Title
Egyptian Pottery: Proceeding of the 1990 Pottery Symposium at the University of California, Berkeley

ISBN
1-882744-14-4

Authors
Redmount, Carol A.
Keller, Cathleen A.

Publication Date
2003

Peer reviewed

Egyptian Pottery

Proceedings of the 1990 Pottery Symposium at the University of California, Berkeley

Edited by Carol A. Redmount and Cathleen A. Keller

Number 8

University of California Publications in Egyptian Archaeology

Berkeley

Number 58

Contributions of the University of California Archaeological Research Facility Berkeley

Cover photo: Four pedestalled bowls of late predynastic period from el-Ahaiwah and Ballâs. Their identifying numbers in the Phoebe Apperson Heast Museum of Anthropology at the University of California, Berkeley are, from left to right, PAHMA 6-17458, 6-5577, 6-18291, 6-5565. (See Podzorski, "Incense Burners of the Late Predynastic Period in Egypt: An Examination of the Evidence from Three Sites," pp. 22-37.)

ISBN 1-882744-14-4

Egyptian Pottery

Proceedings of the 1990 Pottery Symposium at the University of California, Berkeley

Edited by

Carol A. Redmount

and

Cathleen A. Keller

Number 8
University of California Publications in
Egyptian Archaeology

Number 58
Contributions of the
University of California
Archaeological Research Facility
Berkeley

Available Open Access at:
www.escholarship.org/uc/item/17q0749z

Library of Congress Catalog Card Number 2003106180
ISBN 1-882744-14-4

Archaeological Research Facility
University of California at Berkeley

Printed in the United States of America.

CONTENTS

LIST OF FIGURES

List of Plates

LIST OF TABLES

Color Plate Section

PREFACE AND ACKNOWLEDGMENTS

This volume has been a long time in the making. Its origins lie in a conference, the Fifth Colloquium of the International Group for the Study of Ancient Egyptian Pottery, organized by Dr. Dorothea Arnold of the Metropolitan Museum of Art, New York, Professor Ann Macy Roth of Howard University, and Professor Cathleen Keller of the University of California Berkeley. This conference was held at the University of California, Berkeley, in conjunction with the 1990 annual meeting of the American Research Center in Egypt. Most of the papers were presented at that colloquium, although some represent independent contributions not delivered at the meeting. In most cases the papers were revised or expanded for publication. The road to this publication has been rocky, with numerous unexpected bumps, turns, and delays along the way. Nevertheless, we are pleased that everything finally came together, and that the volume is making its appearance, albeit somewhat belatedly, on the scholarly scene.

We offer this monograph as a contribution to the growing and increasingly sophisticated study of ancient Egyptian ceramics. The articles cover a range of data, derived from museum collections and excavations, and methodological, thematic, and temporal approaches and topics. Renée Friedman addresses regional diversity in the ceramics of predynastic Upper Egypt and its broader implications for the early socio-economic and political development of Egypt. Patricia Podzorski reviews a specific form in the predynastic, the incense burner, and comments on several museum specimens. Stuart Tyson Smith considers the relationship between pots and politics, and Egyptians and Nubians, based on his analysis of Middle Kingdom ceramic material from the Egyptian fort of Askut in Nubia. Peter Lacovara investigates "domestic" pottery in Nubia by examining a Second Intermediate period deposit from Kerma. Joan Knudsen turns to ceramic manufacturing methods and their discernment in her study of Third Intermediate period pilgrim flasks from el-Ahaiwah. David and Barbara Aston delve into issues regarding the typology and dating of Bes Vessels, beginning with vessels dating to the late seventh century BCE. Hedvig Györy offers a discussion of the general development and function of Bes vessels, and, in a second contribution, also presents a review of some post-Pharaonic pottery in the Budapest Museum of Fine Arts. Karol Myśliwiec and Anna Południkiewicz report the discovery in Ptolemaic Athribis of ceramic workshops producing pottery and objects of art that combine ancient Egyptian and Greek traditions. Finally, Carol Redmount summarizes the results of an ethnoarchaeological and technical study of modern Egyptian pottery and considers its potential implications for the study of ancient Egyptian pottery.

Support for the conference was provided by the following units of the University of California, Berkeley: the Graduate Division, the Graduate Program in Ancient History and Mediterranean Archaeology, the Archaeological Research Facility, the Berkeley Art Museum, the Phoebe Apperson Hearst (formerly Robert H. Lowie) Museum of Anthropology, the Center for Middle East Studies, the Near Eastern Studies Department, and the Pacific Film Archive. Financial support for the publication of the conference proceedings was furnished by the Irving and Gladys Stahl Foundation Fund, the Archaeological Research Facility of the University of California, Berkeley, and Mr. Manuel Genato. Special thanks are due to Mr. Oscar Miranda for his work on the manuscript, and to Ms. Shang-Ying Shih for checking many of the references.

1

Variations on a Theme: Regional Diversity in the Predynastic Pottery of Upper Egyptian Settlements

Renée Friedman

Introduction

Since the discovery of the mortuary remains of Predynastic cultures in Upper Egypt a little over a century ago, the pottery found within the numerous graves has been used to date, define, and chart the social and technological development of these earliest settled inhabitants of the Nile Valley. The ceramics from the settlements of Predynastic Upper Egypt, however, have never been fully described, and this diverse body of information has remained an unexploited resource for furthering our understanding of the developments and interactions which led to the establishment of dynastic Egyptian civilization.

During the heyday of Predynastic research at the turn of the century until the outbreak of W.W. II, some sixty-six cemeteries from over twenty-five sites extending from Gerzeh at the level of the Fayum to Sayala in Nubia were investigated (see Mortensen 1991, 30-37). At the same time, some twenty settlements were also identified, only a handful of which were excavated. In order to describe and record the often fragmentary ceramic finds from Predynastic settlements, earlier excavators had recourse for comparanda only to Petrie's (1921) classification system and corpus of whole shapes derived from the mortuary assemblages. This resulted in a general impression that the objects taken to the grave were similar if not identical to those used by the living (Needler 1984, 23). But the excavators themselves were well aware that the pottery from settlements was different from that in graves, especially in the large percentage of utilitarian 'rough wares' (Peet 1914, 7; Caton-Thompson 1928, 71; Mond and Myers 1937, 2). Hampered by the lack of a relevant framework from which to study this mass of material, the investigators generally ignored the rough wares in favor of more familiar and attractive finer wares. It was on the basis of the relatively rare polished wares and their comparable forms in cemeteries that the settlements were dated and their ceramic contents characterized. An examination of complete ceramic assemblages from the recent excavation of various localities within the Upper Egyptian settlements at Hierakonpolis, Nagada, and Hemamieh has revealed that many important insights into Predynastic culture and its regional characteristics were overlooked by previous investigators using the traditional descriptive methods (Friedman 1994).

Settlement Pottery

The pottery from Hierakonpolis, Nagada, and Hemamieh was examined in order to describe and compare the full range of diversity found within the ceramic assemblages of these settlement sites over time and space.[1] Geographically, the sites furnish ceramic samples from the full extent of what has been considered the heartland of Upper Egyptian Predynastic culture (Kaiser 1957, 1985). The northernmost sector of the Upper Egyptian cultural milieu in the Badari region of Middle Egypt is represented by the selective sample from Caton-Thompson's (1928) excavations at Hemamieh now housed in museums in Britain and is supplemented by the results from the recent re-examination of the site (Holmes and Friedman 1989, 1994). The complete ceramic assemblages from the excavation of a number of localities within the large, multi-component site of Hierakonpolis supply the evidence to assess the character of settlement pottery at the southernmost border of what is considered "pure" Upper Egyptian culture (Hoffman 1971/72, 1982, 1987; Geller 1984, 1992; Harlan 1985). The assemblages from excavations in the Nagada region at a series of small villages and hamlets located along the desert edge, collectively called the Khattara sites, and also at South Town conducted by Hassan in 1980, exemplify the material from the geographical mid-point of the Upper Egyptian cultural expanse (Hassan 1981; Hassan and Matson 1989), which, since Kaiser's (1956) influential work, has been considered the nodal point of mainline Upper Egyptian Predynastic culture.

Together, the ceramic assemblages from these three areas span the entire Predynastic period in Upper Egypt. The evidence from over half a million sherds from settlements ranging in date from Badarian, the first undisputed ceramic-bearing occupation in Upper Egypt, to the end of the Predynastic period, or late Gerzean (Nagada IId/IIIa), has been assessed. Unfortunately, not every phase is well represented in the ceramic examples available from each region (fig. 1.1). Hemamieh is the only site at which the Badarian, Amratian, and Gerzean periods are more or less clearly, if not completely, documented. Nevertheless, both Hierakonpolis and the Nagada region have also revealed evidence of habitation during all three phases of the Predynastic, although the material pertaining to all of these periods has not yet been studied (Hoffman 1989; Hassan 1981). In the Nagada region, the mid to late Amratian (Nagada Ib-IIa) is well represented at the Khattara sites, although material datable to the early Gerzean is lacking. At Hierakonpolis, the documented sequence in the desert localities begins in the late Amratian/early Gerzean (Nagada IIa), but is continuous to the end of the Predynastic. Comparable phases of the Gerzean (Nagada IIc-d) are well represented in all three regions with sufficient temporal overlap for meaningful comparison within the major traditional subdivisions of the Upper Egyptian chronological and cultural sequence.

