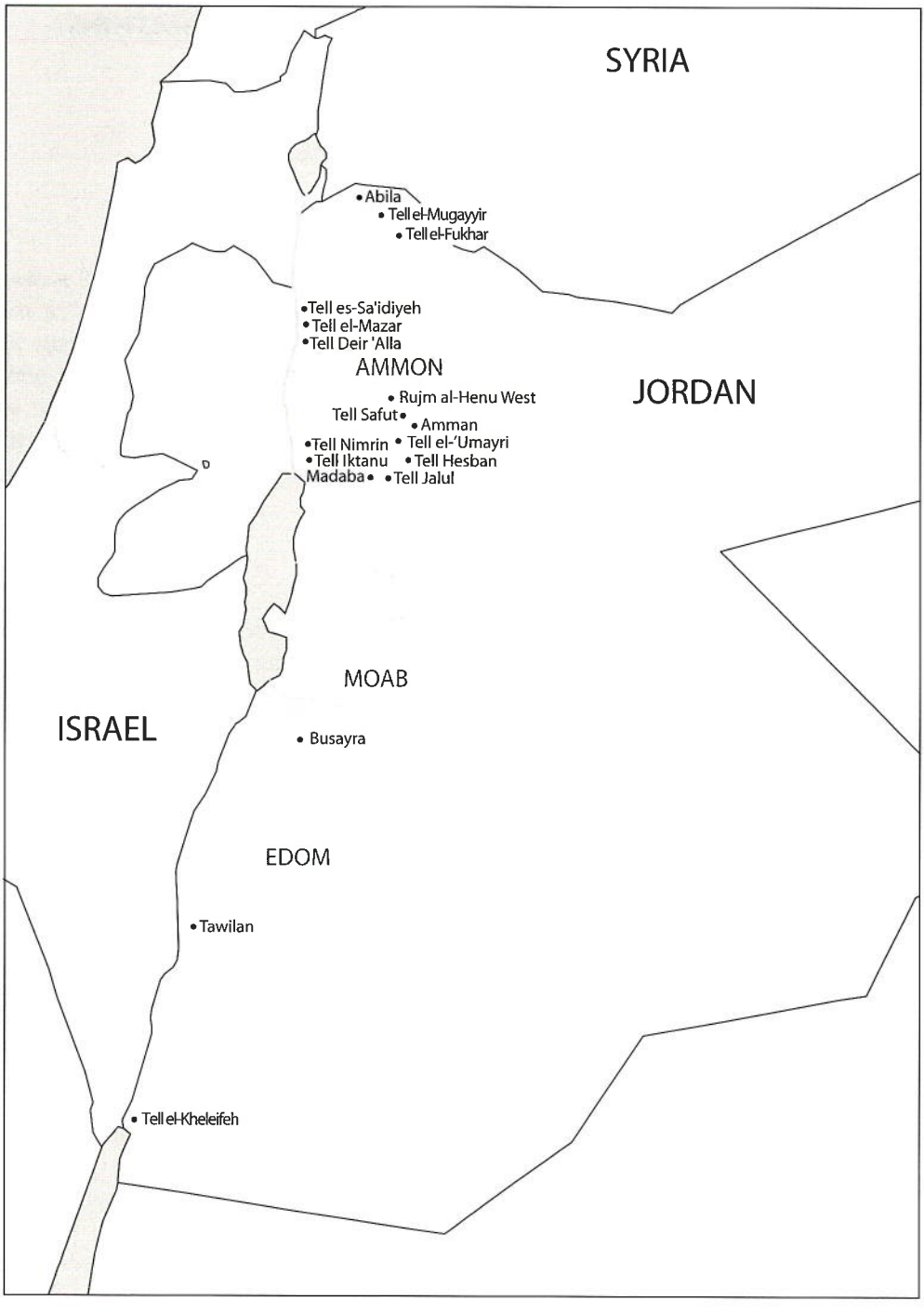

Fig. 1: Map of Jordan showing excavated Persian period sites

ceramic study, which relies on a assessment of traditions in the production of pottery, including materials and techniques. A new component we bring to this program is the archaeometric analysis of sherds and the provenancing of clay sources.

The current project is an initiative of CAAS, the Centre of Art and Archaeological Studies, a collaboration between Delft University of Technology and Leiden University. CAAS is a centre for the scientific study of material cultural heritage in its archaeological and art historical context with a focus on the interface among the disciplines involved.

Historical and archaeological overview of the Persian period (539-332 B.C.)

The Persian period/Iron Age III begins in 539 B.C., when the Persian king Cyrus conquered Babylon and subsequently took control over the entire Babylonian empire, including Transjordan. The administrative division of Transjordan is unknown, but it may have been divided into several provinces. Seal impressions from Tell el-'Umayri in Jordan hint at the presence of a provincial administration (Herr 1999: 233-234).

The archaeological record of Transjordan of the first half of the Persian period demonstrates continuity from earlier times. Several sites remained inhabited during the 'Babylonian' period (± 600-539 B.C.) and the first part of the Persian period, including Tell Deir 'Alla, Tell el-Mazar, Tell el-'Umayri (Bienkowski 2002b).

This time frame is relatively peaceful for the Southern Levant, until the decline of the empire in the second half of the Persian period, beginning with the reign of king Artaxerxes II (404-358 B.C.). The independence of Egypt around 400 B.C., together with several rebellions of the Phoenician cities, caused that tensions rose in Palestine. The unrest led to campaigns by the Persians into Phoenicia and the Southern Levant, culminating in 342 B.C. with the reconquering of Egypt. Alongside this turmoil, internal struggles within the Persian government led to weakening of the empire. It seems reasonable to assume that Persian rule in the region diminished after 400 B.C. (Stern 2001; Bienkowski, 2002b). The demise of the Persian Empire came rapidly following this turmoil, when in 332 B.C. Alexander the Great conquered the area (Stern 2001). Subsequently the Hellenistic period begins.

The situation of Transjordan in the latter half of the Persian period is far from clear. The very presence of Persian rule has not been well attested. Transjordan appears to have been relatively peaceful since no clear destruction layers can be assigned to this latter part of the Persian period. It has been noted that the archaeological evidence is quite minimal (Bienkowski 2002b).

The Persian rule over Transjordan does not appear to have suddenly or drastically changed the local material culture. The characteristic script of this period, Aramaic, seems to have replaced the national scripts at the end of the sixth century B.C. (Bienkowski 2002b). The large assemblages of luxury items, such as metal ware, alabaster, glass and faience, which have been found in settlements and tombs in Palestine and Jordan, present a sharp contrast with the material culture of the previous period. To

Fig. 2: The site of Tell Deir 'Alla in Jordan, in 2005

this group of luxury items also belongs the most important key used in identifying the Persian period throughout the Southern Levant, namely Attic pottery. The chronological significance of Attic pottery as a terminus post quem results from our ability to date Attic pottery at times within a decade (Stern 1982).

Tell Deir 'Alla during the Persian period

Tell Deir 'Alla, situated in the central Jordan Valley, is one of the key sites in Transjordan for the Persian period and is the main focus of our research. The eastern summit of the site preserves four phases of use for the Persian Period, phases V-II.

The first occupational phase, V, represents a small loosely constructed village, which probably grew gradual. There is some evidence of later rebuilding activities. Towards the end, the village seems to have slowly disintegrated or perhaps it was destroyed gradually.

In phase IV, courtyard refuse began to accumulate until it gradually covered the phase v village (see Figure 3 for an example of pottery from phase IV). Both of these

phases can be assigned to the Persian period on basis of fifth century B.C. Aramaic script on ostraca, indicating the presence of regional Persian rule (van der Kooij 2001).

In phase III, dated to the fourth century B.C., a new settlement was constructed, probably in a short time span. Phase III was a roughly built settlement, which was probably destroyed suddenly by an unknown reason. It is poorly preserved due to surface erosion. Remains of stone foundations and small areas of the living surfaces have been preserved along with pits. In this phase some Attic pottery was found, including a fish plate (Figure 4) (van der Kooij 2001). Several largely complete pottery vessels have been found in pits (Figures 5 and 6) (Franken and Ibrahim 1978).

The excavators found in phase II a huge pit, at least ten meters in diameter and two and a half meters deep, on the eastern summit. This large pit was subsequently refilled. Probably other pits can be connected to phase II. The excavator dates the phase to the fourth century B.C. after which the tell was not occupied. After a gap at the site, it served as a burial site in the Mameluk period (van der Kooij 1987, 2001).

Figure 3. Carrot-shaped bottle, Phase IV, reg nr. 2561

Figure 4. "Fish plate", Phase III, reg. nr. 2711

Figure 5. Deep bowl, Phase III, reg. nr. 2614

Figure 6. Grinding bowl, Phase III, reg. nr 2583

Ceramics from the Persian period in Transjordan

To assess the question of continuity and change, we present an overview of the Persian period ceramics from stratified deposits, according to geographic areas: the north, the Jordan Valley, and each of the three areas traditionally assigned to the Iron Age kingdoms of Ammon, Moab and Edom. Cemeteries, single tombs and surveys will be omitted, because these do not have a stratified context.

Northern Transjordan

In Northern Transjordan, excavators at the sites of Abila, Tell Mugayyir and Tell el-Fukhar, designate Persian period remains. At Abila a limited amount of Iron Age IIC/Persian period pottery has been excavated (Wineland 2001). The excavations at Tell Mugayyir have yielded relatively much Persian period pottery (Ibrahim and Mittmann 1986). Tell el-Fukhar has Persian period occupation (Strange 2002) and pottery (Ottoson 1993). Unfortunately, nothing has been published of the pottery found in these excavations.

Jordan Valley

In addition to Tell Deir 'Alla several other sites have yielded indications or evidence of occupation during the Persian period:

Tell es-Sa'idiyeh

Stratum III represents the Persian period remains, including a large so-called open-court building, which dominates this stratum and was discovered in the sixties by J. B. Pritchard. The building can be dated around late sixth to fourth century B.C. It contained only a few artefacts (Pritchard 1985). During the new excavations of the site by the British Museum, several sub-phases of this building were discovered. It appears that the structure that Pritchard excavated was the last in a series of buildings, which stood isolated on the tell. The building sequence dates back to the late seventh century B.C. (Tubb and Dorrell 1994). Bienkowski (2002a) published a 'Persian' pottery vessel from the site, however the context and date remain unclear. It was excavated either in the occupational debris or in the cemetery.

Tell el-Mazar

Phase I, dated to the first half of the fourth century B.C., consists of many pits and silos. The digging activities damaged the remains of phase II, which was a fifth century village (Yassine 1988). Phase II can probably be equated to Deir 'Alla phase V and IV (van der Kooij 2001). Only photos of selected pottery from phases I and II have been published in Yassine 1988.

Tell Nimrin

Occupation during the Persian period can be subdivided in at least two phases. The first, dated to the sixth-fifth century B.C., seems to be directly followed by the second phase, which dates to the fourth century B.C. The dating has been based on a number of ostraca. (Flanagan et al. 1994). Dornemann (1990) published pottery from the tell, including some sherds, which could be dated to the Persian period, but might also be very Early Hellenistic in the absence of a secure context. The Persian period pottery published in 1994 has a clear stratigraphical context (Flanagan et al. 1994). The excavators describe these ceramics as being generally fine, having an orange to pinkish brown colour, with some fine sandy inclusions. The surfaces occasionally have bubbles from air pockets.

Tell Iktanu

On top of the northern hill at Tell Iktanu are the remains of a fortress. In its upper layers Persian and possibly Hellenistic pottery was found, together with a black glazed Greek sherd from the fifth-fourth century B.C. The pottery from the later periods seems to be a direct continuation of the Iron Age II ceramics of the site. Some sherds have been published in the preliminary report of the excavation, but no distinction was made between an Iron Age II/Persian or Hellenistic date (Prag 1989, 1990).

Ammon

Several Ammonite towers are reported to have yielded pottery from the Iron IIC/Persian period, but their pottery has not yet been or very sparsely published: Tell ad-Dreijat (Younker 1990), Khilda fortress (Younker 1999; Bienkowski 2002), Khirbet Umm ad-Dananir (McGovern 1989), Rujm al-Hawi (McGovern 1989), Rujm al-Malfuf North (Younker 1999), Rujm Salim (Geraty, Herr and LaBianca 1988).

The only Ammonite tower of which the pottery has been published is Rujm al-Henu West, dating to the Iron Age IIC/Persian period. The date is based on comparison with the pottery from the fill of the reservoir of Tell Hesban (Clark 1983).

For Tell Safut, it is possible that the occupation of the site could have extended into the Early Persian period. Further evidence has not been published (Wimmer 1987a,b). The following sites in Ammon have evidence for occupation during Persian period:

The citadel of Amman

Ceramics dating from the sixth century B.C. and Persian period have been found, but not in a good stratified context, hampering a more precise date (Dorneman 1983; Greene and Amr 1992).

Tell Hesban

The site used for identifying Persian period pottery in Ammon is Tell Hesban, where Area B and C have yielded Iron Age IIC/Persian pottery. In 1972 Lugenbeal and Sauer

published the pottery assemblage from a deep sounding in Area B. Most of the pottery came from a massive Hellenistic fill, which contained mixed Iron Age pottery. This is caused by digging into Iron Age layers for obtaining earth to fill a cistern. The remainder of sherds were from loci that contained later pottery as well (Lugenbeal and Sauer 1972). The authors date the Iron Age collection to the seventh and sixth century B.C. This publication has also been used as evidence for identifying Iron IIC/Persian period pottery by several studies, like Clark (1983), Dornemann (1983). Sauer later also argued that the date of the Iron Age sherd collection could be extended even into the fourth century, however succinct evidence was not presented (Sauer 1994). On basis of the mixed context it can be argued that Hesban is not a very suitable site for studying pottery from this period.

Tell el-'Umayri

The site, which is part of the Madaba Plains Project has occupational layers from the Iron Age IIC/Persian period. Four integrated field phases (IP), 8–5, are assigned to the Iron IIC/Persian period (Herr 2000, 2002).

In IP 8 and 7 the site consisted of a small settlement, with an administrative complex and occupation around it. The beginning of IP 8 can be dated to 580-560 B.C. according to Herr (Herr 1999: 230, 2000: 16). In this phase few finds have been found lying on the floor, other then a cache in field A with Ammonite pottery, bowls and lamps (Herr 2000: 16).

According to the excavator the transition to the Persian period took place in this phase. The end date of phase 8 is however difficult to determine. Herr bases his dating on the presence of a fragment of an Attic kylix in a fill-layer between floors of the phases 8 and 7. The sherd can be dated to the late sixth or fifth century B.C. (Herr 2000: 16). Not many finds were found on the floor, but an assemblage of 'Early Persian' kitchenware has been found in situ on a plaster floor of IP 7 (Herr 2002: 36).

In IP 6 the administrative complex went out of use and some new structures were built to the east. In IP 5 the population decreased further and the settlement was eventually abandoned at the late fifth or fourth century B.C. (Herr 2000).

The site is important for the establishing a regional assemblage of Persian period pottery.

Tell Jalul

In field A Iron IIC/Persian period structures were discovered including structures, which dated to the fifth or fourth century B.C. (Younker 1999a). In field B a repaving of an entrance road was dated to the sixth-fifth century B.C. (Younker 1999b). In field C a late sixth to fifth century B.C. building has been excavated, which contained according to the excavator Persian period pottery, some Attic pottery and a 'typical' Persian period stone incense stand (Younker 1999). Also a large Persian period building was discovered in this area, which contained two stone incense altars (Younker 1997). In field D besides a large building from the sixth-fifth century B.C. (Younker and Merling 1999), remains of domestic structures were excavated. The latter contained large quantities of Iron

IIC/Persian period bowls (Younker 1997). However, no pottery has so far been published.

Moab

Harrison (1994: 429) states that Tell Madaba could have had occupation during the Persian period, based on finding some as yet unpublished Persian-Hellenistic pottery.