The ceramic collections also derive from several of the functional zones known from Predynastic settlements and provide a broad base from which to contrast and

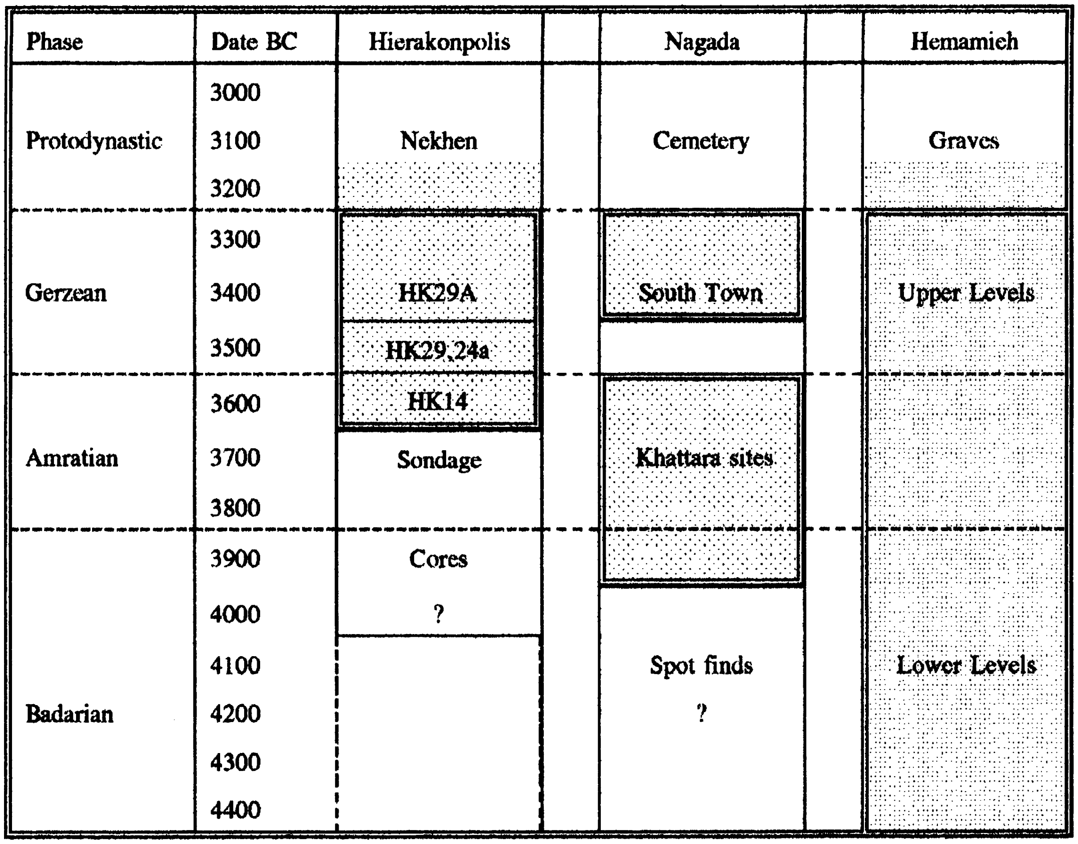


Figure 1.1 The temporal range of the Predynastic sites of Hierakonpolis, Nagada, and Hemamiah. Shaded areas refer to periods for which the ceramic sample has been examined.

compare the range of diversity within the ceramic assemblage. Observable functional variability occurs at the general site and locality level. Diversity within and among settlements appears to increase over time. Thus, the various localities within the large and important settlements at Hierakonpolis and Nagada, and the smaller site of Hemamieh, can be placed in two groups of broadly comparable function. The Gerzean portions of Hierakonpolis and Nagada South Town appear to have been dense population centers with diverse functional zones including administrative or cultic centers, food processing and/or storage areas, and ceramic and lithic production zones; however, ceramic assemblages from localities of known function have been investigated only at Hierakonpolis. On the other hand, the small agricultural villages of the Khattara sites in the Nagada region, the apparently seasonal encampment at Hemamieh, and the up-wadi occupations at Hierakonpolis, all of Amratian date, may be profitably contrasted and compared as representatives of sites of predominantly domestic function (Hoffman 1971/72, 1982ab, 1987; Geller 1992; Hassan 1981, 1988; Wetterstrom 1993; Holmes 1989; Barocas, Fattovich, and Tosi 1989).

The examination of the ceramic material utilized a modified version of the taxonomic classification system devised by Hoffman and Berger (1982) specifically to record potsherds. This system places at the primary level fabric as defined by a combination of clay type (Nile silt or marl) and macroscopically visible tempering agents (e.g., organic matter, straw, grog, shale, and so forth), which, for the most part, appear to have been purposeful additions to the clay. Shape, as subjectively and empirically determined from the diagnostic sherds, is bound to fabric. The independent variables of surface treatment and decoration are considered in relationship to both fabric and shape. This system allows for clear correlation with the traditional corpora, while providing a number of variables with which to describe each sherd and record quantifiable changes of chronological, regional, and technological significance. Petrie's corpus of whole vessels and classification based mainly on surface decoration proved to be not only inadequate for describing the often fragmentary pottery of settlements, but also misleading with regard to some of the most important aspects of the ceramic assemblage. Continued reliance on it has even led some scholars to suggest that pottery cannot reliably be used to determine the relative date or cultural association of settlement remains at all (Ginter et al. 1982).

The qualitative and, to a lesser extent, quantitative analysis of the ceramic assemblages of these three settlement sites now makes it possible to examine the evidence for a number of different aspects of the cultural complex of Predynastic Upper Egypt, using, if not the full range, a more complete range of ceramic products than those known from contemporary cemeteries.

The most notable outcome of the examination of these settlement assemblages has been the elucidation and definition of regional pot-making traditions in the Amratian phase in each of the geographic areas. Specifically, while the fine, untempered, polished pottery was similar at all sites, the coarse utilitarian pottery, not known from contemporary graves, was strikingly different in each region with regard to tempering agent, manufacturing technique, and surface finish. These marked regional variations are a previously unknown aspect of a culture usually considered, on the basis of its graves, to be remarkably homogeneous. This evidence of regionalism hints at a much more complex cultural and political situation in Upper Egypt than expected from the study of the mortuary complex alone and has wide-ranging implications. Significantly, this regional diversity disappears by the mid-Gerzean period (Nagada IIc), already established as a time of increased social stratification and societal change (inter alia, Trigger 1983). By this phase, the local utilitarian pottery had been replaced by a standardized, technologically superior, chaff-tempered rough ware. This new pottery is identical in temper, manufacturing technique, and shape at all sites and represents a major departure in production mode and style from what had been in use previously for utilitarian purposes. This new, standardized pottery, the rough ware of Petrie's corpus, appears at Hierakonpolis and possibly other sites in conjunction with a suite of specialized activities, such as standardized blade manufacture and large scale beer production. Such a combination of operations strongly suggests centralized control of economic necessities. These transformations are not only useful as chronological markers, but no doubt also reflect social and economic changes that played a role in the development of the Egyptian state. The appearance of this transformation across time and space, especially as revealed in the ceramic assemblage, may also provide a reflection of political events of relevance to our understanding of the so-called 'unification' of Egypt (see also Köhler 1992 a, b).

The study of the pottery from settlements of Upper Egypt has illuminated several hitherto vague aspects of the Predynastic period, but it is the distinctive regional pot-making traditions of the Amratian (Nagada I-IIa) period which will be the focus of this paper.

The Settlement Assemblages of the Amratian Period

Radiocarbon samples associated with the Amratian assemblages at each site have yielded the following dates:

1) Hemamieh TP1 Level 6 internal; Beta 35823; 4940 ± 80 B.P.; 1 sigma cal., 3790-3645 B.C. (Holmes and Friedman 1994, table 10);
2) Khattara sites; weighted average; 5015 ± 80 B.P. - 4780 ± 70 B.P.; cal. 3850-3650 B.C. (Hassan 1984, 1985);
3) Hierakonpolis HK14; WSU 1729; 4820 ± 120 B.P.; 1 sigma cal., 3720-3500 B.C. (Geller 1992, 182).

The level of temporal comparability indicates that the ceramic distinctions which serve to distinguish each region cannot be considered exclusively a factor of time. The settlement assemblages are attributed to the Amratian phase on the basis of a morphological comparison of "untempered" pottery (fabric/temper class 2) with either a black-topped red slip or a fully red polished slip with or without the addition of decoration in white paint to cognate forms in the mortuary corpora (Petrie's B, P, and C classes). The Amratian assemblages in general, however, are most clearly distinguished by the distinctive temper of the utilitarian wares which were local to each region.

The Coarse-tempered Utilitarian Wares

Previously unsuspected regional differences within the ceramic assemblages of the Amratian settlements in each of the geographical regions are clearly apparent, albeit poorly defined, from an examination of the utilitarian pottery or kitchen wares at each site (fig. 1.2). As pottery of this type was not included in the contemporary graves, its existence is a major addition to the perception of the period. Three regional traditions can be distinguished most clearly on the basis of the choice of macroscopically visible tempering agent. Differences in manufacturing technique, surface treatment, and, only to a lesser extent due to the fragmentary nature of the material, shape can also be discerned.

At the Khattara sites of the Nagada region, the distinctive tempering agent was composed of ground potsherds or "grog." Grog was added to the more or less refined local Nile silt alone or with the addition of coarse to fine organic matter, apparently grass stems and leaves. The fabric recipe was fluid; however, two fabrics are differentiated on the basis of the presence (fabric/temper class 27) or absence (fabric/temper class 7) of organic tempering material which also appears to correlate with certain shape and surface treatment choices. The technique used to fashion vessels of both fabrics appeared to be similar. Bases, built from slabs of clay flattened or placed in a rounded mold, were attached to coil constructed bodies. Pounding or paddling to join sections and thin walls is evident from the star-shaped cracks radiating from large grog inclusions. Smaller vessels were probably made using the pinch or coil technique. Exteriors were smoothed with wet hands, a cloth, a flat tool, or a reed brush. Marks from scraping or trimming are occasional and occur with frequency only on the flat bases of grog-tempered fabric 7 vessels. Surface treatments applied to fabric 7 pots were variable and included a self-slip or wet smoothing, brown, red, and occasionally grey-black slips and washes. Burnishing occurred on about half of the examples. Vessels of grog and organic-tempered fabric 27 could be coated with a self slip and either burnished or lightly polished and buffed with a piece of leather or cloth, but were most frequently left untreated and little effort was made to

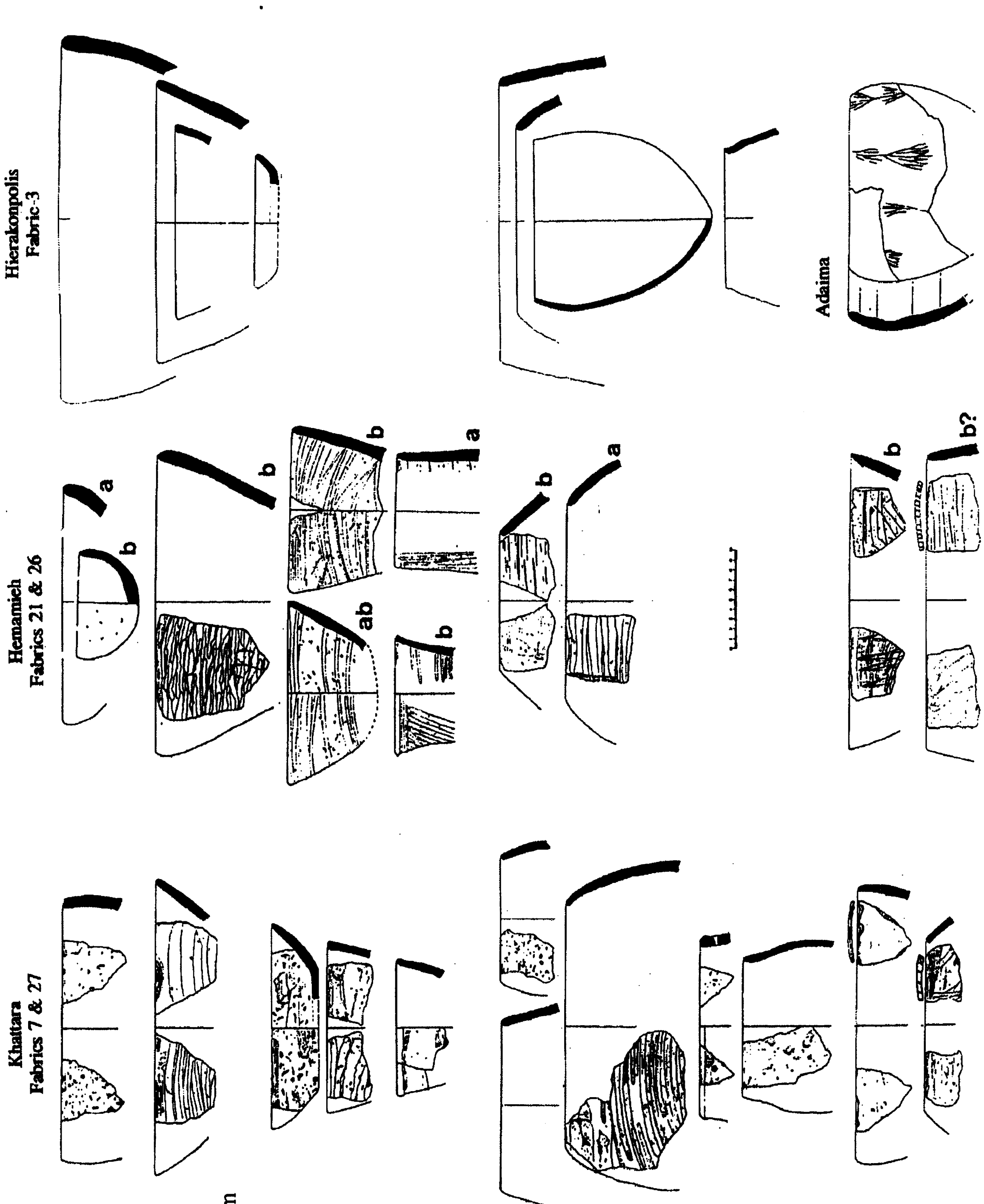


Figure 1.2 Coarse-tempered utilitarian wares from settlements of the Amration period.

eradicate the surface irregularities. Decoration in the form of incision (while wet) across the top of the rim was applied to a small percentage of bowls and jars of both fabrics. Other forms of decoration were very rare.

Recognizable shapes (fig. 1.2) are limited to deep and shallow bowls of various sizes with sloping or curving wall profiles and globular or bag-shaped hole-mouth jars (or deep restricted bowls) with direct rims and relatively unrestricted orifices in relation to the sloping or curving shoulder. Rims, with rare exceptions, are direct and the flattening of the rim top appears to be a regionally significant attribute of the Nagada area. Bowls and jars with modeled rims and jars with a concave upper body, i.e., jars with S-shaped profiles, are extremely rare and are made almost exclusively of fabric 7. Both flat and round bases were recovered. Rim to base profiles are preserved only for two shallow, flat based bowls. It is assumed that the majority of similar bowls had flat bases, while jars had flat or rounded bases. The higher frequency of slip and polish on the dense and relatively non-porous pottery of fabric 7 suggests that specific functional concerns were involved in the rather fluid recipe for these coarsely and quickly made vessels. The orifice diameter and wall thickness of fabric 7 vessels is consistently smaller than those of fabric 27. There is also a greater incidence of use-related sooting of the exterior surface of fabric 7 hole-mouth jars, suggesting, perhaps, more frequent use as a cooking pot than was the case with similar vessels composed of fabric 27. Due to the fragmentary sample, it is impossible to determine if similar upper body shapes in each fabric class should be reconstructed as distinctly different complete shapes, but it is possible.

At Hierakonpolis localities HK14 and HK24a, the local fabric in the Amratian phase was tempered with shale fragments (fabric/temper class 3). The surfaces were wet smoothed and occasionally coated with a red ocherous wash, but rarely burnished. It is assumed that the larger vessels were constructed from coils or slabs of clay, although all surface indications have been eradicated. There is no evidence of paddling to smooth joints, although many, but not all, tabular shale inclusions are oriented parallel to the surface. Shapes are limited to jars and relatively deep bowls with direct rims, curving wall profiles, and apparently flat bases; however, round bases in this fabric have also been recovered (fig. 1.2).

The nature of the local variant in the Amratian period in the Badari region is more difficult to define due to limitations of the sample. An Amratian assemblage was only distinguished at the 3'6" level below the surface from Caton-Thompson's (1928) excavation records, and only a selective collection of these sherds has been retained in museums. What has been considered Amratian pottery also occurred in deeper levels in conjunction with Badarian pottery (see Caton-Thompson and Whittle 1975; Friedman 1994). The assemblages from the recent re-excavation of Hemamieh suggest that the Amratian utilitarian wares were, in part, a continuation and outgrowth of the wares of the Badarian phase (Holmes and Friedman 1994). The two phases are therefore considered as a unit in this discussion.

In the Badarian period, the local utilitarian pottery is distinguished by the addition of coarse organic matter, apparently chopped grass stems, to the more or less refined Nile silt (fabric/temper class 21 = Brunton's Badarian Rough Brown class). This fabric is part of a continuum which incorporates a fabric characterized by the presence of fine organic material which may be a natural inclusion in unrefined Nile silt (fabric/temper class 26 = parts of Brunton's Badarian Smooth Brown class). These two fabric classes are distinguished here for descriptive purposes and because certain shapes appear to be fabric specific. The number of diagnostic examples from arguably Amratian levels at Hemamieh is admittedly small (see fig. 1.2 shapes marked a), but they appear quite similar to the Badarian examples in fabric, surface treatment, and the simplicity of the form. The surface treatment applied to the tempered fabrics in both periods was most often a brown or self slip which had been burnished with a pebble while still moist, or loosely burnished when leather-hard. None of the limited number of Amratian examples was decorated, but in Badarian levels decoration takes the form of finger channeling and rim top incision.

In terms of shape and decorative choice, the utilitarian wares in the Badarian and Amratian periods at Hemamieh show strong similarity to those at the Khattara sites of the Nagada region (fig. 1.2). Deep and shallow bowls with sloping or curving profiles and relatively unrestricted globular, baggy, or biconical jars with direct rims are common to both districts. At Hemamieh, however, vessels have rounded or tapered direct rims with few exceptions, in contrast to the squared rims of the Khattara sites. Smaller vessels at Hemamieh were pinched to shape while larger forms were made by coiling or perhaps slab construction (Vandiver and Lacovara 1985/86). There is scattered evidence of scraping to thin and join clay sections, and grooves from wiping one or both surfaces with a reed brush are common. There is not, however, any clear evidence for the paddling or pounding of the vessel walls at Hemamieh, although this formation or finishing technique is assumed to have been used in the manufacture of the fine untempered and polished vessels of the Badarian and Amratian phases (Arnold 1993, 17).

The fully quantified ceramic samples from the test pits of the recent re-excavation of Hemamieh indicate that vessels of both fabric 21 and fabric 26 continued to be present throughout the Amratian, although in diminishing numbers. Gradually, these fabrics were supplanted by straw-tempered pottery of still undetermined shape, often coated with a thick black, red, or brown slip which was occasionally burnished. This straw-tempered fabric (fabric/temper class 1) falls within the range of variation of the utilitarian wares of the Badarian phase according to Brunton (Brunton and Caton-Thompson 1928, 23f.), and a limited number of fragments were recovered in the Badarian levels of the recent test excavations. In the unsealed Badarian and Amratian levels at Hemamieh, incised decoration, punctation, and impressed designs also appear on sherds of the straw-tempered fabric. Unfortunately the exact chronological placement of these examples is far from clear.