Routledge (2005: 212) noted that the area of Moab shows a lack of settlements from the fifth and fourth century B.C. in contrast to Ammon and Edom. Possibly it is the lack of excavations, rather than a lack of habitation that is the reason for the absence of this period in the archaeological record. The Kerak Plateau Survey seems to point at occupation during the Persian period, however Miller (1991: 205) acknowledges that the knowledge of Persian period pottery is for the most part insufficient to be more decisive.

Edom

Three sites display evidence for occupation during the Persian period. Two however have the burden of stratigraphical problems. At Tawilan a cuneiform tablet, which bears the name of one of the three Persian kings named Darius, was discovered in a secondary context. Clear occupation from the Persian period has not been found, but it is possible that the last Iron Age occupation continues into or throughout the Persian period. For Tell el-Kheleifeh the stratigraphy is similarly unclear. In the poorly preserved stratum V some fifth- and fourth-century B.C. Greek sherds and Aramaic ostraca have been found, which can be connected with an Iron Age II/Persian phase (Bienkowski 2001b).

Busayra

Only a single site in Edom, Busayra, has clear evidence for occupation during the Persian period. Phase 4 of the excavation has yielded two stratified Attic sherds from the late fourth century B.C. The site could have been inhabited throughout the entire Persian period until at least 300 B.C., when it was destroyed by fire. Phase 4 seems to have been largely a continuation of the Iron Age II-phase 3. The excavator states that the phase 4 pottery shows a continuation of the shapes of the local pottery of Iron Age II. Both the coarse ware and the painted Edomite pottery are stylistic identical throughout the entire period (Bienkowski 2001b, 2002a).

An approach to the pottery from the Persian period

On basis of this overview of the Transjordanian Persian period pottery, we can conclude that not much has been published. The extent of continuity or change in ceramic traditions is therefore unknown.

Attesting continuity and change is central in the current CAAS-study of the Deir 'Alla pottery, in which the Persian period pottery of the site is also studied. As has

become apparent from the overview of Persian period sites there is need for the characterisation of the ceramic repertoire of this period. In order to obtain insight into the pottery it is necessary to extend the scope of study from a stylistical study to a research, which is based on the notion of ceramic traditions (Franken 2005; London 1999). A ceramic tradition can be defined by the study of the constants in a pottery production.

> "These constants are the methods employed by the potters, to be reconstructed from the study of a chronological sequence of assemblages excavated at one site. This includes the making processes of the various pottery classes as far as these can be explained from a single method. It includes the type of clay that agree with the production method, as well as the methods of drying, firing and marketing of pottery." (Franken 2005: 15)

A tradition can be present over a large area or can minimally be confined to one or several villages. Contemporaneous ceramic traditions do not have to be solely present in one assemblage. Several can even coexist besides each other. As is the case for the cooking pot, which can be from the same workshop as the regular repertoire, but made according to another tradition. It can however also be made in another workshop which solely works within that particular tradition

In case of the Persian period pottery in Transjordan this approach is currently applied by Gloria London in her research on the 'Umayri and Hesban pottery (London 1999). This type of broad research is better able to establish continuity or change within the ceramic traditions, then a stylistical study alone. It can be more helpful in obtaining further insight into regional economic, social and political dynamics, because gradual, sudden or no change in ceramic traditions have their own specific causes.

Following this brief presentation of the theoretical basis, we intend to carry out the following project with the Deir 'Alla pottery. The first step will be to separate the pottery according to phase, which requires a clear stratigraphy as a criterion. Following the subdivision in phases, the focus of the research turns towards the mapping of the characteristics of the pottery per phase. Besides shapes and techniques, also the types of clays used, will be incorporated in this mapping process. To study the fabric groups, we start with a macroscopic assessment of fresh breaks followed by thin sections analysis and chemical analysis of the fabrics. The method used for this analysis is X-Ray Fluorescence Spectrometry (XRF). The use of XRF can help to support the conclusions made on basis of visual traits and help to overcome difficulties in clustering clay-fabrics visually.

Our aim is to determine if the ceramic fabrics can be connected with regional clays around Tell Deir 'Alla. For this goal local clays around the site will be sampled for workability. Workable clays will be fired and cut in order to assess if the sample matches the fabrics of the ancient ceramics. XRF will be used to fingerprint the local clays. Our aim is to establish whether Deir 'Alla produced most of its own pottery on site/in its vicinity or if it acquired the largest part of its pottery from a more distant regional workshop. Instrumental Neutron Activation Analysis, INAA, will be used if neces-

sary to try and pinpoint certain non-local vessels to their source, in order to obtain more conclusive evidence for the provenance.

Our approach is designed to better characterise local ceramic traditions and establish how much of the corpus was produced locally. Subsequently, it can be determined if certain shapes and/or some techniques, like the fast wheel, were limited for example, only to non-local clays.

After mapping the traditions of the assemblage of a phase, the next step will be to compare the results with those of the previous or following phase. This enables us to map or follow the development of an assemblage, and to learn which local traditions develop further, which disappear or which stay the same. In addition it can be determined what has been incorporated from non-local traditions from the previous phase and what is new in each specific phase.

Once having studied the continuity and change within the ceramic repertoire of Deir 'Alla, it will be important to explain the results with the use of ethnoarchaeological, anthropological, archaeological and historical information in order to clarify why certain changes in the ceramic assemblage took place or why continuity prevailed.

In summary, the approach presented here, based on Franken's work, enhanced by archaeometrical analyses, is expected to provide greater insight into a ceramic assemblage. One goal of studying the Persian period pottery is to establish how much continuity prevailed and why.

Outlook

The pottery from the Persian period in Transjordan is still largely unknown, due to the small number of publications and the largely stylistical approach to the pottery. Establishing the existence of the hypothetical continuity is therefore difficult and can in our opinion only be done when using an approach based on ceramic traditions. Together with the studies of Tell Hesban and Tell el-'Umayri pottery, the current CAAS-research of the Iron Age II and III pottery of Tell Deir 'Alla aims to contribute to the knowledge of Persian pottery. The preliminary results of this study of the ceramics of Tell Deir 'Alla will be submitted to the subsequent editions of this journal.

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Notes

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THE IRON AGE POTTERY OF KHIRBET AL-MUDAYNA AND SITE WT-13 IN JORDAN

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Abstract

The pottery of Moab in Jordan is largely "terra incognita". Only a few sites have been excavated in the region, and the published pottery comes mainly from tombs. The excavations of the tell of Khirbet al-Mudayna and the nearby Site WT-13, both dating to the Iron Age, are designed to fill in this gap in our knowledge. In cooperation with the Ceramic Laboratory of the Faculty of Archaeology at Leiden a research project has been drawn up to study the pottery of these sites both typological and technologically. The first results are being presented here.

Khirbet al-Mudayna

Khirbet al-Mudayna is a major Iron Age site in the Wadi ath-Thamad, on the northern border of ancient Moab in Jordan (Figure 1). The excavation is part of the Wadi ath-Thamad Project of Wilfrid Laurier University, Waterloo, Canada, which started in 1995 under the direction of Prof. P.M. Michèle Daviau. Besides the excavation of the tell of Khirbet al-Mudayna itself, this project involves a survey of the area and the excavation of a Nabataean settlement located at the foot of the tell and of an Iron Age shrine site nearby (Figure 2).

At Khirbet al-Mudayna some exciting discoveries were made. The site is heavily fortified with a casemate wall that is visible on the surface above an earth embankment. A large six-chambered gate, comparable to gates found at Megiddo, Hazor and Gezer in Israel, gave entrance to the town (Chatwick, Daviau and Steiner 2000). Adjoining a large open courtyard behind the gate stood a small building with benches alongside the walls, which could be identified as a temple (Daviau and Steiner 2000). Several limestone altars were found inside, one with a complete Moabite inscription (Dion and Daviau 2000). From the temple area a street led southwards, with public buildings on both sides. Three pillared buildings have so far been excavated.

Khirbet al-Mudayna is situated in an area that was a bone of contention among the ancient kingdoms of Israel, Ammon and Moab in the Late Iron Age (900–600 B.C.). The famous Mesha inscription, dating to ca. 830 B.C., bears witness to that, as do the biblical texts. Fortresses and towns in the region, such as Madaba, were alternatively under the control of the Israelites, the Moabites and the Ammonites. One of the

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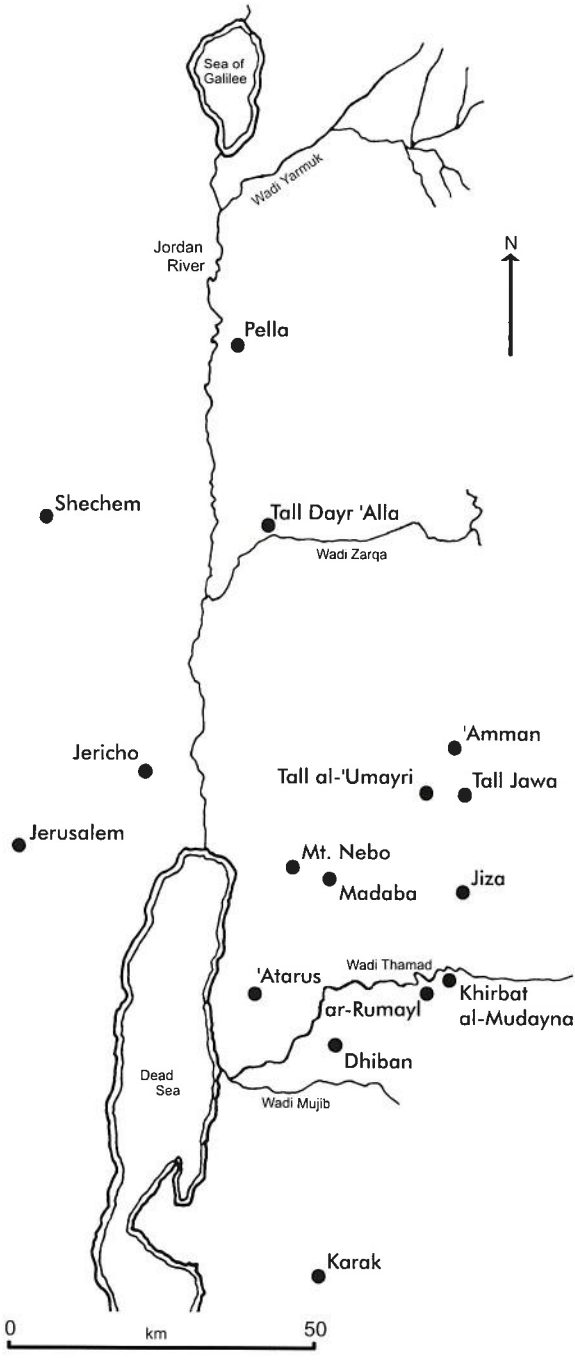

Figure 1. Map of the area east of the Dead Sea with Khirbet al-Mudayna at the Wadi ath-Thamad.

Figure 2. Tell al-Mudayna in the background. The hill to the left of the tell may be a siege ramp. It has not been excavated.

questions concerning Khirbet al-Mudayna is whether it can be identified as a Moabite town. A preliminary comparison of the pottery from the nearby Ammonite site of Tell Jawa, also excavated by Prof. Daviau, shows a definite difference in pottery types. Another important aspect to be researched is the economic background of Khirbet al-Mudayna, as part of an ongoing study into the economy of early states in the southern Levant (Daviau and Dion 2002; Steiner 2001).

Shrine Site WT-13

Several kilometers west of Khirbet al-Mudayna a cultic site was discovered on top of a natural hill. Salvage excavations were conducted from 1997 onwards (Daviau 2006). Although the site was heavily disturbed, several walls and floors were found. The investigations produced dozens of figurines, fragments of anthropomorphic statues, and a large amount of pottery. The figurines and statues have their closest parallels at 'En Haseva in the Wadi Arabah and Horvat Qitmit in the Negev, both cultic sites dating to the Late Iron Age (Cohen 1994; Beit-Arieh 1995). Site WT-13 may have functioned as an open air sanctuary serving the region. An earlier phase of occupation revealed five bread ovens and some connected surfaces, but no buildings. The pottery includes both Early and Late Iron Age forms.

The pottery of Iron Age Moab

Not many sites have been excavated in ancient Moab and most pottery is known only from tombs. The ancient capital of Moab, Dhiban, was excavated in the 1950s and 1960s, but little of the Iron Age town could be retrieved and the published pottery comes mainly from fills. Other sites, such as Lehun, Ataruz and Balua. have been excavated, but their pottery has not yet been published, Several surveys have yielded Iron Age pottery, but in the absence of published pottery from well-stratified sites, this survey pottery is difficult to date.

As a result, the Moabite pottery repertoire remains largely 'terra incognita'. The excavations of Khirbet al-Mudayna and Shrine Site WT-13 provide an opportunity to study Iron I and Iron II pottery from well-defined contexts. A research project was drawn up in collaboration with the Ceramic Laboratory of the Faculty of Archaeology at Leiden University. Some 2000 diagnostic sherds from the tell and 400 diagnostic sherds from Site WT-13 were sent to Leiden as well as a box of diagnostic sherds collected randomly around the tell.

Research objectives

The research comprises the following objectives:
- a presentation of the pottery repertoires of Khirbet al-Mudayna and WT-13 by function/type and by stratigraphical location;
- an identification of the function of rooms and buildings on the basis of pottery and other finds;
- a comparison of the pottery with pottery repertoires from other regions in Jordan;
- a dating of the pottery, to be able to establish when the sites were inhabited;
- a technological analysis of several aspects of the pottery, such as fabric, construction techniques and firing temperatures in order to distinguish different regional workshops; and
- an analysis of imported materials to identify regional and supra-regional contacts.

Results

The research is ongoing, but some results may be presented here. According to the available C-14 dates the town of Khirbet al-Mudayna was built in Iron Age II, somewhere in the 9th or the beginning of the 8th centuries B.C. Very little pottery was retrieved from the first phase of occupation. The town was then violently destroyed late in the Iron Age. The pottery from this destruction layer can be dated to around 700 B.C. or even as late as 600 B.C.

Pottery repertoire

Most of the pottery from the last phase of occupation at Khirbet al-Mudayna, dating to the end of the Iron Age, consists of ordinary household vessels: cooking pots, storage

jars, kraters, medium and small bowls and jugs and juglets. Almost none of these pots are slipped and/or burnished.

The repertoire is rather monotonous. Almost 70% of the krater rims belong to the same type, a large, deep, 4-handled, hole-mouthed vessel with a folded rim. Several complete vessels have been excavated from one of the pillared buildings (Figure 3). These have a diameter of 28–35 cm and are 23–28 cm deep. Of the medium bowls 45% consist of a smaller version of this vessel. Thus almost 20% of all rims found at Khirbet al-Mudayna in 1996–1999 consists of this bowl type. Close parallels have so far only been found (in very small quantities) at Dhiban, some 20 km away (Reed and Winnet 1964: Figures 57:1; 72:2). On the Kerak Plateau similar-looking rims have been found (Brown 1990: 199, nrs. 245–247; Worschech, Rosenthal and Zayadine 1986: Figure 12:13–19). In Busayra in Edom two- and four-handled kraters or deep bowls with thickened rims and a ring base seem to be common too (Bienkowski 2002: 279; Figures 9–22: 2, 3, 5). Half of the cooking pots excavated at Mudayna are of a type that has so far only been reported from the region of Moab (Routledge 1996: 187; Worschech 2000). It is a sturdy vessel with a squared rim and two handles (Figure 4). Recently Eveline van der Steen seems to have found similar vessels among the pottery from Tell

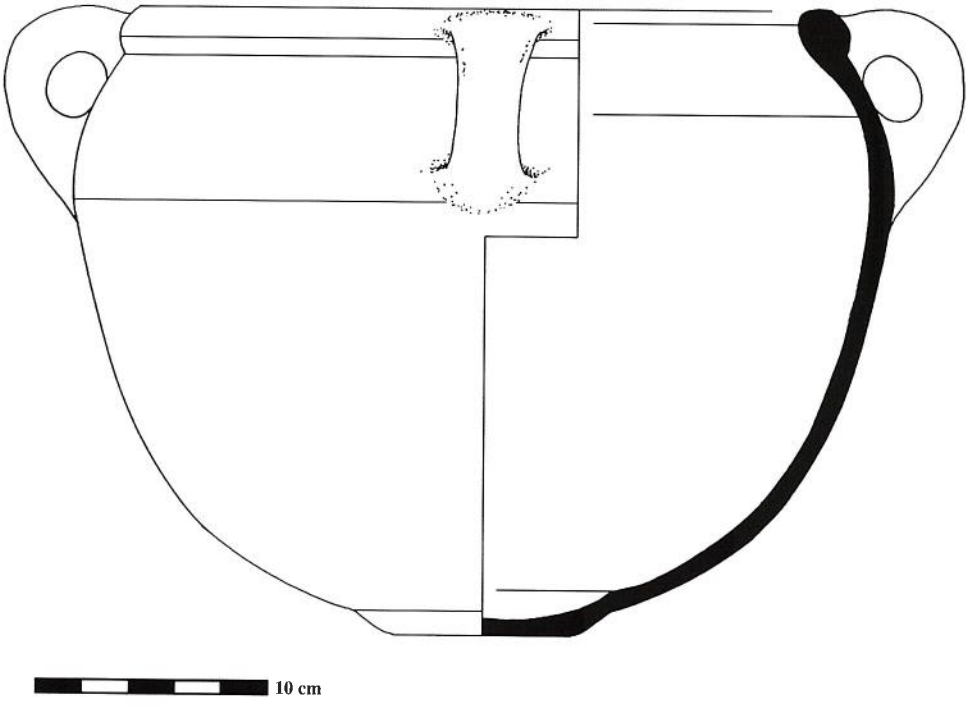

Figure 3. Krater with folded rim.