It should be noted that straw-tempered pottery was also reported at Hierakonpolis in all levels of the deep cores at Nekhen that may extend back to the Badarian (Hoffman 1989). Although not common in any of the Amratian assemblages examined for this study, at the Khattara sites of the Nagada region straw-tempered pottery is conspicuous by its virtual absence. The subsequent popularity of mass-produced straw-tempered pottery does not appear to stem from these early homemade occurrences, but can only be understood in terms of changes in utility pottery acquisition and production in the Gerzean phase.

At all three sites in the Amratian phase, the regionally distinct utilitarian vessels, be they tempered with coarse organic matter, grog, or shale, were used for essentially the same purposes. Use-related residues indicate that these vessels often served as cooking pots and in other food preparation contexts. From the technological point of view, each of the regionally distinct temper choices was well suited to the task of cooking. Large pieces of temper of any type, but particularly grog and mineral tempers like shale, will mitigate thermal shock and crack propagation, and promote the transfer of heat to the contents (Rye 1981; Rice 1987). The choice of tempering agent and the range of simple shapes in each fabric were no doubt influenced by functional concerns as well as tradition. The fluid recipe for each regionally defined fabric and the non-standardized range of size and shape of the vessels suggest that the production of these utilitarian wares took place in the household for personal household use. Due to the fragmentary nature of the material, it is currently impossible to define more clearly the exact shapes these regional traditions may have favored, and the relationship of these various regional traditions to one another remains to be explored.

The Untempered Polished Wares

In contrast to the regionally distinct traditions of household-based utilitarian pottery production, the untempered polished wares (fabric/temper class 2) of the Amratian phase (Petrie's B, P, and C wares) at all three sites show a marked similarity in paste preparation, shaping modes, firing technology, surface treatment, and decorative choices. These wares have black-topped red and entirely red polished surface treatments both with and without additional white painted decoration. This class of pottery has its own repertoire of shapes, mode of manufacture, and a developmental trajectory that separates it from the coarse-tempered utilitarian wares. Shapes such as beakers with direct and everted rims, bowls with everted rims, modeled and everted rim jars, and carinated bowls and jars appear to be restricted to the untempered polished wares. At this point, it is unclear if the untempered pottery may also be differentiated from the coarse-tempered wares on the basis of base shape. The quantity of flat bases of untempered pottery recovered versus the number found in tempered fabrics certainly suggests that the majority of untempered jars and beakers had flat bases, although many bowls had rounded bottoms at Hierakonpolis and Khattara.

Despite the overall similarities among the untempered polished ware assemblages, minor, but possibly regionally significant, morphological differences are apparent. Thus, distribution from a central source can be ruled out. Local production of this pottery is also attested to by the discovery of kilns at Hierakonpolis (Geller 1984), apparently dedicated to the production of untempered pottery, and by the analysis of the silts used to make untempered polished red and black-topped pottery at Armant and Hierakonpolis that shows the sediments to be local to each site (Ginter, Kozlowski, and Pawlikowski 1985, 38; Allen and Rogers 1982). Both sets of evidence suggest that manufacture of this uniform and labor intensive pottery was in the hands of specialists who were well versed in the general fashion prevailing throughout Upper Egypt. All sites exhibit pottery with the same fine level of clay preparation and cleaning; the same techniques of formation, which probably involved coiling followed by paddling and scraping, but may or may not have included the turning of the rim; the same care taken to eradicate surface irregularities; the same ideas about surface treatment, finishing, and decoration (with certain regional(?) differences); and the same control of the kilning process, which usually resulted in well-fired red-slipped pottery, with or without the secondary black-topping treatment.

Further evidence that this pottery was produced by specialists is supplied by the limited presence of vessels composed of fine organic-tempered, or, more likely, unrefined Nile silt (fabric/temper class 26) at both Khattara and Hemamieh. Some of the vessels of this fabric are clearly amateur attempts at imitating the finer red polished untempered pots. The shapes are often irregular, the walls are thicker, the surface finish is often streaky, and the color is variable (but most often brown or mottled), indicating poor control of the kiln atmosphere. None of the examples is black-topped. The contrast in quality between the vessels of these two fabrics certainly suggests that those made of fabric/temper class 26 are homemade and home-fired products, made alongside the utilitarian wares, perhaps only when the specialist-made vessels were unavailable or unaffordable.

All of the upper body shapes of the untempered polished wares distinguished in the settlement assemblages have parallels among the B, P, C, and F ware classes of the mortuary corpora, although not necessarily in the corresponding surface treatment-based ware class. The distinction between surface treatment and shape suggested by the traditional B and P ware mortuary classes does not appear to be so clearly defined in settlement contexts. Although certain shapes occur only with a black-top (e.g., certain beakers and everted rim jars) or only with an entirely red surface (e.g., everted rim and carinated bowls), other shapes may occur with either a black-topped or entirely red-slipped surface and only minor, if any, morphological differences which correlate with the surface treatment choice. This does not mean that surface color was an arbitrary decision; certain preferences are clear and correspond to those visible in the mortuary corpora. Bowls are most often, but not always, red-slipped and polished, while jars and beakers are most frequently, but not invariably, black-topped. In particular, beakers and jars with very large orifice diameters often occur without the usual black-top, perhaps due to the practical difficulties of manipulating such large vessels during the black-topping process. Only the application of white painted decoration correlates strongly with shape. Within the settlement finds, Petrie's C ware is essentially restricted to red polished bowls and beakers with everted rims, although isolated examples of sloping-walled bowls, carinated bowls, and perhaps bottles with white-painted decoration also have been found. In order to avoid repetition, figures 1.3-4 illustrate the shape range of the untempered polished wares at each site irrespective of surface treatment.

It remains to be determined whether all of the morphological variability seen in the assemblages from the three sites is due to local, regional, or temporal differences or some combination thereof. In the present state of research, it is unknown whether specialist potters were active on the local or regional level. The regionally specific styles of painting pottery, discerned by Finkenstaedt (1980, 1981, 1985) on Petrie's C ware for the Abydos and Nagada regions, suggest that activity went beyond the local level (see also Ginter and Kozlowski 1994, 98). Due to the lack of any clear representational motifs in the limited and fragmentary sample of white paint decorated sherds from the settlements, little can be added to Finkenstaedt's stylistic observations. Finkenstaedt's (1980, 116) assertions about the quality of the pigment, however, are supported in the settlement remains. The paint on the sherds from Hemamieh is a chalky pinkish pigment. The paint on sherds from Hierakonpolis and Khattara, with one (perhaps imported) exception, can be distinguished by the generally whiter hue, the fugitive outline left behind when the paint has flaked off, and the clarity of line. Additionally, the number of examples painted with white dots and dot-filled panels at Hemamieh and other localities in the Badari region (Brunton and Caton-Thompson 1928, pls. 16, 38; 1937, pl. 34) suggests this decorative element may be a regional peculiarity shared with certain sites in the Abydos region such as Naga ed-Dêr, significantly the northernmost site known in that region.[2]

Other regionally, as opposed to temporally, distinct features may be seen, for example, in the relatively minor morphological differences between the round-based bowls of the Khattara sites and Hierakonpolis. The hemispherical bowls at Hierakonpolis often have an incurving rim, and the wall profile is curved. At Khattara, the wall profile is straight and sloping and the rims, never incurving, are more frequently flattened than at any other site. Further, while the bowls from Hierakonpolis are always clearly burnished with a pebble, the bowls at Khattara are often only polished or buffed with a piece of leather or a cloth. Due to the small size of the sample and the selective retention of sherds at Hemamieh, the regional nature, if any, of red polished bowls at that site cannot be assessed.

Regional differences may also be seen among the beakers and bowls with everted rims. The degree to which the rim is everted and the angle of the upper body vary by site. At Khattara and Hemamieh, the tip of the rim is everted and the wall is most often vertical. At Hierakonpolis, a greater part of the rim is everted and the wall often slopes toward the base at about a 100° angle. In all three regions, bowls with everted rims were favored for white painted decoration (Petrie's C ware). At Hemamieh and Khattara, the rims of these bowls are strongly everted and the orifice diameters are small (12-15 cm); at Hierakonpolis the rims are only slightly everted and, although small bowls (dia. 13-18 cm) are known, the decorated bowls are surprisingly large (dia. 18-25 cm). More controversial is the significance of the differential treatment of the rim and the shoulder shape of the jars at each site. This may be of more chronological than regional significance. It also remains to be seen if the carinated jars with everted rims recovered at Khattara and also found at Armant Settlement 1000/1100 represent a regionally significant form or if this form and the diagonal burnish applied to it (and various beakers) indicate a retention or adaptation of what have been considered Badarian elements with chronological significance.

The relatively high percentages of the untempered wares in the Amratian assemblages at the Khattara sites (average 46.2%) and Hierakonpolis localities (58.5% at HK14; 36.7% at HK24a), as well as at other settlements currently being excavated (percentages at Hemamieh are precluded by the selective collection of Caton-Thompson and the limited scope of the recent excavations), suggest that this pottery was more than just a funerary ware or fine china. While shape choices were no doubt influenced by the main use to which such pottery was put, i.e., mobile serving function or table-ware, it is clear from the distribution of shapes within the settlements that certain pots of these wares were also valued as non-porous storage vessels, a task for which the coarse-tempered pottery was not well suited.

The scale of pottery production is an important indicator of both technology and the social context of the craft (Rice 1987, 183-91). The location of the Amratian kiln sites, apparently on the outskirts of town at Hierakonpolis and Armant (Geller 1984; Ginter, Kozlowski, and Pawlikowski 1985), and both the quantity and relatively standardized range of shapes and sizes suggest that the scale of production for the untempered polished wares was greater than households producing for their own consumption. Whether the evidence for untempered polished ware production can be interpreted as indicating a household industry in which usually part-time specialists produced for a broader, but still local, consumption, or a workshop industry in which more time and capital outlay was dedicated to the craft remains to be determined as more information becomes available. The development of a specialized, possibly workshop, arrangement for the production of the untempered polished wares in the

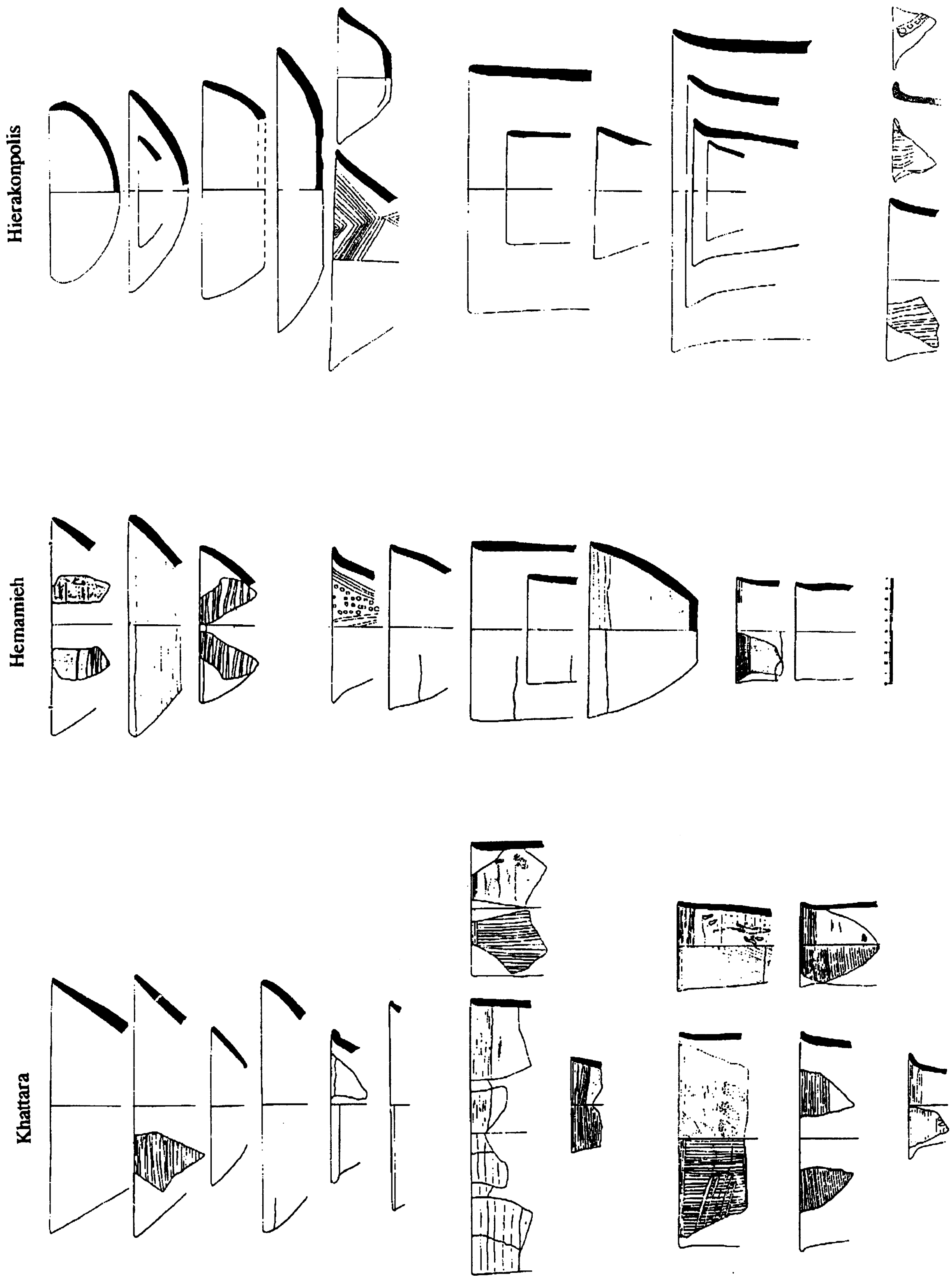


Figure 1.3 Open forms of untempered polished wares from settlements of the Amration period.

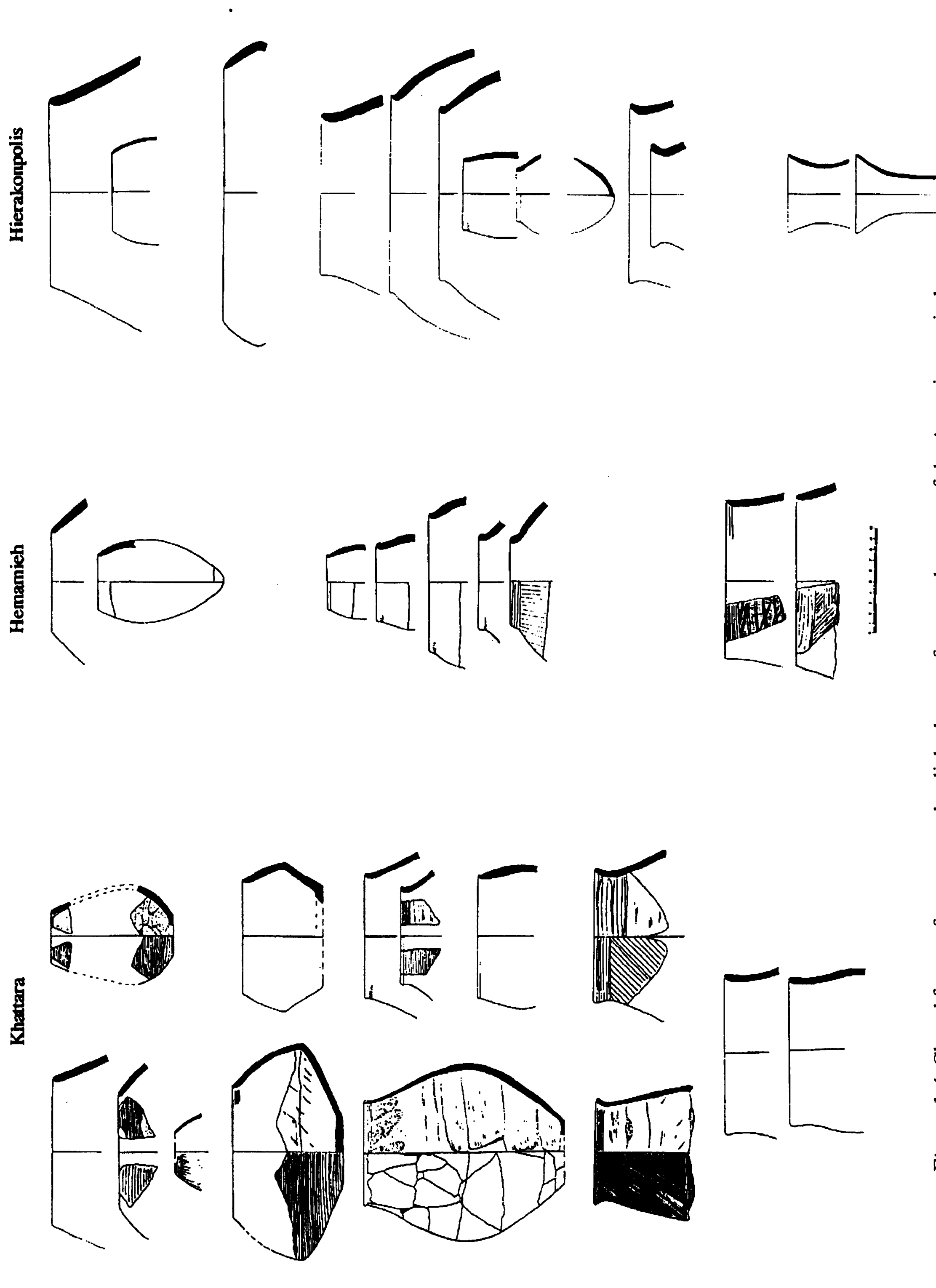


Figure 1.4 Closed forms of untempered polished wares from settlements of the Amration period.

Amratian appears to presage the dramatic change in the production, acquisition, and significance of utilitarian wares in the Gerzean period. The possibility that itinerant professional potters may have been active at a regional level must also be considered (see e.g., Kelley 1979).

Regionalism

The distribution of the diverse coarse-tempered pottery traditions and perhaps certain elements of the untempered polished wares correspond to the regional distinctions observed by Holmes (1989) in the lithic material of the same settlements. While the choice of tempering agent distinguishes the utilitarian pottery from each region, fundamental differences with regard to main lithic blank technology and the predominance of certain tool classes serve to define each region for Holmes. Using the information supplied by both the ceramics and the lithics, it is possible to posit the extent of these regions; however, similarities among the artifacts at settlements other than those studied above are based almost entirely on published reports and, for the most part, not an actual examination of comparative material.

The occurrence of grog-tempered and grog and coarse organic-tempered pottery at the Khattara sites surrounding Nagada and apparently also at Armant (Ginter et al. 1986, 61-65; Ginter, Kozlowski, and Pawlikowski 1988, 101-102; Ginter and Kozlowski 1994, 74, 93) indicates that this regional tradition stretched at least as far south as Armant. Sherds of these fabrics found at Armant are also similar to those recovered at the Khattara sites with regard to the range of forms and surface treatments. Ceramic evidence is lacking for the northern limits, but comparison of the lithic data suggests that the northern border of the region lay in the vicinity of Nag Hammadi. The lithic tradition of the Nagada region is characterized by an industry that used hard hammer percussion to produce broad secondary flakes from which the predominant tool classes of endscrapers, burins, notches, and retouch pieces were produced. Indeed, a recent publication of the settlements in the Armant region shows a distribution of tool groups and a use of raw materials to make flakes, blades, and bladelets practically identical to the Khattara sites (Ginter and Kozlowski 1994, 74). On this basis, the lithic assemblages of the Nag Hammadi-Nagada-Armant area are considered to represent a single industry (Holmes 1989, 329-30; Huzayyin 1937; 1941, 308-309).