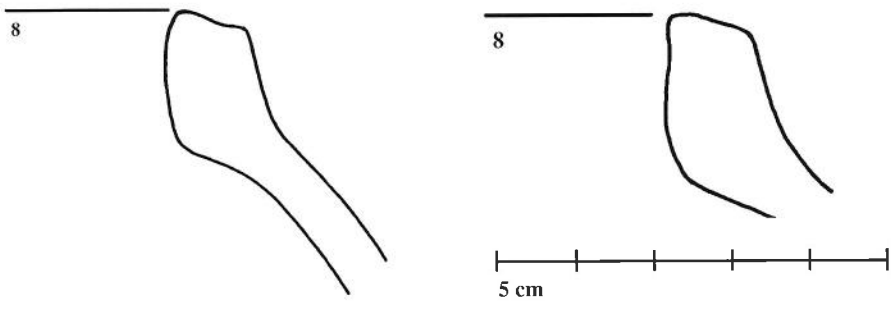

Figure 4. Cooking pot sherds with squared rims.

Mazar in the Jordan Valley (personal communication), while some cooking pots of Tell Deir 'Alla also display the same features (personal communication Niels Groot). The implications of this surprising distribution pattern have yet to be analyzed.

Only a very small part of the sherds are painted with black and red stripes or slipped and burnished, and black-burnished bowls are scarce. This is in stark contrast to the pottery from the same period found in the areas of Ammon to the north (where most pottery is burnished) and Edom to the south (with a large amount of painted pottery). It may be that in Moab these techniques to decorate pottery were not in vogue, or that Khirbet al-Mudayna was an outpost within the Moabite territory, with little demand in fine wares.

Technology

All Late Iron Age sherds were studied by the ceramist of the Ceramic Laboratory of the Faculty of Archaeology at Leiden University, Loe Jacobs. He could distinguish four basic forming techniques for the vessels:[1]

(1) throwing on a fast wheel. This applies to most small and medium bowls, most cooking pots and the small juglets.
(2) throwing on a wheel with lower speed. The vessels were possibly made in parts. This was observed for the larger cooking pots and mortars.
(3) throwing from coils with continuous but slow rotation. Storage jars, big platters, kraters, and the bases of large storage jars were made in this way.
(4) throwing from a cone and cut loose: lamps and small bowls.

A sample of some 40 sherds was then selected for a low-tech fabric analysis of quantitative and qualitative aspects of the fabric. The sherds were cut by hand to get a first impression of their hardness. Then they were refired under oxidizing conditions at a temperature of 800 degrees Celsius. The color was noted, and the ware of the sherd was analyzed under a binocular microscope.

Three different fabrics could be distinguished. The first fabric is rich in finely divided iron components and contains grains of limestone, probably all part of the clay matrix. This red-firing clay was used to produce only cooking pots. Some cooking pots made of this paste were tempered with basalt. The second fabric was a pink-firing ware which contained calcium as well as small amounts of microfossils of the ostracoda type, both as part of the clay matrix, and less iron components than the first group. The third fabric, a buff-firing ware, contained a larger amount of microfossils, and it is likely that this was added as temper.

Pottery workshops

A study of the Iron Age pottery tradition[2] of Tell el-Umayri, an Ammonite site near Amman, has shown that different techniques were used to produce the vessels: combined coiling and turning as well as throwing on a fast wheel and coiling alone (London 1991). This would be conform to our observations. London identified four sets of potters: those who produced the full range of open and closed vessels; a separate workshop for cooking pots, a group who hand-built oversize containers, and finally others who made the highly burnished "Ammonite" vessels. All were craft specialists. Each group could "man" one or several workshops, depending on the wares identified. Ethnological and ethno-archaeological research has shown that potters (workshops) use only one kind of clay. The potters may mix clays to suit their needs, but they do not use different clays to produce different vessels within one workshop

Applying this model to Khirbet al-Mudayna would result in the identification of several pottery workshops working the Mudayna market, as at least three different wares could be distinguished. The first ware was only used to produce cooking pots. Some cooking pots were tempered with basalt, while others were tempered with quartz sand. Thus it seems that two potteries were producing cooking pots, using the same clay source but different tempers. Two other potteries were producing all the other vessels in use at Mudayna. Both potteries made small and large, open and closed vessels. Some of these pots were also tempered with basalt.

Cooking pots

Although during the Bronze and most of the Iron Age cooking pots were tempered with chrystalline calcite, not one of the Mudayna cooking pots was tempered with that material. Quartz sand and basalt were used. Other studies confirm the situation found at Mudayna.

In the course of Iron II most potters producing cooking pots seem to have changed their temper from chrystalline calcite to other minerals. Both in Jerusalem and Bethsaida this change has been recorded. In Jerusalem from the 8th century B.C. onwards potters preferred extremely fine quartz sand (Franken and Steiner 1991: 107). This shift made it possible that pots were thrown on a fast wheel and it also

affected the shape of the pots, which became smaller, with narrower mouths and diameters from 8 – 12 cms. In Bethsaida basalt became the preferred temper for cooking pots; if calcite was used, it was ground down to a powdery substance (Clark and London 2000: 102).

The cooking pots published from Buseira en Tawilan in Edom, occupied in the 7th and 6th centuries B.C., were not tempered with calcite either. They were all made of clays with high silica contents, with quartz as the main inclusion (Bennet and Bienkowski 1995; Bienkowski 2002). In Tawilan calcite was the main temper in use for all other types, but not for cooking pots (Bennet and Bienkowski 1995: 55).

Future work

This will include a study of the fine wares of the tell and of the pottery of Site WT-13. Relevant questions concern the technology and wares of the Early Iron Age pottery from Site WT-13 and the relation of the later Iron Age sherds with those of Khirbet al-Mudayna. In other words: did the inhabitants of Mudayna visit the shrine bringing food (in pottery vessels) or is there no direct connection discernable between the two sites.

Acknowledgements

Grants towards this research as been received from the Dr. M. Aylwin Cotton Foundation, the Mediterranean Archaeological Trust, the Netherlands Organization for Scientific Research (NWO), the Social Sciences and Research Council of Canada, and Wilfrid Laurier University. The Ceramic Laboratory of the Faculty of Archaeology at Leiden University conducted the technological analysis of the pottery.

Notes

1. It is important to note that only the rims and some bases of the vessels could be studied, not the whole vessel.
2. A pottery "tradition" refers to all of the manufacturing techniques used by a community of potters at any given time. (London 1991: 403).

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THE EARLIEST CERAMICS FROM TELL SABI ABYAD, SYRIA

Olivier P. Nieuwenhuyse

Abstract

This report presents new and hitherto unpublished early ceramics from Tell Sabi Abyad, Syria. Provisionally dated to between 7000–6700 cal. BC, this pottery is likely to represent the earliest found in the immediate region. Contrary to expectations arising from earlier fieldwork, and contradicting the generally accepted framework for early ceramics in Syria, this pottery appears to be surprisingly advanced, and it is occasionally decorated. The article presents the context and the technological properties of this earliest pottery. We conclude with some preliminary remarks concerning the introduction of pottery in northern Syria.

Introduction

In an earlier contribution to this journal we reported on the discovery at Tell Sabi Abyad II of stratified levels containing a very early Near Eastern ceramic assemblage (van As, Jacobs and Nieuwenhuyse 2004). Provisionally dated to around 6800 cal. BC, this so-called Coarsely-Made Plant-Tempered pottery (henceforward CMPT Ware) was irregularly shaped, roughly finished and made of coarse clay tempered with organic inclusions. It contained a limited range of simple shapes and was entirely plain. It closely resembled "early" ceramic assemblages known from a range of other excavated Pottery Neolithic sites in the region, and it fitted very well with generally accepted ideas at the time concerning the introduction of ceramics in this part of the Near East (Akkermans 1988, 1993; LeMière 1986; LeMière and Picon 1999). At the time, therefore, we assumed that this assemblage formed part of the earliest ceramic horizon in northern Syria.

Ongoing fieldwork has decisively proved us wrong. The most recent fieldwork at Tell Sabi Abyad has yielded an even *earlier* ceramic assemblage, with an entirely different character in terms of its technology. In stark contrast to CMPT Ware, this pottery is remarkably advanced, elegantly shaped, and well finished. To our surprise, it is occasionally decorated. Tell Sabi Abyad does not stand on itself: other sites, too, have begun to yield very early ceramic assemblages (Arimura et al. 2000; Bartl et al. 2006, in press; Faura 1996a, 1996b; Faura and LeMière 1999; Nishiaki and LeMière 2005; LeMière and Picon 1999; Miyake 2005; Özdoĝan 1999, 2003; Tsuneki and Miyake 1996). These new discoveries are rapidly changing our perspective on when, how and why Neolithic communities in the Near East began using pottery. In this preliminary report I wish to introduce the earliest pottery assemblage known so far at Tell Sabi Abyad,

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briefly discuss its technological characteristics and offer some remarks regarding the introduction of pottery in northern Syria.

The context of the earliest pottery

Tell Sabi Abyad is a cluster of four prehistoric mounds, known as Tell Sabi Abyad I to IV, situated closely to one another in the northern part of the Balikh valley, some 30 km south of the Turkish border (Figures 1 and 2). Over the past years, extensive excavations on the western slopes of the largest mound, Tell Sabi Abyad I, have exposed levels dated to the Early Pottery Neolithic on a large scale (Operations III–V). Characterised by a distinctive ceramic assemblage dominated by CMPT Ware, these levels have been radiocarbon dated to between 6700–6200 cal. BC (Akkermans et al. 2006).[1] Previously, excavations at the adjacent mound of Tell Sabi Abyad II had yielded similar ceramics from the top-most occupation level, on which we reported in the earlier LJPS report (van As, Jacobs and Nieuwenhuyse 2004; Nieuwenhuyse 2000). As the last field campaign (2005) at Tell Sabi Abyad I has now made clear, an intermediate stage appears to be

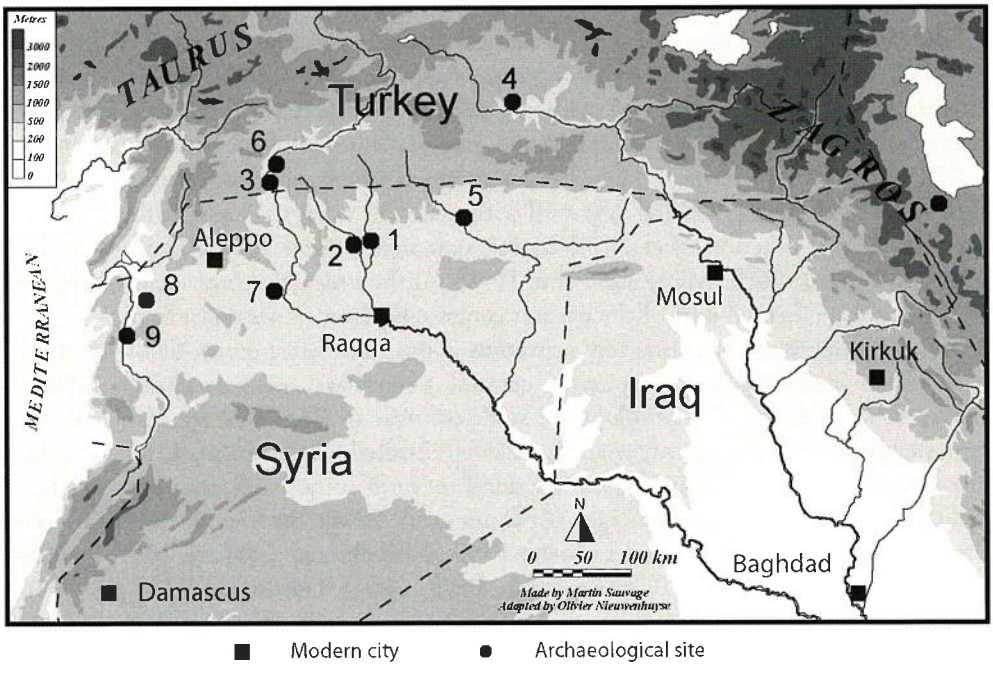

Figure 1. Map of the Near East showing the location of Early Pottery Neolithic sites mentioned in the text. No. 1: Tell Sabi Abyad. No. 2: Tell Damishliyya. No. 3: Mezraa Teleilat. No. 4: Salat Cami Yani. No. 5: Tell Seker al-Aheimar. No 6: Akarçay. No. 7. Tell Halula. No. 8. Tell el-Kerkh. No. 9: Šir.