The Hierakonpolis region is distinguished by the use of shale to temper the kitchen wares. The appearance of what has been interpreted as shale-tempered pottery in the contemporary settlement at Adaima suggests that the region extended northward at least to the area around Esna (Midant-Reynes et al. 1990, 1991). Moreover, the occurrence of small amounts of shale-tempered pottery within the Armant settlements suggests some degree of interaction between these two regions (Mond and Myers 1937, 50-51, 178-79, "Grit-ware"). Thus the Hierakonpolis region may have extended further to the north, perhaps to the historical boundary between the Third and Fourth Upper Egyptian nome located at or near Gebelein (Fischer 1961; Brovarski 1976). The southern boundary of the region remains unknown. The region as defined by its lithic industry is distinguished by main blank technologies that include both flakes and blades. Common tool classes are burins, retouch pieces, endscrapers, and notches. At present, there is insufficient information available to determine the extent of the region on the basis of the lithics (Holmes 1989).

The lithic and ceramic traditions in the Badari region thus far appear to be limited to the thirty-five kilometer stretch of the Badari realm investigated by Brunton and Caton-Thompson (1928). This apparent restriction is due to insufficient evidence from settlements in the Abydos region to the south (but see Patch 1991) and the apparent lack of habitation in the area immediately to the north. Holmes identified two temporally distinct lithic industries in the Badari region which she called the Badarian and the Mostageddan. The Badarian industry of the Badarian and Amratian periods is characterized by a generalized flake blade technology which may have evolved into the Mostageddan industry in the Gerzean phase. The Mostageddan is characterized by a blade and bladelet technology which was also heavily influenced by contemporary Lower Egyptian industries (Holmes 1989, 1992). Based on similarities with the decoration of C ware in the Badari region, a certain amount of interaction with the northern sites of the Abydos region, which at present is defined only by its C ware style, is evident. Thus, a boundary between these two regions (if there is one) may eventually be found at some point midway between their currently presumed ranges.

The identification of inter-regional variation in the Amratian period within both the lithic and ceramic assemblages of the upper Egyptian settlements is a significant addition to an understanding of the Predynastic period on several levels. At the very least, the distinct preferences or "traditions" surrounding the production of domestic necessities, shared beyond the local level and over a relatively large area, indicate the existence of fairly well-defined interaction spheres. As these regional traditions are largely seen in the homemade products of the domestic realm, the transmission of these regional methods involved the interaction of people beyond the level of incidental intercommunity exchange. It is possible that exogamy, necessitated by small community size, would have facilitated the transmission of ideas and artifacts (Hassan 1988, 157). Population expansion may also have promoted the regional spread of the domestic traditions. Based on information from Europe in recent historic times, Hassan (1988, 158) suggests that the flood plain from Maadi to Nagada could have been filled by an expanding population in about two hundred and twenty years, or approximately half of the estimated duration of the Amratian period.

While Finkenstaedt (1985) suggests that the regionally restricted motifs on C ware indicate a different cultic focus in the Nagada and Abydos regions respectively, Holmes (1989, 328) considers it likely that the inter-regional variability of the lithic industries reflects different Predynastic kingdoms or other socio-political units within pre-unified Egypt. Indeed, the hypothetical map of the proto-states of Upper Egypt produced by Kemp (1989, fig. 8) simply by calculating equidistant catchment areas around archaeologically rich centers of importance in ancient Egyptian tradition is remarkably close to the geographic range demonstrated by the distribution of the distinct regional traditions within the material culture of the settlements. Despite the evidence of regional divisions dating back perhaps to the beginning of the Predynastic sequence, the political relevance of these regional interaction spheres before the end of the Amratian (although likely) cannot be demonstrated, and it is not at all clear that towns of later significance always served as early nodal points. Nevertheless, the clear identification of social regions in Upper Egypt on an archaeological basis, which may predate divisions into polities but may have formed the basis for them, is an important new addition to the discussion of the origin and development of the early state in Egypt.

Acknowledgments: I wish to thank the late Dr. Michael Hoffman, Michael Berger, Jeremy Geller, and Fred Harlan for allowing me to use the ceramic data from Hierakonpolis and for making their unpublished results and drawings available to me. For allowing me to examine the pottery from his 1980 season at Nagada and for access to unpublished manuscripts, I am grateful to Dr. Fekri A. Hassan. I would also like to thank Barbara Adams, Curator of the Petrie Museum of Egyptian Archaeology at University College London, Helen Whitehouse of the Ashmolean Museum at Oxford, and Rosalie David of the Manchester Museum in Manchester for making the sherds from Hemamieh and Armant and relevant documents available to me, often on short notice.

NOTES

[1] A full account of this examination and its results can be found in my dissertation (Friedman 1994), of which this paper is an excerpt.

[2] Compare the dotted decoration on Caton-Thompson 1928, pl. lxxii.110; lxxiii.145 (drawn here in figure 2) and lxxiv.196, Brunton and Caton-Thompson 1928, pl. 38.18dn, 33k, (see also pl.16, MS23 for a possible prototype from the Badarian period) and Brunton 1937, pl. 34.25 to Lythgoe and Dunham 1965, fig. 22d, fig. 42g = Friedman 1981, pl.12 from Naga ed-Dêr. Also compare the quadrupeds on Brunton and Caton-Thompson 1928, pl. 38.49k to Lythgoe and Dunham 1965, fig. 3d. For comparable depictions of hippopotami and plant motifs compare Brunton 1937, pl. 34 and Lythgoe and Dunham 1965, fig. 31a, 101e and Finkenstaedt 1981, fig. 7, which is probably from Naga ed-Dêr and by the same hand.

REFERENCES

ALLEN, R. O., and M. S. ROGERS

1982 "Preliminary Findings on the Technology of Ceramic Manufacturing at Hierakonpolis." Appendix in ***The Predynastic of Hierakonpolis - An Interim Report*** by M. A. HOFFMAN. Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium, 149-50.

ARNOLD, D.

1993 "Techniques and Traditions of Manufacture in the Pottery of Ancient Egypt." Fasc. 1 in ***An Introduction to Ancient Egyptian Pottery***, edited by D. ARNOLD and J. BOURRIAU. Deutsches Archäologisches Institut Abteilung Kairo Sonderschrift 17. Mainz am Rhein: Philipp von Zabern, 9-141.

BAROCAS, C., R. FATTOVICH, and M. TOSI

1989 "The Oriental Institute of Naples Expedition to Petrie's South Town (Upper Egypt), 1977-1983: An Interim Report." In ***Late Prehistory of the Nile Basin and the Sahara***, edited by L. KRZYŻANIAK and M. KOBUSIEWICZ. Poznań Archaeological Museum Studies in African Archaeology 2. Proceedings of the International Symposium organized by the Archaeological Commission of the Polish Academy of Sciences, Poznań Branch, 11-15 Sept. 1984. Poznań: Poznań Archaeological Museum, 295-302.

BROVARSKI, E.

1976 "Two Monuments of the First Intermediate Period from the Theban Nome." In ***Studies in Honor of George R. Hughes***. Studies in Ancient Oriental Civilizations 39. Chicago: Oriental Institute, 31-41.

BRUNTON, G.

1937 ***Mostagedda and the Tasian Culture***. British Museum Expedition to Middle Egypt, First and Second Years, 1928, 1929. London: Bernard Quaritch.

BRUNTON, G., and G. CATON-THOMPSON

1928 ***The Badarian Civilisation and Predynastic Remains near Badari.*** British School of Archaeology in Egypt and Egyptian Research Account Publication 46. London: British School of Archaeology in Egypt.

CATON-THOMPSON, G.

1928 "The Predynastic Settlement: North Spur Hemamieh." Part 2 in ***The Badarian Civilisation and Predynastic Remains near Badari*** by G. BRUNTON and G. CATON-THOMPSON. British School of Archaeology in Egypt and Egyptian Research Account Publication 46. London: British School of Archaeology in Egypt, 69-116.

CATON-THOMPSON, G., and E. WHITTLE

1975 "Thermoluminescence Dating of the Badarian." ***Antiquity*** 49: 89-97.

FINKENSTAEDT, E.

1980 "Regional Painting Style in Prehistoric Egypt." ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 107: 116-20.

1981 "The Location of Styles in Painting: White Cross-Lined Ware at Nagada." ***Journal of the American Research Center in Egypt*** 18: 7-10.

1985 "Cognitive vs. Ecological Niches in Prehistoric Egypt." ***Journal of the American Research Center in Egypt*** 22: 143-47.

FISCHER, H. G.

1961 "The Nubian Mercenaries of Gebelein during the First Intermediate Period." ***Kush*** 9: 44-80.

FRIEDMAN, R. F.

1981 Spatial distribution in a Predynastic Cemetery: Naga ed Dêr 7000. M.A. thesis, University of California, Berkeley.

1994 **Predynastic Settlement Ceramics of Upper Egypt: A Comparative Study of the Ceramics of Hemamieh, Nagada and Hierakonpolis**. Ph.D. dissertation, Department of Near Eastern Studies, University of California, Berkeley. Ann Arbor: University Microfilms.

GELLER, J. R.

1984 The Predynastic Ceramics Industry at Hierakonpolis, Egypt. M.A. thesis, Washington University, Saint Louis.

1992 **Predynastic Beer Production at Hierakonpolis, Upper Egypt: Archaeological Evidence and Anthropological Implications**. Ph.D. dissertation, Washington University, St. Louis. Ann Arbor: University Microfilms.

GINTER, B., and J. K. KOZŁOWSKI

1994 ***Predynastic Settlement near Armant***. Studien zur Archäologie und Geschichte Altägyptens 6. Heidelberg: Heidelberger Orientverlag.

GINTER, B., J. K. KOZŁOWSKI, M. LITYŃSKA, and M. PANLIKOWSKI

1988 "Field Report from the Excavation of the Sites MA 21/83 and MA 21a/83 near Armant in Upper Egypt in 1986." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 44: 95-104.

GINTER, B., J. K. KOZŁOWSKI, and M. PAWLIKOWSKI

1985 "Field Report from the Survey Conducted in Upper Egypt in 1983." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 41: 15-42.

1986 "Investigations into Sites MA 6/83 and MA 21/83 in the Region of Qurna-Armant in Upper Egypt." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 43: 45-66.

GINTER, B. V., J. K. KOZŁOWSKI, M. PAWLIKOWSKI, and J. ŚLIWA

1982 "El-Tarif und Qasr el-Sagha. Forschungen zur Siedlungsgeschichte des Neolithikums, der Frühdynastischen Epoche und des Mittleren Reiches." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 38: 97-129.

HARLAN, J. F., III

1985 ***Predynastic Settlement Patterns: A View from Hierakonpolis***. Ph.D. dissertation, Washington University, St. Louis, Missouri. Ann Arbor: University Microfilms.

HASSAN, F. A.

n.d. Chronology and Temporal Sequence of Predynastic Nagada Ceramics.

1981 The Predynastic of Egypt: Subsistence-Settlement Studies. The Nagada-Khattara Region. Final Report to the National Science Foundation. Washington State University, Pullman.

1984 "Radiocarbon Chronology of Predynastic Nagada Settlements, Upper Egypt." ***Current Anthropology*** 25: 681-83.

1985 "Radiocarbon Chronology of Neolithic and Predynastic Sites in Upper Egypt and the Delta." ***African Archaeological Review*** 3: 95-116.

1988 "The Predynastic of Egypt." ***Journal of World Prehistory*** 2: 135-85.

HASSAN, F. A., and R. G. MATSON

1989 "Seriation of Predynastic Potsherds from the Nagada Region (Upper Egypt)." In ***Late Prehistory of the Nile Basin and the Sahara***, edited by L. KRZYŻANIAK and M. KOBUSIEWICZ. Poznań Archaeological Musuem Studies in African Archaeology 2. Proceedings of the International Symposium organized by the Archaeological Commission of the Polish Academy of Sciences, Poznań Branch, 11-15 Sept. 1984. Poznań: Poznań Archaeological

Museum, 303-16.
HOFFMAN, M. A.
1971/72 "Part IV: Test Excavations at Locality 14." In Preliminary Report on the First Two Seasons at Hierakonpolis by W. A. Fairservis, Jr. ***Journal of the American Research Center in Egypt*** 9: 49-66.
1982 ***The Predynastic of Hierakonpolis - An Interim Report.*** Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium.
1982a "Excavations at Locality 29." In ***The Predynastic of Hierakonpolis - An Interim Report*** by M.A. HOFFMAN. Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium, 7-14.
1982b "Settlement Patterns and Settlement Systems." Chap. 6 in ***The Predynastic of Hierakonpolis - An Interim Report*** by M. A. HOFFMAN. Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium, 122-38.
1987 A Final Report to the National Endowment for the Humanities on Predynastic Research at Hierakonpolis, 1985-86. Earth Sciences and Resources Institute, University of South Carolina. Columbia, South Carolina.
1989 "A Stratified Predynastic Sequence from Hierakonpolis (Upper Egypt)." In ***Late Prehistory of the Nile Basin and the Sahara***, edited by L. KRZYŻANIAK and M. KOBUSIEWICZ. Poznań Archaeological Musuem Studies in African Archaeology 2. Proceedings of the International Symposium organized by the Archaeological Commission of the Polish Academy of Sciences, Poznań Branch, 11-15 Sept. 1984. Poznań: Poznań Archaeological Museum, 317-24.
HOFFMAN, M. A., and M. BERGER
1982 "A Taxonomic System for Predynastic Settlement Ceramics and the Locality 29 Assemblage." Chap. 2.1 in ***The Predynastic of Hierakonpolis - An Interim Report*** by M. A. HOFFMAN. Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium, 66-86.
HOLMES, D. L.
1989 ***The Predynastic Lithic Industries of Upper Egypt: A comparative study of the lithic Traditions of Badari, Nagada and Hierakonpolis.*** Cambridge Monographs in African Archaeology 33. British Archaeological Reports International Series 469 (i-ii). Oxford: B.A.R.
1992 "The Evidence and Nature of Contacts between Upper and Lower Egypt during the Predynastic: A View from Upper Egypt." In ***The Nile Delta in Transition: 4th-3rd Millennium B.C.***, edited by E. C. M. VAN DEN BRINK. Proceedings of the Seminar held in Cairo, 21-24 October 1990, at the Netherlands Institute of Archaeology and Arabic Studies. Distributed by The Israel Exploration Society. Tel Aviv: Edwin C. M. van den Brink, 301-16.
HOLMES, D. L., and R. F. FRIEDMAN
1989 "The Badari Region Revisited." ***Nyame Akuma*** 31: 15-19.
1994 "Survey and Test Excavations in the Badari Region, Egypt." ***Proceedings of the Prehistoric Society*** 60: 105-42.
HUZAYYIN, S. A.
1937 "The Flint Industry." Chap. 14 in ***Cemeteries of Armant I, The Text***, by R. MOND and O. H. MYERS. London: Egypt Exploration Society, 191-253.

1941 ***The Place of Egypt in Prehistory: A Correlated Study of Climates and Cultures in the Old World.*** Mémoires presentés á l'Institut d'Égypte et publiés sous les auspices de Sa Majesté Farouk Ier, roi D'Égypte 43. Cairo: Institut Français d'Archéologie Orientale.

KAISER, W.

1956 "Stand und Probleme der ägyptische Vorgeschictsforschung." ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 81: 87-109.

1957 "Zur inneren Chronologie der Naqadakultur." ***Archaeologia Geographica*** 6: 69-77.

1985 "Zur Südausdehnung der vorgeschictlichen Deltakulturen und zur frühen Entwicklung Oberägyptens." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 41: 61-87.

KELLEY, A. L.

1979 "The Production of Pottery in Ancient Egypt." In ***Acts of the First International Conference of Egyptology, Cairo Oct. 2-10, 1976***, edited by W. F. REINIKE. Schriften zur Geschichte und Kultur des Alten Orients 14. Akademie der Wissenschaften der DDR Zentralinstitut für alte Geschichte und Archäologie. Berlin: Akademie, 365-68.

KEMP, B. J.

1989 ***Ancient Egypt: Anatomy of a Civilization.*** Cambridge: Cambridge University Press.

KÖHLER, C. E.

1992a "The Pre- and Early Dynastic Pottery of Tell el-Fara`in/Buto." In ***The Nile Delta in Transition: 4th-3rd Millennium B.C.***, edited by E. C. M. VAN DEN BRINK. Proceedings of the Seminar held in Cairo, 21-24 October 1990, at the Netherlands Institute of Archaeology and Arabic Studies. Distributed by The Israel Exploration Society. Tel Aviv: Edwin C. M. van den Brink, 11-22.

1992b "Problems and Priorities in the Study of Pre- and Early Dynastic Pottery." ***Cahiers de la Céramique Égyptienne*** **3** (Ateliers de Potiers et Productions Céramiques en Égypte): 7-16.

LYTHGOE, A. M., and D. DUNHAM

1965 ***The Predynastic Cemetery N7000: Naga-ed-Dêr, Part 4.*** University of California Publications, Egyptian Archaeology 7. Berkeley and Los Angeles: University of California Press.

MIDANT-REYNES, B., N. BUCHEZ, A. HESSE, and C. LECHEVALIER

1990 "Le Site Prédynastique d'Adaïma: rapport préliminaire de la campagne de fouilles 1989." ***Bulletin de l'Institut Français d'Archéologie Orientale 90***: 247-58.

MIDANT-REYNES, B., N. BUCHEZ, E. CRUBEZY, and T. JANIN

1991 "Le Site Prédynastique d'Adaïma: rapport préliminaire de la deuxieme campagne de fouille, 1990." ***Bulletin de l'Institut Français d'Archéologie Orientale*** 91: 231-47.

MORTENSEN, B.

1991 "Change in the Settlement Pattern and Population in the Beginning of the Historical Period." ***Ägypten und Levante*** 2: 11-37.

MOND, R., and O. H. MYERS

1937 ***Cemeteries of Armant I.*** London: Egypt Exploration Society.

NEEDLER, W.

1984 ***Predynastic and Archaic Egypt in the Brooklyn Museum.*** Wilbour Monographs 9. New York: Brooklyn Museum.

PATCH, D. C.

1991 **The Origin and Early Development of Urbanism in Ancient Egypt: A Regional Study**. Ph.D. dissertation, University of Pennsylvania. Ann Arbor: University Microfilms.

PEET, T. E.
1914 ***The Cemeteries of Abydos, Part II—1911-1912.*** Egypt Exploration Fund Memoir 34. London: Egypt Exploration Fund.
PETRIE, W. M. F.
1921 ***Corpus of Prehistoric Pottery and Palettes.*** British School of Archaeology in Egypt and Egyptian Research Account Publication 32. London: British School of Archaeology in Egypt and Bernard Quaritch.
RICE, P. M.
1987 ***Pottery Analysis: A Sourcebook.*** Chicago: University of Chicago Press.
RYE, O. S.
1981 ***Pottery Technology: Principles and Reconstruction.*** Manuals on Archaeology 4. Washington, D.C.: Taraxcum.
TRIGGER, B. G.
1983 "The Rise of Egyptian Civilization." In ***Ancient Egypt: A Social History***, by B. G. TRIGGER, B. J. KEMP, D. O'CONNOR and A. B. LLOYD. Cambridge: Cambridge University Press, 1-70.
VANDIVER, P., and P. LACOVARA
1985/86 "An Outline of Technological Changes in Egyptian Pottery Manufacture." ***Bulletin of the Egyptological Seminar*** 7: 53-85.
WETTERSTROM, W.
1993 "Foraging and Farming in Egypt: The Transition from Hunting and Gathering to Horticulture in the Nile Valley." In ***The Archaeology of Africa: Food, Metals and Towns***, edited by T. SHAW, P. SINCLAIR, B. ANDAH and A. OKPOKO. One World Archaeology 20. London: Routledge, 165-226.