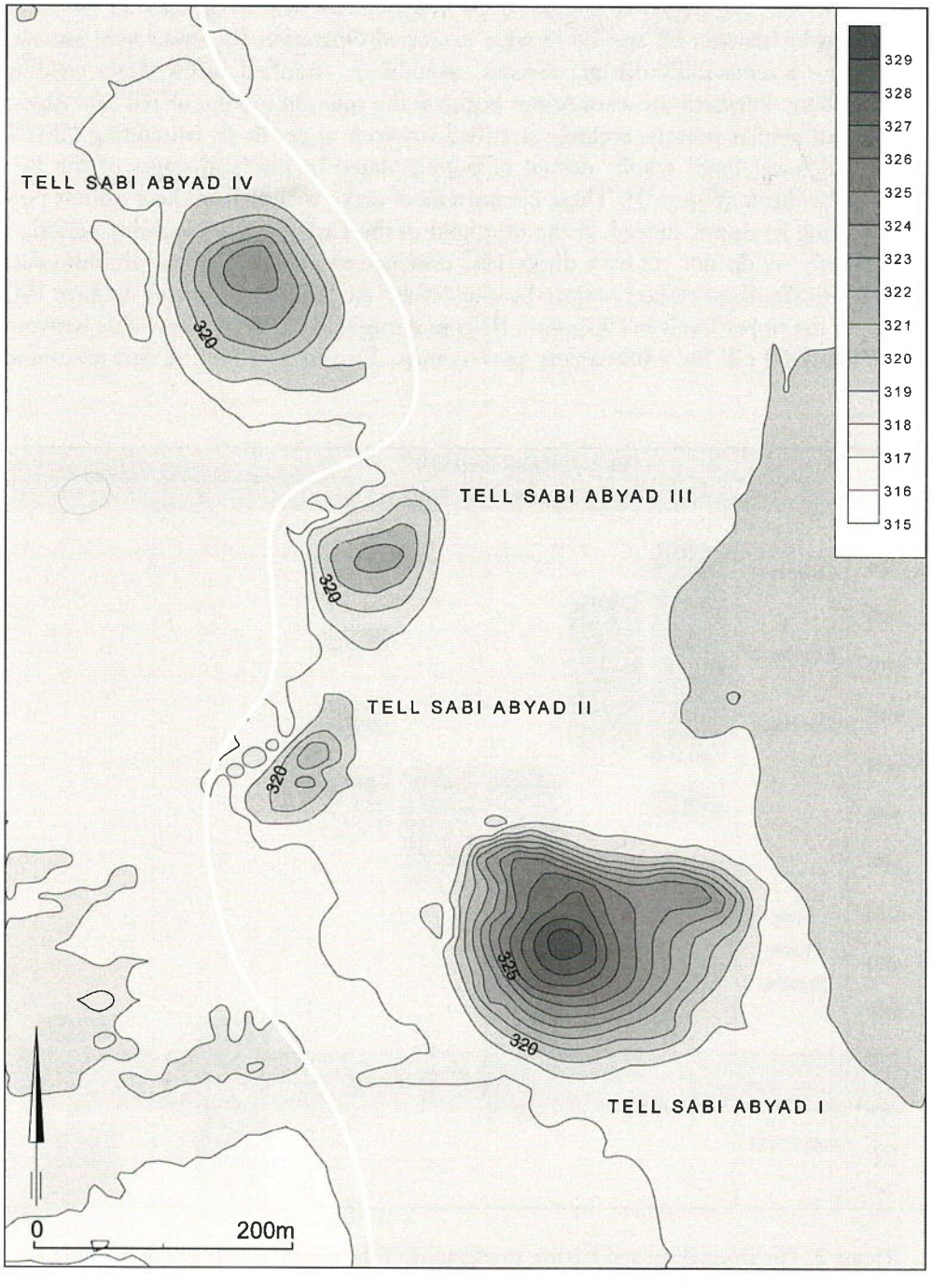

Figure 2. The locations of Tell Sabi Abyad I to IV.

missing at Tell Sabi Abyad II (Figure 3). At Tell Sabi Abyad I, at the base of two deep soundings in trenches E3 and E4 in what is termed Operation III, strata were excavated bearing a remarkably distinct ceramic assemblage, stratified below strata yielding CMPT Ware. Furthermore, excavations begun at the adjacent mound of Tell Sabi Abyad III yielded similar pottery, securely stratified between upper levels containing CMPT Ware and lower levels wholly devoid of pottery dated to the final stages of the Pre-Pottery Neolithic (Figure 3). These circumstances make it clear that these earliest pottery-bearing levels are, indeed, at the threshold of the Early Pottery Neolithic period.

Presently we do not yet have direct 14C evidence to provide a secure absolute date for, specifically, these earliest pottery-bearing levels.[2] At Tell Sabi Abyad we do have 14C dates for the upper levels in Operation III containing CMPT Ware: these date between ca. 6700–6300 cal. BC (Akkermans, pers. comm., December 2006). A date at around

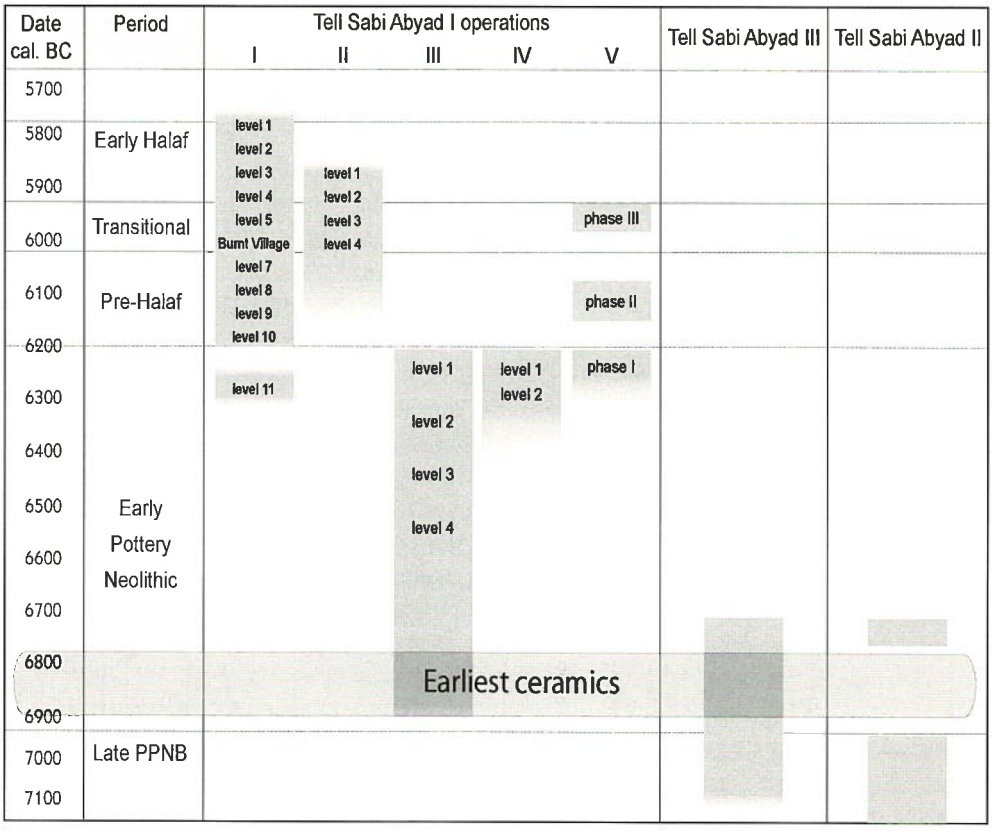

Figure 3. The chronology and relative stratigraphy of the excavations at Tell Sabi Abyad I, II and III. Vertically shaded: excavated occupation sequences. Horizontally shaded: the period covered in this report.

6800 cal. BC for the introduction of CMPT Ware is attested at some other sites in the Balikh and elsewhere (Akkermans 1988, 1993; LeMière and Picon 1999). At Tell Sabi Abyad II, the Pre-Pottery Neolithic reached its final stages at around 7000 cal. BC (Verhoeven 2000). Provisionally, then, we date the earliest stage of the Pottery Neolithic discussed in this report to somewhere between 7000–6700 cal. BC.

What is important, extremely low densities of ceramic material characterise the earliest Pottery Neolithic levels. Days would go by without excavating a single sherd, before one or two would be recovered from well-stratified, secure contexts. Similar low densities characterise the Early Pottery Neolithic levels of nearby Tell Damishliyya (Akkermans 1988), and are also attested at Early Pottery Neolithic sites elsewhere such as Mezraa Teleilat on the Turkish Euphrates (Karul et al. 2002; Özdoĝan 2003) and Salat Cami Yanı on the Tigris (Miyake in press). Although precise, quantified statistics for relative ceramic densities remain to be computed, this suggests that in its earliest stages pottery was far from the type of every-day, common artefact used in abundance, as it would rapidly become in later stages. At the start of the 7th millennium B.C., very few pots may have been simultaneously in use. Importantly also, the cultural milieu in which the early pottery occurs closely resembles that of the preceding aceramic stage. In terms of architectural lay out, lithic industries, and an abundant use of vessels made of stone or lime/gypsum (so-called white ware), the earliest Pottery Neolithic context at Tell Sabi Abyad indicates a strong sense of continuity from what is presently known of the final Pre-Pottery Neolithic (Akkermans et al. 2006; Verhoeven and Akkermans 2000). As is now being documented at Tell Sabi Abyad and elsewhere, many once-thought typical "aceramic" features continued long into the Early Pottery Neolithic. The initial introduction of ceramics, then, does not seem to have been associated with abrupt cultural change.

The earliest ceramics

As the investigation of this new material has only just begun, we can provide no more than a preliminary presentation. In terms of ceramic technology, what is perhaps most distinctive about the earliest ceramics compared to pottery from subsequent stages is that it was made of a clay tempered with mineral inclusions. We provisionally use the term Early Mineral Ware to refer to this category (henceforth: EMW).[3] Although further research must chart the mineralogical composition in detail, a dense distribution of small to medium-sized, grey, dark grey to black sub angular minerals is macroscopically observed in most of the EMW sherds. The nature of these minerals remains to be determined. The macroscopic fabric analysis suggests that the fabric composition differs from the natural, non-tempered, composition of workable clays sampled by Leiden University close to the Balikh river within the context of a study on the Transitional and Early Halaf ceramics from Tell Sabi Abyad (van As 2004: 15–16; Nieuwenhuyse 2007). This may suggest that the mineral material was not naturally present in the clay, but constituted a purposeful addition, in short, a temper, but it is also possible that the pottery

was not locally produced. At Tell Seker al-Aheimar, a site contemporaneous to Tell Sabi Abyad yielding early ceramics that appear to be superficially similar to the pottery discussed here, LeMière and Nishiaki identified rock of volcanic origin as a tempering material, which they argue may point to a non-local origin of the early vessels from Seker (Nishiaki and LeMière 2005: 61, 64).[4]

Apart from the identification of the raw materials used as temper, a crucial, unresolved issue concerns the relationships between the earliest, mineral-tempered pottery and the subsequent CMPT Ware. One possibility is that the two categories have little to do with one another, and that the CMPT Ware simply replaced the earlier EMW. This view is supported by the conspicuous discrepancies in ceramic technology, vessel shape, size and decoration: the two categories simply appear to be very dissimilar. In addition, the exclusivity of the earliest pottery does not compare well with the subsequent abundance of pottery, and suggests a wholly different role of the earliest pottery compared with later productions. Alternatively, it is possible that these earliest vessels *were* direct precursors of the later plant-tempered pottery at the site, and that the CMPT Ware grew out of the earlier MCW. At Tell Seker al-Aheimar, Akarçay and Salat Cami Yanı, while the earliest pottery-bearing levels contained mineral-tempered pottery exclusively, this gradually changed into ceramics showing a mixed mineral-plant temper, and eventually into exclusively plant-tempered pottery (Arimura et al. 2000; LeMière and Picon 2003: 185; Miyake 2005, in press; Nishiaki and LeMière 2005: 62). The sequence now excavated at Tell Sabi Abyad shows a similar development: following the earliest ceramic levels discussed here, in subsequent levels pottery fabrics change to a combination of coarse plant and mineral inclusions, to be followed by levels with only plant-tempered pottery. In short, there appears to be an element of continuity and gradual evolution in pottery production in general (Nishiaki and LeMière 2005: 64).

A further distinctive, and conspicuous, aspect of this early pottery is the great care with which the vessels were shaped and finished. The subsequent CMPT Ware was roughly shaped, frequently resulting in vessels of uneven height and with wobbly rims. In stark contrast, the earliest, mineral-tempered vessels show regular profiles and rims. The wall thickness, too, is quite regular, even if it may vary considerably even on a single vessel. Primary shaping techniques probably included pinching for the smaller vessels and coiling for the larger ones, but traces of the primary shaping are on the whole difficult to identify due to intensive subsequent smoothing and burnishing of the vessel wall. The remarkable evenness and smoothness of the vessel wall represents another contrast to subsequent products; occasionally the surface even reached a dull gloss. Most shapes were simple convex-sided bowls or shapes with straight walls (Figure 4). "Ear-shaped" lugs are occasionally present (Figure 4: 7–8, 17). It cannot be excluded that for the occasional carinated contour the potters took a mould for shaping the base, after which the upper part of the vessel was build with coils. If so, no complicated tools need to be implicated; people may simply have re-used the lower part of some other vessel as a mould (van As and Jacobs 1989). Thus far no examples have been attested of these

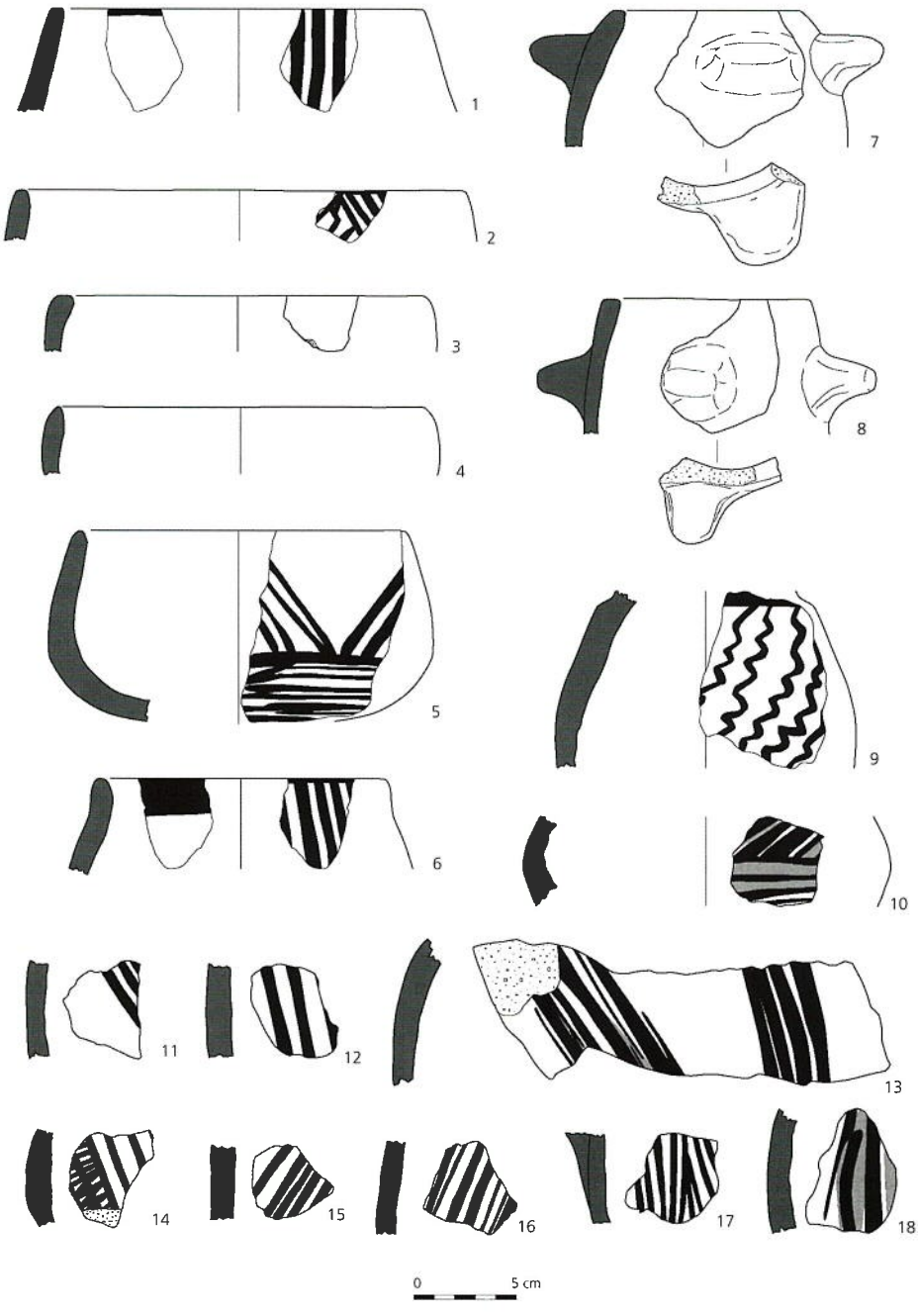

Figure 4. Examples of EMW from Tell Sabi Abyad I (deep sounding trench E3, Operation III) and Tell Sabi Abyad III (trench H7). From Tell Sabi Abyad I: nos. 1, 3–7, 9–10, 12, 14–17. From Tell Sabi Abyad III: nos. 2, 8, 11, 13, 18. All light coloured except no. 3, dark coloured.

early vessels having been shaped on basketry or reed mats, as is occasionally seen with CMPT Ware from later stages (Nieuwenhuyse in press).

There is significant variation in the colour of the surface as well as the cross-sections. Awaiting further study, various technological explanations can be suggested. The colour variation may may indicate the use of different raw materials for pottery production.[5] Alternatively, different firing techniques may have been available to these early potters. About one-third of the vessels show a light-coloured surface and section throughout, presumably indicating neutral or oxidizing firing circumstances (surface colours ranging from 10YR7/4, very pale brown, to 10YR6/4, yellowish brown). Apart from occasional secondary traces of soot, the light surface on the whole appears to be evenly coloured without significant clouding. The majority of the vessels, however, have a darker surface colour and core, shading into grey or dark-grey (surface colours in the range of 5YR3/1, very dark grey, to 10YR5/1, grey). Whether or not these darker vessels indicate the deliberate use of reducing firing circumstances merits further technological study.[6] The variation in colour may to some extent also reflect the use of the pottery: frequent traces of soot suggest that at least a good part of the vessels were used over a fire. In a number of cases this seems to have darkened the sherds.

To our great surprise, finally, this early pottery was occasionally decorated. While the other properties of the pottery discussed so far all find parallels at other recently investigated Early Pottery Neolithic sites in Syria and southeastern Turkey, the presence of decoration at Tell Sabi Abyad thus far appears to be unique.[7] Two decorative techniques are attested thus far: red slipping and painting. These two alternatives cannot always be distinguished easily, however, and the pigments used for either slipping or painting at first sight appear to have been the same. A diluted, watery red-brown paint or slip is typical (shading from 2,5YR, dark brown, to 5YR3/2, dark reddish-brown). The slip appears to have been applied with brushes rather than by dipping the vessel into a fluid, and the same tools may have been used for applying the pigment in the form of some motif. These often lack sharply defined boundaries, so that sometimes it is difficult to see whether some regular lines represent a roughly painted motif or an imperfectly executed slip. There was little elaboration of the design structure. As far as we can reconstruct from the fragmented material, the most common motif appears to have been parallel diagonal lines (Figure 4: 1, 6, 10–13, 15–16) or diagonal lines in alternating directions (Figure 4: 2, 5, 17). We have come across an example of crosshatching (Figure 4: 14). One example showed diagonal waves (Figure 4: 9).

Some preliminary remarks on the introduction of pottery in northern Syria

Given the preliminary state of the investigation – the levels discussed here were excavated only in 2005 – we shall refrain from moving deeply into the realm of "hot air" and speculation. As this brief presentation makes clear, the excavation of Early Pottery Neolithic levels at Tell Sabi Abyad has presently brought more questions than answers. A significant amount of crucial ceramic-technological work remains to be done. In

particular, further work must investigate if the adoption of pottery at Tell Sabi Abyad began with local production right from the start, or if people began using pottery by first importing products from elsewhere, only subsequently followed by local production of coarser, plant-tempered vessels.

At first sight, it appears to be reasonable to argue that at Tell Sabi Abyad the earliest pottery was an introduced technology. After all, apart from the huge differences with later, coarser pottery, a non-local origin of early mineral-tempered ceramics is suggested at other Early Pottery Neolithic sites in Syria (Nishiaki and LeMière 2005). Significantly also, at Tell Sabi Abyad thus far there appears to be no "trial" stage in which novice potters can be seen 'experimenting' with their new technology; the earliest ceramic products seem to have arrived in a fully developed state. The origins of this new technology might therefore be suggested to have been elsewhere. If so, one possible candidate might be the area immediately to the north where early mineral-tempered ceramics are being excavated at Akarçay Tepe, Mezraa Teleilat and Salaat Cami Yani in southeastern Turkey (Arimura et al. 2000; Miyake 2005; Özdoğan 2003).

However, chemical analyses suggest that the early mineral-tempered pottery from Akarçay was imported to that site (LeMière and Picon 2003: 185), while the excavator of Mezraa Teleilat, too, suggests that his earliest pottery came from elsewhere (Özdoğan 2003: 40). This leaves the question: where did all these Early Pottery Neolithic communities gain their earliest pottery from? Was there at this early stage already a regional production centre exporting pottery widely across the northern Syrian plains? Technological studies should further explore the degree of specialist technological expertise needed to produce the earliest wares, and to what extent this specific expertise was already available among Late Pre-Pottery Neolithic communities. The 'experimental' stage may have been fairly short. Local pottery production in northern Syria may have started abruptly, for instance, by importing from elsewhere marriage partners having the necessary expertise.

However this may be, the discovery of early Pottery Neolithic levels at Tell Sabi Abyad and other prehistoric sites in Syria and southeastern Anatolia changes the way we look at long-term evolution of ceramic technology in the Near East. Evolutionist models generally chart the long-term development of ceramic production from simple to complex. Thus, it has for a long time seemed to be self-evident that the earliest attempts of pottery production *must* be simple. LeMiere's careful synthesis (Faura and LeMière 1999; LeMière 1986, 2000; LeMière and Picon 1999, 2003) outlines a multiple-stage development of ceramic technology in the Near East: from experiments with containers made of unfired clay at an already very early date, to the earliest production of still primitive, plain pottery in certain regions, to, eventually, the stylistic and technological diversification and massive breakthrough of ceramics across the Near East. However, as is now emerging, the development of CMPT Ware was a *secondary* stage in the evolution of pottery technology. It appears that, at least in the Balikh valley, after an initial stage in which carefully-shaped, well-finished and sometimes decorated ceramic vessels prevailed, pottery production then shifted to roughly-made, plain CMPT Ware. In a phrase, pottery production went from "nice" to "coarse".

To be sure, terms such as "advanced" versus "simple" bear the risk of containing dangerous modern cultural stereotypes. The discovery of mineral-tempered, decorated EMW at Tell Sabi Abyad (Figures 5 and 6) may seem to run against commonly accepted expectations regarding early ceramics, but to some extent this reflects the difficulties of applying a linear model of progressive evolution to the development of ceramic technology and style. Archaeological interpretations can profit from moving away from overgeneralizing models, towards incorporating a contextual focus on the small-scale and regionally specific (Hoopes and Barnett 1995). On a global scale archaeologists have documented numerous case-studies of technologically and stylistically elaborated early pottery (see the various contributions in Barnett and Hoopes 1995). All sorts of socio-economic, ecologic and symbolic factors influence innovations in ceramic technology and style. Archaeologists working in the Near East are familiar with other examples of pottery production shifting from elaborately decorated to plain, or from technologically "fine" to "coarse". The change from the intricately painted Halaf Fine ware to the drab Ubaid wares comes to mind, or the subsequent development of coarsely vegetal-tempered Late Chalcolithic wares.

Processual models have always awarded prime importance to the adaptive potential of pottery. Pottery is often seen as crucial for the efficient storage of agricultural surpluses, making possible the expansion of a sedentary, agricultural way of life. No medium appears to be better suited for producing durable, impregnable storage facilities than fired clay (Arnold 1985). Also, the introduction of ceramics is often assumed to have lead to a "culinary revolution", by increasing the range of palatable foodstuffs available, detoxifying them, and increasing levels of hygiene (Arnold 1985). There can be little doubt that the introduction of pottery had these beneficial effects in the long run. However, as the recent fieldwork suggests, the introduction of pottery in northern Syria took place within a final Pre-Pottery Neolithic cultural context that appears to have continued for some time, changing only gradually (LeMière and Picon 1999; Thissen in press). Rather than a massive beak-through associated with large-scale cultural change, the introduction of pottery at Tell Sabi Abyad seems to have been a small-scale event, at least initially. There is little evidence to suggest that the earliest pottery was used for storage. If it was, this probably was small-scale, short-term, and perhaps limited to specific, special, products. Pre-Pottery Neolithic communities had been storing their surpluses for ages; apparently they kept doing so according to the good old way, at least during the initial stages of the Pottery Neolithic. Certainly, voluminous, tall-necked storage jars *would* eventually become part of the ceramic repertoire, but this appears to have been a much-delayed development. At Tell Sabi Abyad, it is possible to follow the gradual development of the neck during the Early Pottery Neolithic (Figure 7), culminating in the tall, restricted jar necks from the Pre-Halaf and Transitional stages (Akkermans et al. 2006; LeMière and Nieuwenhuyse 1996; Nieuwenhuyse 2007).

LeMière and Picon (1999, 2003) have convincingly argued that cooking may have been a major function of early, mineral-tempered ceramics across the Near East. At Sabi Abyad, indeed, there is good evidence that the earliest vessels were used for preparing

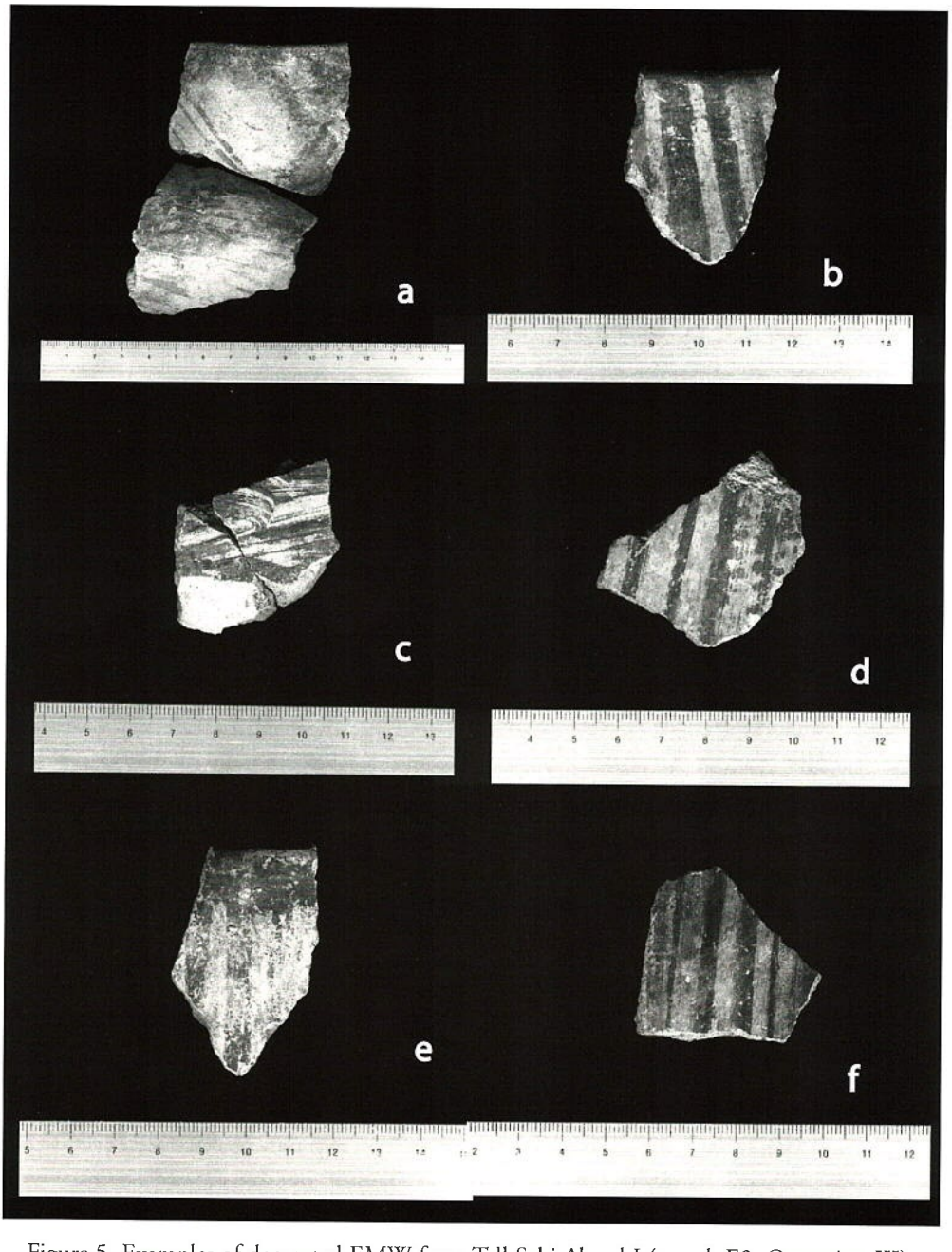

Figure 5. Examples of decorated EMW from Tell Sabi Abyad I (trench E3, Operation III).

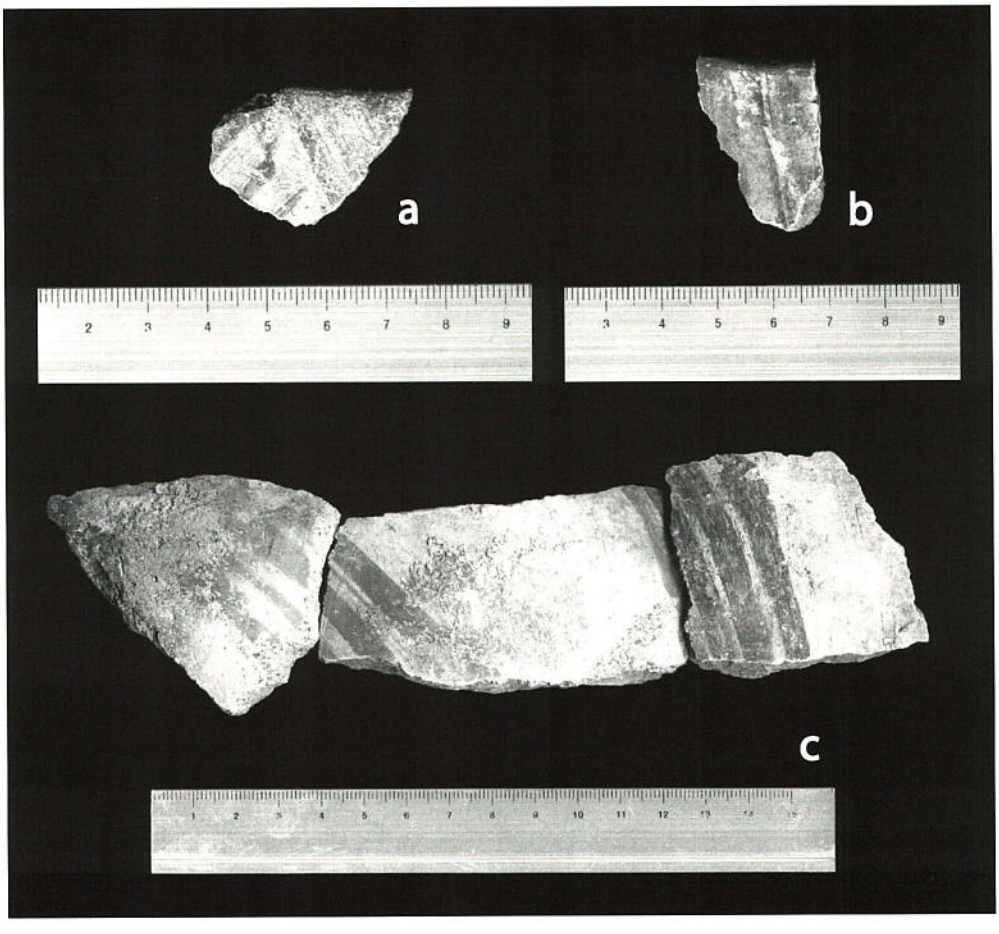

Figure 6. Examples of decorated EMW from Tell Sabi Abyad III (trench H7).

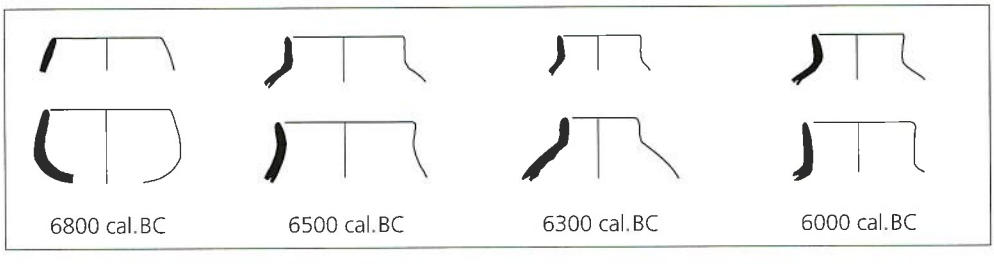

Figure 7. The gradual development of the neck at Tell Sabi Abyad.
Left: Earliest pottery ca. 6800 cal. BC. Right: storage jars from the later Pre-Halaf and Transitional periods ca. 6000 cal. BC.

foodstuffs over a fire, in other words for cooking. Depending, of course, on the proper identification of the mineral inclusions, the strong mineral-tempered fabrics and the regular wall-thickness would not contradict an interpretation of "cooking ware". Traces of soot show that at least part of the vessels were used over a fire. The occasional lugs would have improved the performance potential of the vessel, by providing better grip while busying around with it. However, the rareness and exclusivity of the earliest pottery may be taken to argue that the "culinary revolution" involved small numbers of people initially. As a special cooking ware this pottery may have been reserved for special occasions, not for everyday life. By and large, for the daily routine of preparing food and drink, Early Pottery Neolithic people at Tell Sabi Abyad seem to have continued time-honoured culinary practices from the preceding Pre-Pottery Neolithic stage. The subsequent CMPT Ware appears to have been much less suitable to be used in direct contact with fire, although it was nevertheless used as a make-shift cooking ware, easily replacable when the vessel broke (LeMière and Picon 2003). Technologically specialized cooking wares may have held a minute proportion of the ceramic assemblage until the much later development of groups such as Dark-Faced Burnished Ware and Mineral Coarse Ware (LeMière and Nieuwenhuyse 1996; Nieuwenhuyse 2007). Functional studies of the various pottery groups are essential to gain further insight into the uses, and changes therein, of Early Pottery Neolithic ceramics.

The plain, coarse, CMPT Ware has often been compared with contemporaneous containers made in other materials, in particular with vessels made of lime or gypsum, the so-called white ware. Containers made in these two raw material categories resemble each other in terms of certain aspects of their *châine opératoire*, as well as to some degree in vessel shape and size. Because of these resemblances, and because the production of white ware preceded the introduction of ceramics, it has been cited as the immediate precursor of vessels made of fired clay (DeContenson and Courtois 1979; Kingery et al. 1988). The EMW discussed here, however, seems to have had very little to do with white ware. If any comparisons should be drawn, the earliest ceramic vessels stand closer to the *stone vessels* that occur so frequently in the final Pre-Pottery Neolithic and Early Pottery Neolithic in Syria (Roodenberg 1986; Verhoeven and Akkermans 2000).[8] Although these two categories differ in shape and size (many stone bowls really are miniature vessels), they share the properties of being rare, conspicuous, small-sized containers that were most probably not used for every-day consumption of food and drink. Both categories have very even, often glossy surfaces, and the diffused, irregular manner in which many of the painted motifs are rendered on the ceramics somewhat recalls the use of coloured types of stone for the production of stone vessels. Although the specific function of the earliest pottery will have differed from that of stone vessels, then, at a general level they may both have figured within the sphere of ritual, display, or the consumption of food and drink at special occasions.

The stage characterized by this early, painted pottery does not appear to have lasted for very long. With the rise of CMPT Ware, pottery changed into an every-day artefact used in great abundance. Simultaneously, people at Tell Sabi Abyad would entirely give

up using decorated pottery. Contrary to expectations, considering the inherent potential of clay for stylistic manipulation, plain ceramics would characterise the assemblage for about a half millennium. Then, at around 6200 cal. BC, people returned to using decorated vessels, initiating the "painted pottery revolution" that eventually led to the Halaf ceramic tradition (Cruells and Nieuwenhuyse 2005; LeMière and Nieuwenhuyse 1996; Nieuwenhuyse 2007). As has recently come into focus, this change did not occur in a cultural vacuum. It was part of a complex series of socio-economic and symbolic transformations, which included the introduction of stamp seals as markers of property, the rise of a semi-pastoralist way of life, and the exploitation of secondary products. To chart these changes over the long term, and to interpret them contextually, is one of the goals of the project *Abrupt Climate Change and Cultural Transformation* at the Faculty of Archaeology at Leiden University.

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Notes

1. A selection of pottery vessels from these levels is on display in the new prehistory section of the National Museum of Archaeology in Damascus.

2. An extensive program of 14C dates is part of our current project *Abrupt Climate Change and Cultural Transformation* at the Faculty of Archaeology at Leiden University directed by prof. dr. P.M.M.G. Akkermans and prof. dr. H. van der Plicht. This four-year project is sponsored by the Netherlands Foundation of Scientific research (PR-05-38).

3. Only the earliest pottery-bearing levels at Tell Sabi Abyad yield EMW exclusively. These are followed by levels containing both EMW and CMPTW. These in turn are followed by levels with CMPTW exclusively.

4. At present we neither confirm nor deny a direct resemblance between the technological properties of the Sabi Abyad EMW and the earliest ceramics from other Early Pottery Neolithic sites such as Tell Seker al-Aheimar, Akarçay and Salat Cami Yanı, apart from the general observation that the earliest pottery at all these site was mineral-tempered.

5. Presently we cannot state if the variation in colour corresponds systematically to differences in clay fabric. At Tell Seker al-Aheimar, the light-coloured "Basalt-tempered Ware" and the dark-coloured "Early Dark Ware" differed in mineralogical composition (Nishiaki and LeMière 2005: 61–62).

6. Note that these observations of colour were made on the original material. To study firing circumstances in relationship to surface colour, the samples should be re-fired in the laboratory in standardized, oxidizing circumstances.

7. Interestingly, the Akarçay team has published a single painted-and-impressed sherd that appears to be similar to the decorated early pottery discussed here (Arimura et al. 2000: 241, fig. 10:3).

8. Perhaps significantly, the excavations at the Pre-Pottery Neolithic B site Tell Sabi Abyad II hardly yielded any white ware (n = 8), whereas a large number of stone vessels were recovered (n = 58) (Verhoeven and Akkermans 2000).

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INTERPRETATION AND SIMULATION OF THE MANUFACTURING TECHNIQUE OF ROMAN SAGALASSOS RED SLIP WARE

Abraham van As and Loe Jacobs

Abstract

By interpreting the marks left by the Roman potters, a reconstruction is made of the manufacturing technique of Sagalassos Red Slip Ware. Certain observations on the technique of slip-coating led to a number of simulation experiments in the Ceramic Laboratory of the Faculty of Archaeology at Leiden University.

Introduction

The remains of the ancient city of Sagalassos are situated on the western slopes of the Taurus mountain range in southern Asia Minor (Figure 1). Sagalassos was already a town in the time of Alexander the Great. In the Hellenistic period it became a prosperous and important city, which in 25 B.C. was annexed to the Roman Empire. After an earthquake, around the middle of the seventh century A.D., Sagalassos was abandoned. Since the early 1990s, large-scale excavations and restaurations are undertaken at Sagalassos by an international team directed by Marc Waelkens (Leuven University, Belgium).

On the invitation of Marc Waelkens, we carried out a limited study of a representative collection of Roman pottery found at Sagalassos.[1] This collection included Sagalassos Red Slip Ware (SRSW), cooking pots, dolia and other consumer ware. Since the typology and fabric analysis of the Sagalasssos ceramics had already been studied, our study aimed at the reconstruction of the manufacturing techniques of the potters. This article is focused on the most remarkable category, the SRSW, particularly the thrown SRSW.

Interpretation: a reconstruction of the manufacturing technique

Most SRSW was thrown or thrown from the hump. Some vessels were thrown closed. In addition to these techniques, we also discovered fragments evidencing mould-made pottery (Figure 2). Once leather-hard, the outside of the thrown SRSW was scraped while spinning the wheel. Foot stands were made in the same way. In the event of a stamp decoration being applied by the potter, the traces of his hands giving counter-pressure are clearly visible on the inside.

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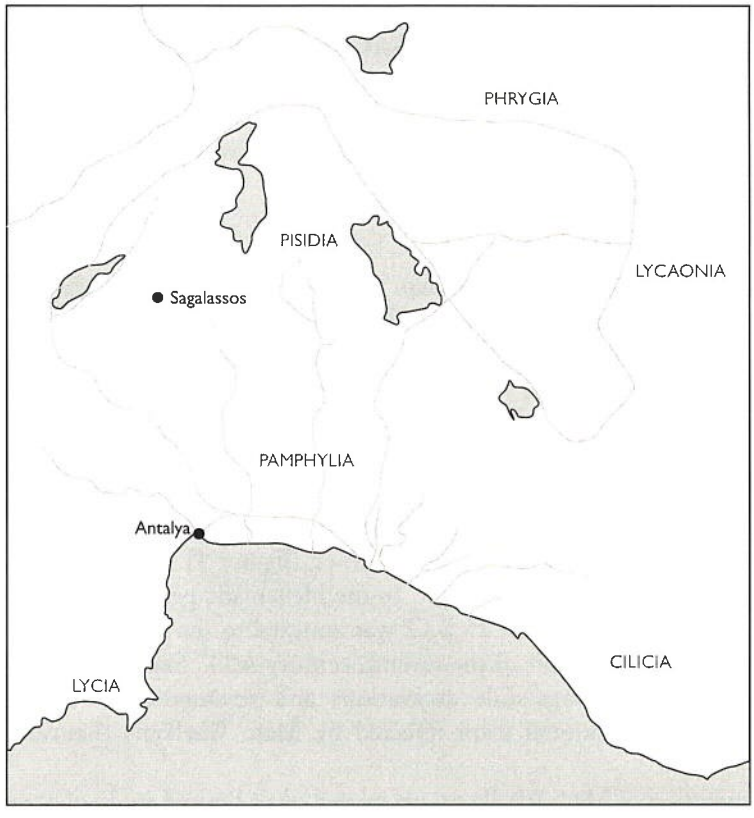

Figure 1. Location of Sagalassos in southern Asia Minor.

The production of SRSW demanded special raw materials. In order to prevent unwanted grooves appearing in the leather-hard surface during spinning, the clay could not contain coarse-grained mineral inclusions. Plates and dishes, frequently found in the SRSW repertory and thrown on the fast potter's wheel, easily crack during the drying- and firing process. However, since no cracks were observed, it is not unlikely that, in order to improve the coherence of the clay, the Sagalassos' potters added fine fibrous material to it (see for the use of so-called 'paper clay': van der Plas and van der Plas 1997). This is not demonstrable, since this type of addition leaves no visible trace after firing.

Finally, a red fired engobe or slip coating was applied. For this layer was extremely thin and almost transparent a very fine, fluid slip must have been used. To create this kind of slip required levigating appropriate clays. During this process deflocculation took place (Hamer 1975 sub 'deflocculation'). Had a thicker slip been used, small cracks can easily occur during drying because of tension that results due to the different degree of shrinkage of the slip coating and the claybody itself. To counter this

Figure 2. Mould-made Standard Red Slip Ware vessel from Sagalassos: type 1A150.

effect, the slip layer of the SRSW was kept thin. A biscuit fired or completely dry pot provides the most appropriate surface for applying a thin slip coating. Since an extra firing would have been costly in terms of fuel, it seems more likely that the slip coating was applied to a completely dry base. By doing so, the slip layer adheres better to the vessel's surface.

There are different techniques for applying a slip coating. The best way, however, to obtain a smooth, slightly shiny, and barely porous surface, is to first dip one half of a vessel, and then the other half into a slip solution. In order to ensure a contiguous slip coating that covers the vessel completely, a small overlap often develops in the middle. Here, in effect, the slip is applied twice. As a result, the colour is a little darker. On some vessels such overlap zones are clearly visible.

The SRSW was fired at temperatures between 850°C and 950°C (Viaene et al. 1995). At these relatively low temperatures, however, it can be problematic to obtain the satiny glossy surface of the SRSW. Lead-bearing components could have been used to solve the situation. For the manufacture of the SRSW, however, a sinter engobe was used, because its fine particles fuse earlier than the coarse ones of the clay of which the vessels were made. Only non-calciferous clays are suitable. Illite clays yield the best results (Grimshaw 1980: 150–152; Noble 1966; Winter 1978: 7–23).

Simulation

Based on our proposed technique of applying the slip coating, we conducted simulation experiments (Figures 3–7). It was not necessary to use an illite clay, as the potters in Roman times did, although one requirement was that the clay we used had the same workability qualities as SRSW. We used a commercial clay after we altered it to create approximation of the SRSW.[2]

Pulverised feldspar, quartz, and fat clay were added to the plastic clay.[3] In addition, sand was added in grains no larger than 250μ. Feldspar improves the workability of the clay. At the same time, it reduces the resistance against deformation and makes the vessels thrown on the potter's wheel more solid. Furthermore, it improves the sintering process at higher temperatures. Like feldspar, pulverised quartz makes the claybody less dense. Consequently, the drying/shrinkage behaviour improves and the resistance against deformation decreases. The addition of fat clay improves the plasticity. Sand was added to make the clay more open. Generally, a certain amount of non-plastic material in the form of grains makes the claybody agreable to work with. It not only improves the forming quality of the clay, but also the solidity of the vessels so that the vessels do not collapse.

Figure 3. Throwing one of the forms of the SRSW repertory.

Figure 4. Scraping the outside of the leather-hard vessel while spinning the wheel.

Figure 5. Making a foot stand by scraping while spinning the wheel.

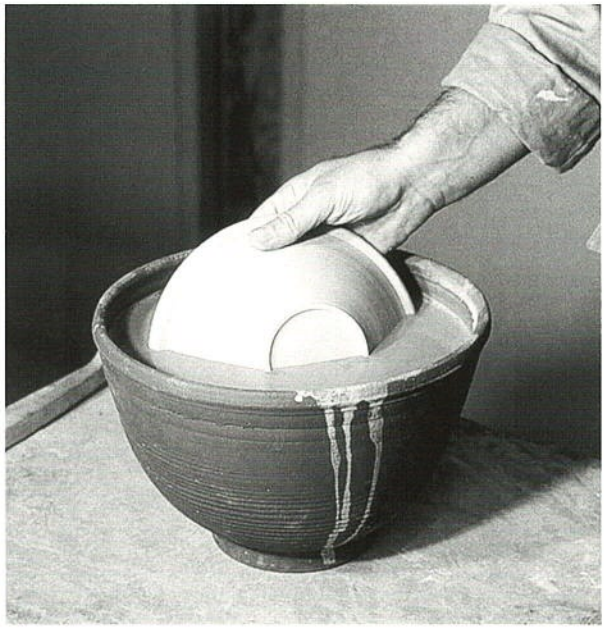

Figure 6. Dipping half of the vessel in a slip solution.

Figure 7. After dipping the other half of the vessel an overlap of the slip coating is visible in the middle.

Ten replicas of a number of forms of the SRSW repertory were thrown. When leather-hard, the vessels were finished on the wheel by scraping in order to obtain the appropriate uniform thickness. We assumed that the vessels could not crack due to differences in drying and shrinkage.

Based on the experimental work, we learned that the slip should preferably not be applied to a leather-hard surface, since the layer of slip dries too slowly to achieve a uniform taut coat. It is necessary, although difficult, to work fast in order to avoid trickling, finger imprints and unacceptable difference in slip thickness as a result of overlaps. When a less fluid slip is used in order to avoid trickling, the resulting thickness of the slip layer does not correspond to the coating of the SRSW. The application of a slip to a completely dry surface yields the best results, since the water is almost immediately absorbed. A highly absorbant surface helps to minimize or avoid trickling. We observed however, that when bone dry, the highly absorbant vessels become extremely susceptible to damage as soon as the slip is applied. If touched when the pot or the slip coating are still wet, problems arise due to sticking. This phenomenon was observed only once or twice. For this reason, dipping the entire pot all at once as is the case when glazing biscuit ware, is not suitable. Nevertheless, the application of a slip coating to a bone-dry surface must be done fast. The vessel should not be submerged in the fluid slip for a long time, since to the highly open structure the surface is extremely absorptive. If the pores soak up the water completely, the structure will lose its coherence and the vessel will fall apart, comparable to a cookie dipped in the tea for too long. However, there are advantages to the highly absorptive capacity of a bone-dry surface. After lifting the vessel out of the slip the vessel will be bone dry within a moment and almost immediately manageable without causing any damage. The proper balance between the absorptive capacity of the surface and the quality of the clay slip remains to be established experimentally.

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Notes

1. The technological study was carried out at the excavation house of the Belgian Archaeological Sagalassos Expedition at Ağlasun between the 18th and 26th of August 1999 period.

2. Since the original clay was not used for the simulation experiments, the results were obviously not identical with the SRSW.

3. Additions per 10 kg of plastic clay:

Feldspar	0.2 kg
Fat clay	0.5 kg
Quartz	0.5 kg
Sand ≤ 250μ	0.5 kg
Total	ca. 1.7 kg

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PRELIMINARY DATA ON BOIAN AND GUMELNIȚA POTTERY FROM TELEOR 008 AND MĂGURA-BRAN RESPECTIVELY, TELEORMAN RIVER VALLEY, SOUTHERN ROMANIA

Abraham van As, Loe Jacobs and Laurens Thissen

Abstract

This contribution is a third preliminary report of a study of Neolithic pottery excavated by the Southern Romania Archaeological Project (SRAP) directed by Douglass Bailey (Cardiff University) and Radian Andreescu (National Museum, Bucharest [Bucureşti]). It contains the results of a technological analysis of pottery belonging to the Boian (first half of the fifth millennium B.C.) and Gumelnița periods (second half of the fifth millennium B.C.). The pottery has been excavated at two sites in the Teleorman River Valley (Southern Romania): Teleor 008 and Măgura-Bran respectively. The report links up with two earlier preliminary reports on sixth millennium B.C. (Starčevo-Criş, Dudeşti and Vădastra periods) pottery of Teleor 003, also situated in the Teleorman River Valley (see LJPS 20 and 21). The present report includes also some preliminary remarks on pottery technology during the entire fifth and sixth millennium B.C. in the Teleorman River Valley.

Introduction

In the context of the Southern Romania Archaeological Project (SRAP), active since 1998 and investigating prehistoric land-use and settlement patterns in the Teleorman River Valley in the Lower Danube Plain (Bailey et al. 1999, 2001, 2002, 2003, 2004; Howard et al. 2004), the study of pottery use and manufacture plays an important role. Various archaeological sites inhabited throughout the sixth and fifth millennium B.C. were investigated. The opportunity presented itself to trace shifts in the ceramic assemblages over this time-span (successively, the Starčevo-Criş, Dudeşti, Vădastra, Boian and Gumelnița periods).

In 2003 the Starčevo-Criş and Dudeşti pottery was technologically analysed in the Teleorman County Museum of Alexandria (van As et al. 2004). The Vădastra pottery was analysed in 2004 (van As et al. 2005). Both ceramic assemblages were excavated at Teleor 003. The present report deals with the preliminary results of a technological analysis of the Boian and Gumelnița pottery carried out in September 2006. These ceramic assemblages were excavated at Teleor 008 and Măgura-Bran respectively, both situated in the close vicinity of Teleor 003 (Figure 1).

Leiden Journal of Pottery Studies 22, 2006: 137-148.

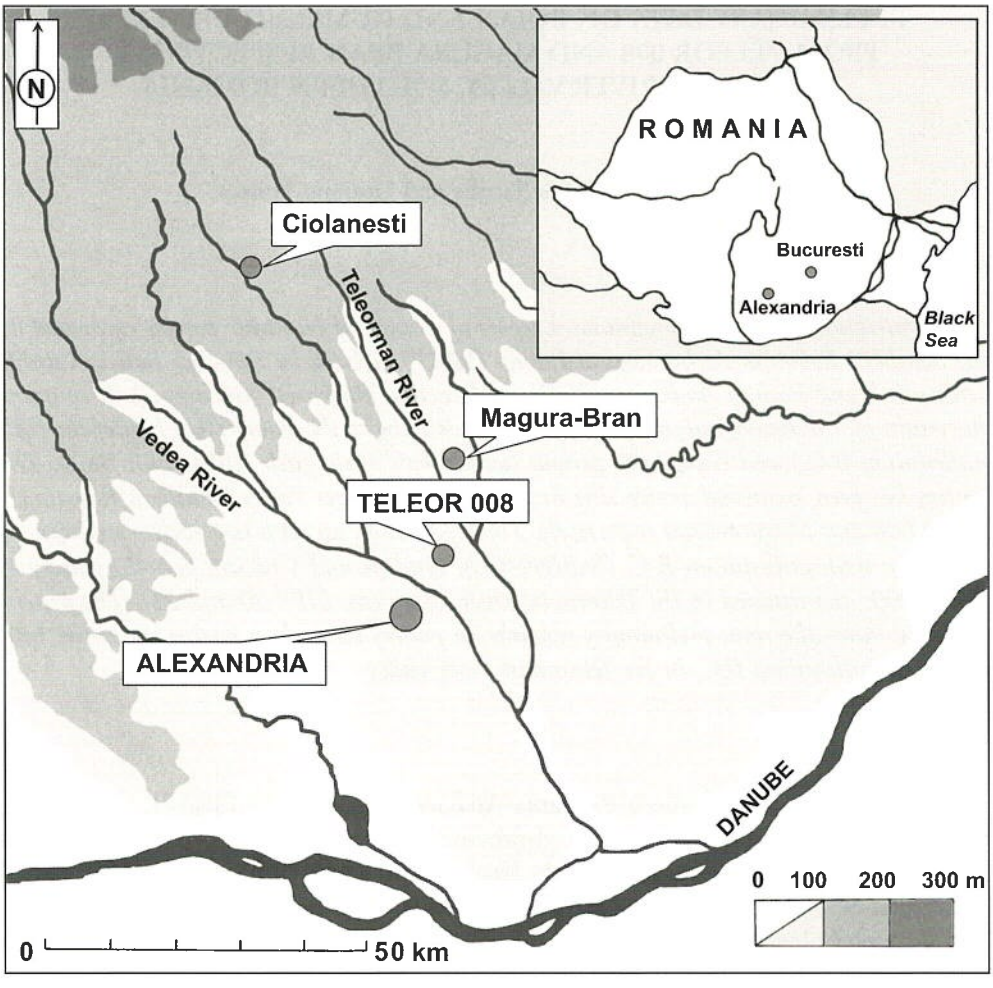

Figure 1. Location of Teleor 008 and Măgura-Bran in the Teleorman River Valley in south central Romania.

Material and methods

The Boian period pottery (dating to the first half of the fifth millennium B.C.) used in the present analysis derives from the small site of Teleor 008. A representative sample of 83 sherds from Sondage 36 was chosen out of a total of 2,941 pottery sherds (997 diagnostic and 1944 non-diagnostic sherds) that were studied previously and that derive from three sondages representing three consecutive stages of occupation of Teleor 008, Sondage 36 being the first (Thissen 2002; Bailey et al. 2004). Our in-depth technological study

covers (1) the reconstruction of the manufacturing technique (forming, decoration and firing) based on observable characteristics of the manufacturing process (e.g., crack patterns, thickenings of the vessel's wall, colour and hardness) of the diagnostic sherds and (2) the fabric analysis, i.e., the microscopic investigation (10 – 50 x magnification) of the mineral inclusions and pores in the clay body observed on a fresh break and a grounded edge.

The pottery dating from the Gumelnița period (second half of the fifth millennium B.C.) was excavated at Măgura-Bran (Gumelnița phases A2–B1). Since this ceramic assemblage has not been studied by Thissen, no data about the total of number of sherds are available. A limited sample of sherds has been investigated as to the manufacturing technique. For the analysis of the fabric a sample of another 83 sherds was microscopically examined. Because of the dark core of most of the Boian and Gumelnița sherds the study of the mineral inclusions was rather difficult. Therefore, the sample was brought to Leiden. In the Ceramic Laboratory of the Leiden Faculty of Archaeology the sherds will be refired in an electric kiln (oxidizing atmosphere) in order to turn the dark core of the sherds into a light colour.

Results

The pottery manufacture

The Boian and Gumelnița pottery was handmade. There are clear indications (crack patterns) that a part of the pottery assemblage was made by using the coiling technique (see Figure 2a and b). Some open forms were probably made in a mould (Figure 3). This seems also be the case for the lower part of some bowls on top of which the shoulder was made by adding a coil of clay.

Looking at the finishing of the surface of the pottery, in the Boian ceramic assemblage, like in the previous Vădastra period, three categories could be distinguished: surface roughened ware (Figure 4), plain burnished ware (Figure 5) and decorated burnished ware (Figure 6). The surface roughed ware was roughened by applying a rough clay coat on the outside (*barbotine*) or by scraping. In general, the gloss of the plain burnished ware is not very shiny. The decorated burnished ware includes various decoration techniques: polishing patterns (*plissé*), appliqué, tool or fingernail impressions and incisions (sometimes with chalk incrustation). The Gumelnița ceramic assemblage of Măgura-Bran could also be classified on the basis of the finishing of the surface of the pottery: surface roughened ware[1], plain burnished ware, decorated burnished ware and nail impressed ware. The Gumelnița ceramic assemblage of Măgura-Bran includes neither complete vessels nor large fragments. Therefore, we have chosen to show some examples of contemporary pottery from Ciolăneşti, situated in the north of Teleorman County (Figure 7).[2]

Many Boian and Gumelnița pottery sherds have a black core. The surface colours are not always uniform, but often show a range of colouring. The colours vary between light red (2.5YR6/6), yellowish red (5YR5/6), brown (7.5YR4/4), light brownish grey

Figure 2a. Crack patterns on Gumelnița pottery from Ciolăneşti indicating the use of the coiling technique.

Figure 2b. Broken Gumelnița vessel from Ciolăneşti indicating the use of the coiling technique.

Figure 3. Mould made Gumelnița vessel from Ciolăneşti.

(10YR6/2), grey (7.5YR5/1) and very dark grey (7.5YR4/4). This indicates that the pottery was fired in a pile where the pottery was in direct contact with the fuel and flames. The atmosphere varied from reducing to neutral. The firing temperature of the pottery was around 750/800°C.

The pottery fabric

In Tables 1 and 2 a description of the fabric of the various pottery categories of the Boian and Gumelnița periods is given. In this description of the clay body (prepared clay) only the dominant type and maximum size of the mineral inclusions and fibres are mentioned. The dominant mineral inclusions are quartz in clear and milky varieties. Besides these, feldspar, iron oxide siltstone, calcareous siltstone, pyroxene and some other mineral inclusions are also found in varying minor quantities. Like in the Vădastra period, a part of the Boian and Gumelnița pottery assemblage was tempered with fibrous material of organic origin. In some cases, the addition of organic fibres seems to have been desirable. During the forming process, when the clay is still in a plastic condition, the organic fibres tend to keep the clay mixture together. Furthermore, the organic fibres may have been used to prevent the development of cracks due to uneven drying (van As et al. 2005: 104-106).

Boian period	1 Surface roughened ware	2 Plain burnished ware	3 Decorated burnished ware
Samples	n = 40	n = 30	n = 13
Mineral inclusions			
Dominant mineral	quartz	quartz	quartz
Maximum size	5 mm	2 mm	2 mm
Roundness	angular (A) sub angular (SA) sub rounded(SR)	A/SA/SR	A/SA/SR
Percentage	5-35%	2-20%	5-25%
Sorting	moderate	moderate	moderate
Fibres			
Percentage	none -20%	none-20%	none-20%
Maximum length	1 cm	1 cm	1 cm

Table 1. Fabric of Boian pottery from Teleor 008.

Gumelnița period	1 Gumelnița surface roughened ware	2 Gumelnița plain burnished ware	3 Gumelnița decorated burnished ware	4 Gumelnița nail impressed ware
Samples	n = 39	n = 35	n = 6	n = 3
Mineral inclusions				
Dominant mineral	quartz	quartz	quartz	quartz
Maximum size	5 mm	4 mm	4 mm	2 mm
Roundness	angular (A) sub angular (SA) sub rounded(SR)	A/SA/SR	A/SA/SR	A/SA/SR
Percentage	10-35%	10-30%	ca. 15%	ca. 10%
Sorting	moderate	moderate	moderate	moderate
Fibres				
Percentage	none -10%	none-10%	none	less than 5%
Maximum length	3 mm	5 mm		2 mm

Table 2. Fabric of Gumelnița pottery from Măgura-Bran.

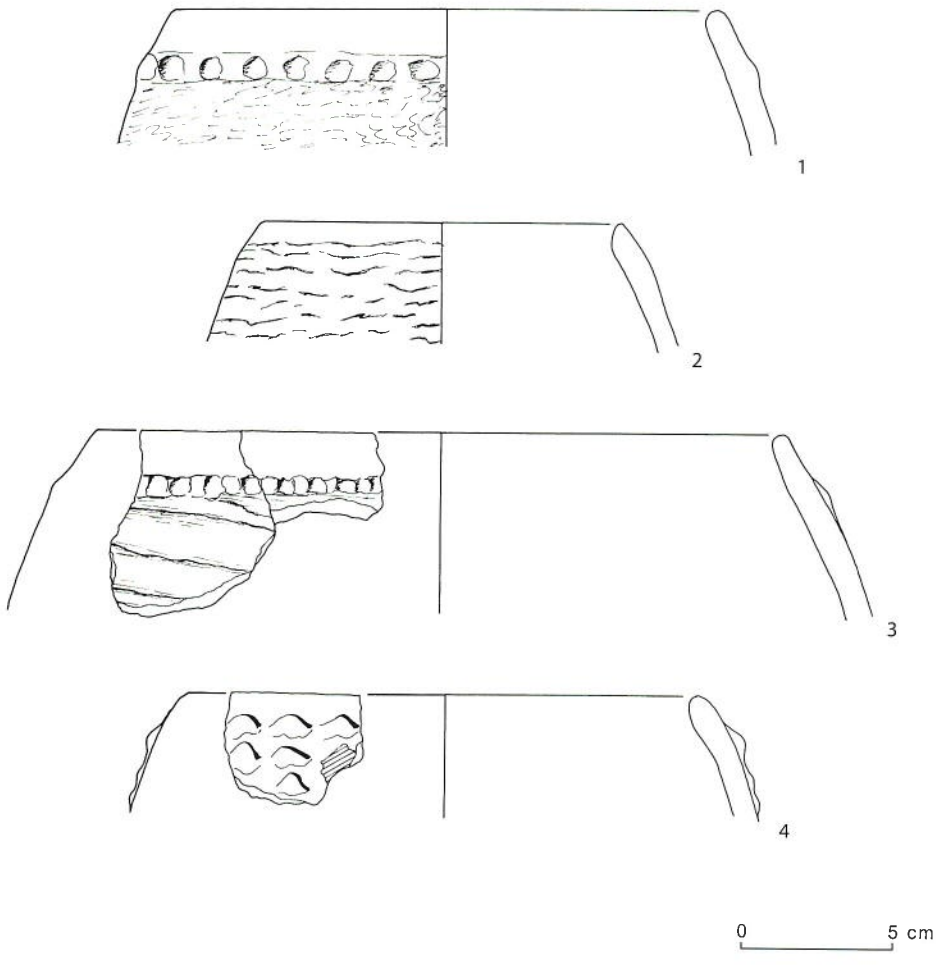

Figure 4. Boian surface roughened ware (Teleor 008): hole mouth pots (1-4).

Conclusion

In general, the technology of the Boian and Gumelnița pottery resembles the techniques used during the preceding Starčevo-Criş, Dudeşti and Vădastra periods. We may say that it roughly concerns a continuous technological pottery tradition.

The mineral inclusions in the Boian and Gumelnița pottery from Teleor 008 and Măgura-Bran respectively correspond with the mineral inclusions in the earlier Starčevo-Criş, Dudeşti and Vădastra pottery from Teleor 003 (see van As et al. 2004: Tables 1 and 2 and van As 2005: Table 1, columns 1-3). The results of the analysis of clay samples

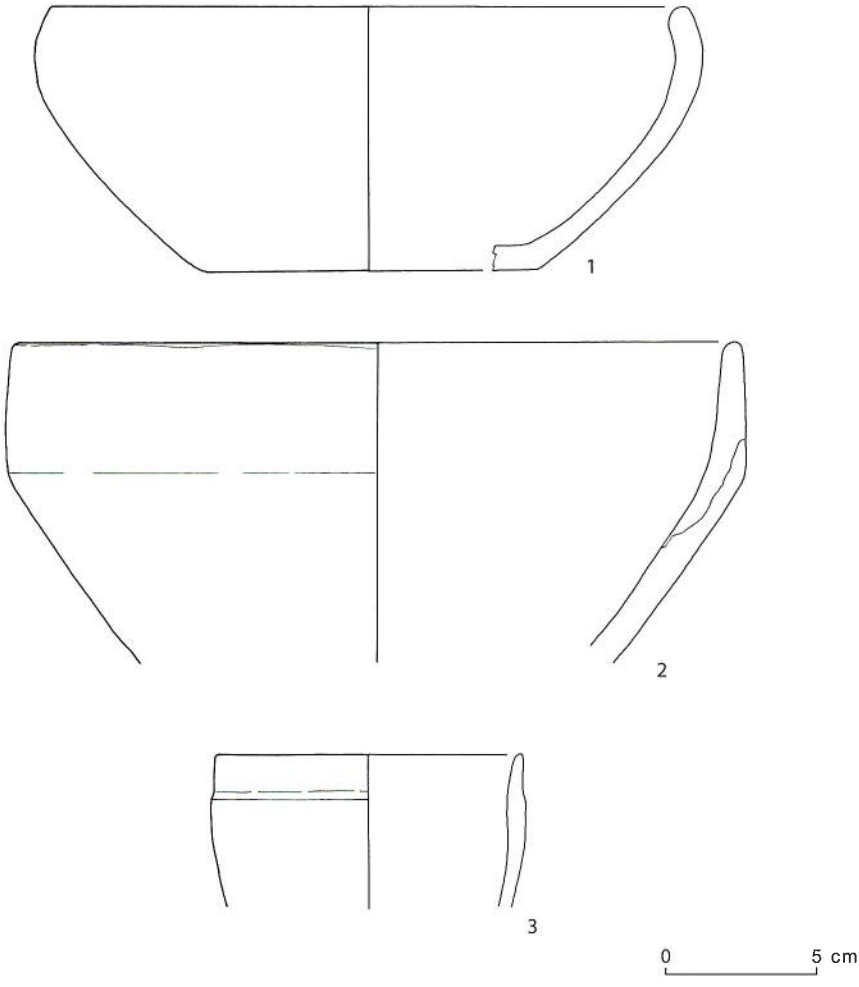

Figure 5. Boian plain burnished ware (Teleor 008): hemispherical bowl (1), carinated bowl (2), beaker (3).

taken from the floodplain of the Teleorman and Clanița River make it plausible that during the entire sixth and fifth millennium B.C. potters selected local clays for the production of their pottery. In the Boian and Gumelnița periods, like in the previous Dudeşti and Vădastra periods, they sometimes added fibrous material to the clay, although not as common as it had been in the Starčevo-Criş period.

The forming and finishing technique of the Boian and Gumelnița pottery is similar to the techniques applied in the preceding periods. The pottery is handmade mainly

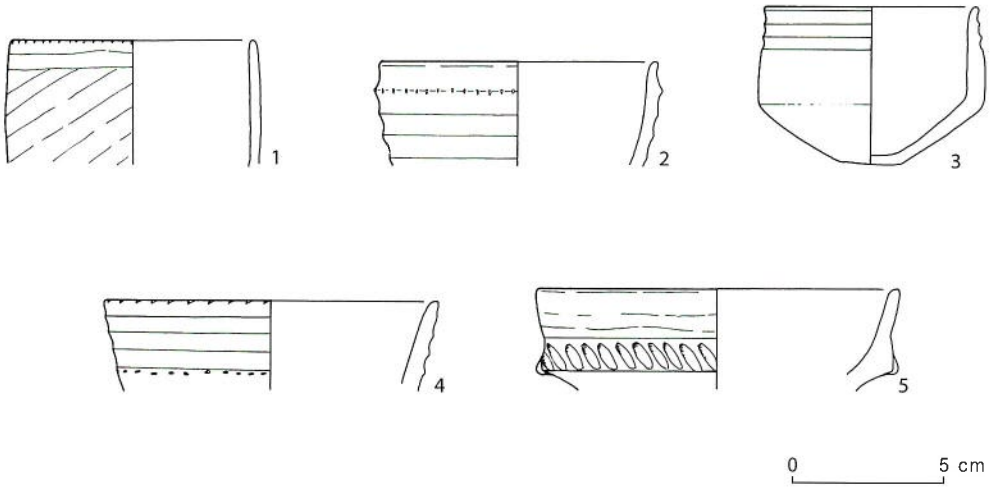

Figure 6. Boian decorated burnished ware (Teleor 008): beaker (1), cups (2-4), dish (5).

Figure 7. Some Gumelnița vessels from Ciolănești.

using the coiling technique. The surface of the pottery was either roughened or burnished. The potters decorated their ware by using similar techniques as before, e.g., tool or fingernail impressions, incisions, or *plissé* patterns created by burnishing. Like in the Dudeşti and Vădastra periods, a decoration with chalk incrustation of incised and/or excised motifs could also be observed in the Boian and Gumelnița periods. Only in the Starčevo-Criş period the pottery was painted with a red slip. During the entire sixth and fifth millennium B.C. the pottery was fired in an open fire, for the greater part under reducing to neutral firing conditions.

In the final publication of the pottery from the Teleorman River Valley attention will be paid to the shifts in pottery shapes in relation to the continuous technological pottery tradition.

Acknowledgements

We wish to express our gratitude to the British Academy, Cardiff University, the Romanian Ministry of Culture, the National Historical Museum of Romania, the Teleorman County Council and the Teleorman County Museum for sponsoring the Southern Romania Archaeological Project. In 2006, Leiden University enabled us to carry out our technological ceramic research in the Teleorman County Museum in Alexandria. We are much indebted to Pavel Mirea for his help during our stay in Alexandria and providing Figure 1. Finally, we wish to acknowledge Douglass Bailey for reading the text.

Notes

1. The Gumelnița ceramic assemblage of Măgura-Bran includes also a category consisting of surface roughened vessels with a burnished rim. This category has been classed in the category of surface roughed vessels.

2. See also Figures 2 and 3.

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BOOK REVIEW

Franken, H.J. 2005. *A History of Pottery and Potters in Ancient Jerusalem: Excavations by K. M. Kenyon in Jerusalem 1961–1967*, London: Equinox Publishing Ltd. hardcover; xviii + 214 pages; black & white figures, tables, bibliography, and index

Gerald L. Mattingly

H. J. Franken (1917–2005), known to many as Henk, had a remarkable career, which included a long and influential tenure at Leiden University. Since his ordination into the ministry in 1942, Professor Franken made significant contributions to three separate but interrelated fields of study – religion, archaeology & ancient history, and ceramic technology. Initially, he served as a parish minister and missionary, but a strong interest in history and Semitic languages drew Franken to Albrightian "biblical archaeology." From 1955–1958, he worked with the British excavations at Jericho, acquired a familiarity and bond with Palestine, and established a friendship with Kathleen Kenyon; these experiences set the course of his next 50 years (cf. van As 2005; Wright 2005).

The Jericho experience led Franken to launch his own dig at Tell Deir ᶜAlla, in the Jordan Valley – a project that opened many doors. Through this excavation, Henk used and refined the techniques of stratigraphic excavation and made important archaeological discoveries, while he developed stronger interests in ceramic technology. At Deir ᶜAlla, Franken's team discussed the location of biblical Succoth and recovered the famous Balaam Inscription. Debate on the relation between the biblical text and history caused Professor Franken and his wife to publish an important textbook, *A Primer of Old Testament Archaeology* (1963) – which already reflected a special interest in pottery technology (cf. pp. 122–131). Numerous excavation reports, in both preliminary and final form, illustrate H.J. Franken's obsession with a painstaking relation between stratigraphy and pottery – and the need to understand the stratigraphic history of an entire assemblage from a site, not just isolated parallels forms.

Franken was not alone in this approach (Franken 2005:17), though some of his work that examined the potter's craft and its changes through history blazed new trails (e.g., 1974; cf. Homès-Fredericq and Franken 1986). Other scholars advanced the study of pottery technology and suggested ways in which such technical studies enhanced the value of anthropological and archaeological fieldwork (e.g., Shepard 1956; Matson 1965; Rye 1981; van der Leeuw and Pritchard 1984; Rice 1987; Orton, Tyers, and Vince 1993). In the study of ancient Palestine, however, only a few scholars pursued a technological approach to pottery that is so familiar to readers of this journal (e.g., Glock 1975; 1982).

Leiden Journal of Pottery Studies 22, 2006: 149-154.

At an early point in the process, Franken saw the value of incorporating the insights of a potter so that we can understand the skills of ancient potters from the inside; this resulted in his fruitful collaboration with Jan Kalsbeek (e.g., 1975). Today we refer to H.J. Franken's approach as the "Leiden school"; this journal and the Department of Pottery Technology, through analyses of materials recovered by numerous field projects, represent the ultimate outcome in this line of research. [See London 1997 for a brief discussion of this interdisciplinary approach; Orton, Tyers, and Vince 1993 provide a more complete survey of the relevant topics.]

As noted above, Professor Franken's pursuit of a more complete understanding of ancient ceramics resulted in studies of "pots and pot makers" – at Jericho, Tell Deir ᶜAlla, and other Near Eastern sites. He always pushed for a more comprehensive study of pottery *and* potters and criticized those who were satisfied to use ceramic typology only as a means of dating archaeological strata. Both approaches, the positive and the negative, achieve a high profile in *A History of Potters and Pottery in Ancient Jerusalem* (2005). In this volume which, sadly, arrived from the publishers on the day of H.J. Franken's death (van As 2005: 7), Henk offered a detailed 220-page study of pottery recovered by Dame Kenyon in the 1961–1967 excavations at Jerusalem. [This volume includes a brief appendix by Margreet L. Steiner, who is one of several scholars – including the late A.D. Tushingham – who played a significant role in the study of Jerusalem's pottery and brought Kenyon's work to publication.] In a dozen chapters, this volume offers a "low-tech" analysis of Jerusalem pottery from the Early Bronze, Middle Bronze, Iron I, Iron II, Persian, Roman, and Byzantine periods.

Comments on methodology appear throughout the book, but Professor Franken concentrated his explicit "philosophical" argument in the preface, introduction, and first chapter. In the preface, he stated two of his major principles. First, Franken offered a critique of those who study pottery for "its value as an indicator of time – for which it was not produced" and, second, he insisted on studying pottery "for its own sake, to learn how it was made, what the circumstances were, what it was used for and who produced it" (p. xiii). In this same context, he noted that this "pottery for its own sake" perspective represented a "stumbling block" for the British School of Archaeology's agenda regarding Kenyon's Jerusalem pottery. Professor Franken made this point over and over (and over) in his introduction and opening chapter – "Theory and Practice of Ceramic Studies in Archaeology" (pp. 1–17). While it is true that pottery has value beyond its role as a tool for dating strata, we should also remember that it continues to play an important role in that regard. In Near Eastern Archaeology, radiocarbon and other dating techniques have not displaced the role of ceramic typology. Franken repeatedly complained about the emphasis that many archaeologists made in this regard, and he rejected the continued bias toward morphological studies. Indeed, Orton, Tyers, and Vince 1993: 3–22 have also made it clear that pottery studies have moved beyond the "typological phase," just as archaeologists have advanced pottery studies beyond the "art-historical phase." Even though scholars who do pottery research should also ask questions about ethnography, technology (of manufacturing), scientific methods (of examining

pottery), and quantification, they can still express some appreciation for curiosity about the older art-historical and typological studies. Though he sometimes appeared to be on the verge of rejecting the typological approach altogether, he did not. He was, instead, trying to draw attention to the other legitimate and important questions that scholars can – and should – ask of pottery.

Franken also drew attention to the fact that ceramic typology, by its very nature, has flaws and stands in need of constant revision. On pages 4–5, he called for its practitioners to describe this method in explicit terms and admit that disagreements exist. A more accurate and honest typological system must be built within the context of a site's entire ceramic assemblage, not created by selected specimens (cf. discussion of "Hume' Problem" on pp. 2–5). Franken expressed appreciation for London's inquiry into the typological method and its assumptions (pp. 6–9). He also emphasized the failure of Near Eastern archaeologists to recognize "unaccountable differences" in the ceramic repertoire that result from the individuality of the ancient potters and their clays. This, in itself, seems to justify the need for pottery research that goes beyond the study of shapes! Another important weakness in the typological approach, which some might regard as a nearly fatal flaw, is the nature of a pottery "tradition."

> A tradition may be confined to few workshops producing either art pottery or pots for specific purposes. On the other hand a tradition may be found spread over large areas and be applied to many workshops, each with their own idiosyncrasies. Different traditions may live side by side for longer or shorter periods (p. 15).

So Franken knew that typologies have their place – and allowed for the abiding value of works by Amiran (1970) and Herr (1996), for instance – but he also wanted Near Eastern archaeologists to acknowledge that the production of pottery was more complicated than is often thought and to admit that pottery cannot always be assigned to the narrow periods that are often claimed.

The period-by-period analysis of Jerusalem's pottery, chapters 2–11, contains an abundance of details, though treatment is somewhat uneven. Excavators who are working with materials from the historical periods represented in the Jerusalem assemblage can glean much from each chapter. At the very least, these chapters raise *many* important questions! Here I offer only a few examples of Franken's observations and conclusions. First, the detailed examination of wares from the Early Bronze Age (probably EB I–II) indicates that the pottery from that period was not produced by local potters. Thus, fabric analysis, long standard in ceramic studies, provides insight into Jerusalem's early history, which Franken described as "semi-nomadic" (pp. 21, 192–193). Second, the author offered an interesting explanation of the high-quality pottery that dates to the Middle Bronze Age – pointing to the relationship between consumer demands, professional potmaking, and changes in technology (pp. 34, 193–194). Third, Franken offered a more extensive analysis of pottery production during the Iron Age (chapters 4–8). He suggested that the pottery tradition that began in the 12th century did not end until well after the Exile, in the 4th or 3rd century (pp. 65, 68) – an important observation with

obvious ramifications. Fourth, Franken also identified the differences between imported Greek pottery from Corinth and Athens and pottery that was Greek in style, though manufactured locally by immigrants and even local potters (pp. 198–200).

Chapter 12 offers a summary of the personnel and potmaking technologies employed in each period of Jerusalem's history; this synthesis provides a model for a chapter that should be included in all final excavation reports. Such summary chapters will promote the site-by-site comparison of pottery production and related economic issues.

Professor Franken included illustrations in nearly every chapter, and this makes the volume more useful. These figures vary widely in nature (e.g., whole pages with drawings of rims and whole vessels), but the volume contains no photographs. This omission detracts from Franken's analysis, even though the line-drawings remain useful. The book also contains an interesting series of ten drawings of "Potter's Actions" by Hugo de Reede. A number of tables provide data of various kinds in spread-sheet layouts. The author made no attempt to include an exhaustive bibliography, but the two-page list mentions a number of useful sources that readers will want to pursue. All students of the Near East will benefit from this analysis of Jerusalem's pottery, and this volume will take its place on the shelf of books that Kenyon and her successors produced to describe the pivotal 1961–1967 excavations. This book also contributes much to the discussion of pottery technology and will encourage many projects to make a more complete examination of the ceramic materials they recover, a process that its author enthusiastically advocated. Even as H. J. Franken pointed to "Hume's Problem" in chapter 1 (drawing attention to the relationship between observations of facts and theory), he returned to a philosophical discussion at the end of chapter 12 – this time to observe that theory must be based on "extensive knowledge" and that "theory does not come in the place of knowledge, and that is all too often what happens" (p. 202).

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