2

Incense Burners of the Late Predynastic Period in Egypt: An examination of the Evidence from Three Sites

Patricia V. Podzorski

Predynastic objects of a variety of forms have been identified as incense burners. The simplest form of incense burner is the plain bowl. An apparently related type is the bowl with perforated lid. A series of large, relatively rare pedestalled dishes or bowls from late Predynastic/Early Dynastic Egyptian contexts have also been identified as incense burners (Baumgartel 1955, 99) and fire or offering stands (*Herdständer* and *Opferständer*, respectively; Frankfort 1924, 127-29). Alternately, these pedestalled dishes have been described as tables and altars (Petrie and Quibell 1896, 20; Petrie 1902, 14; de Morgan 1897, 123; Green and Lythgoe 1900, 9; Lythgoe 1901b, 15, 25; Spencer 1980, 48) or pot stands (de Morgan 1897, 122). None of the sources cited contains a critical analysis of Predynastic incense burners. The following study will examine these three proposed forms of incense burners (plain bowls, lidded bowls, and pedestalled bowls or dishes) from three Upper Egyptian sites.

The impetus for this study came from research on objects recovered by Albert M. Lythgoe (1901a) from the northern cemetery of Ballâs[1] during the excavations of the Hearst Egyptian Expedition of the University of California between 1900 and 1901. Objects of the three types under discussion are also found among the remains from two other sites in the collections of the Phoebe A. Hearst Museum of Anthropology of the University of California, Berkeley.[2] These other sites are the Predynastic cemeteries of el-Ahaiwah, which was situated on the east bank of the Nile about eighteen miles (30 km) north of Abydos (Lythgoe 1901b), and Shurafa[3] which was between Coptos and Qena also on the east side of the Nile (Green and Lythgoe 1900; Reisner 1900, 9). Excavations at these two sites were conducted between 1899 and 1901. These three Predynastic cemeteries excavated by the Hearst Expedition date predominantly to the Nagada II and III.[4]

Before presenting the descriptions of the objects under consideration, I would like briefly to consider the question: "What is an incense burner?" Or, to be more precise, what are the criteria by which an archaeological incense burner can be identified? The identification of functional constraints on the form of an object can give clues to its purpose or use (Rice 1987, 211-12). As far as I can conceive, there is no necessary and sufficient shape required for an object to function as an incense burner. Thus we can place no a priori constraints on what we might expect an incense burner to look like.

Another method for identifying the function of archaeological objects is by analogy, either historic (Rice 1987, 210) or ethnographic (Longacre 1991). Old Kingdom tomb reliefs, which are sometimes captioned, often identify the function of objects and show them in use. In these reliefs incense burners usually appear as a bowl with basal handle covered by a lid with a central knob (Junker 1953, fig.15; Martin 1979, pl. 7.1). An unusual variant is the plain, round-bottomed bowl covered by a lid with loop handle (Junker 1941, fig. 5b). A rare archaeological example of a metal bowl with lid used as an incense burner is also known from the Old Kingdom (Fischer 1979, 916 n.10). The incense burner in the form of a bowl can be difficult to distinguish from a bowl used for some other purpose, such as a lamp (ibid., 913). The two-piece incense burner with basal handle and lid with central knob is more distinctive, so, if found, these pieces should be recognizable. Unfortunately there do not appear to be any Predynastic objects which have the distinctive form of the Old Kingdom incense burners.

Other important evidence for reconstructing the functions of archaeological objects comes from direct evidence of use and use wear analysis (Rice 1987, 232-36). Vessel contents and physical alterations to the object which resulted from its use are typical sources of these types of information. When an object is in physical proximity to fire, soot may be deposited on its surface (ibid., 235-36). On ceramics, it can be difficult to distinguish between dark marks which result from the firing process and post-manufacture carbon staining. Black staining can also be the result of the gradual decomposition and oxidization of organic material over time, as well as other factors.[5] For the identification of incense burners, a telling feature is a coating of soot deposited by the burning of the incense within or on the vessel. However, lamps and braziers also may have carbon deposits on interior vessel surfaces. Intuitively, the differential identification of an incense burner from a lamp (Fischer 1979, 913, 915 n.3) from a brazier is difficult. Part of a floating wick laid on the edge of a bowl and the burning of a small pellet or pile of incense might produce spots of similar appearance. An object used as a brazier would probably have soot all over the interior, but so might an incense burner or lamp which was used repeatedly. The material burned could perhaps be determined through chemical analysis of the soot, since several types of ancient Egyptian incense have been documented (Lucas 1962, 90-97), provided that the incense used could always be distinguished from other organic oils or resins which were burned in lamps or braziers (Fischer 1979, 915).

In summary, there appear to be no functional constraints which condition the shape which an incense burner might take. Historical analogy with incense burners of later periods is not helpful since the recognized shapes of later dynastic specimens are either general and indistinct (plain bowls) or specific (knobbed lid and base) and not present in the period under discussion. Use wear evidence might be helpful, but by itself does not permit the making of absolute distinctions among incense burners, lamps, and small braziers in most cases. Consequently, the identification of incense burners presented below must be, to some extent, intuitive.

DESCRIPTION OF OBJECTS

This section contains physical descriptions of the three possible forms of incense burners under consideration. The shape, material, and technique of manufacture of each group of objects are discussed.

A) PLAIN BOWLS

Based solely on form (see above), the identification of a plain bowl that might have been used to burn incense is impossible. For simple bowls the identification of their function as incense burners must be based on other criteria, such as direct evidence of use. The available evidence for the identification of specific bowls as incense burners or lamps is presented below in the section on direct evidence of use. Neither the northern cemetery of Ballâs nor Shurafa produced plain bowls which show clear evidence of use as incense burners.

A few bowls from el-Ahaiwah tombs were identified as perhaps having been used as either incense burners or lamps. The three, or perhaps four, bowls are all of similar shape and material (table 2.1). Two pieces are flaring rim bowls with flat bases, one large (R26F)[6] and one shallow saucer (R24M). The third is a small, flat-bottomed bowl (R23b)[7] with straight walls. The fourth, problematic specimen is another shallow saucer (R24M). All of these bowls appear to be handmade of Nile silt fabrics. Chopped straw of various sizes is the most conspicuous tempering agent.[8] Sand is also a common nonplastic inclusion and small (< 2 mm) rock bits are also found.

Analysis of the complete grave assemblages for these tombs for purposes of identifying the relative ceramic chronology indicates that they all date to the Nagada III (Kaiser 1957). In terms of sequence dates, they belong to S.D. 75 to S.D. 80 (Petrie 1901), at the very end of the Predynastic or beginning of the Early Dynastic period.

B) BOWLS WITH PIERCED LIDS

An apparently previously unreported type of object which may have functioned as an incense burner was noted among the ceramics recovered from the northern cemetery of Ballâs. This object, which is actually made up of two parts, consists of a bowl with

Table 2.1 Bowls with Soot Stains from el-Ahaiwah.

TOMB	TYPE*	DATE	BODY	MARKS	PLACE	OTHER
46-3	R26kF, Flared	NIIIa2-b	1 Adult	2 spots on rim, many small on interior base	Above head	6-17508 Side tomb, pdstl. dish
98-1	R23b[27], Straight	NIIIa1	1 Adult	Below rim and @ interior base	Lower wall, behind body	6-17753
140-5	R24M, Flared	NIIIa2[28]	1 Adult	4 ring spots on rim	Before body in coffin	6-17943
231-9 (?)	R24M, Flared	NIIIa1-a2	None	1 spot on rim, small spots base	Fill	6-18280

* Petrie type followed by rim form.

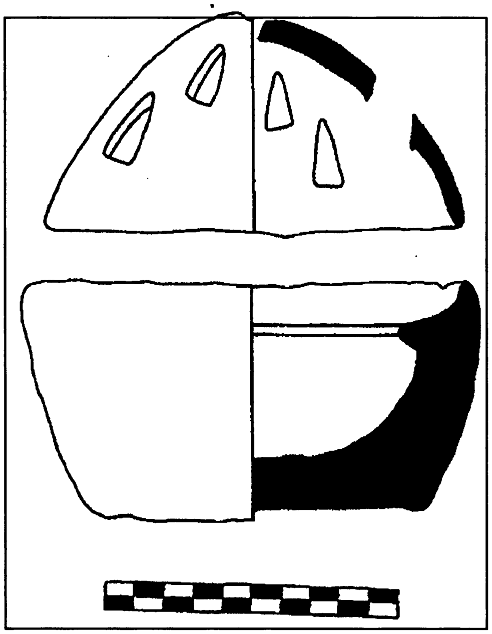


Figure 2.1
Bowl with pierced lid from Ballâs Grave 200 (6-5720 and 6-5717).

a separate lid (fig. 2.1). The lid is pierced by a number of triangular holes. A second lid with triangular holes was also found at Ballâs. This indicates that while this form is rare, it is not unique. The bowl with lid was found in Ballâs grave 200. The lower portion (6-5717) is straight sided with a slightly concave base that is smaller than the rim diameter of the piece. An interesting feature is the inner flange which supports the lid. In form this is similar to the inner rim found on Predynastic ceramics in Petrie's N ware group and, more rarely, in the L and D wares.[9] The Ballâs specimen is not pierced by the four small, evenly spaced holes commonly found in the other examples. The lid (6-5720) is conical and has been pierced by eleven triangular holes which were cut through from the exterior. The interior margins of the holes are only roughly smoothed. The exterior surfaces of both pieces have been smoothed and neither piece appears to have been slipped or painted. Both halves are handmade of a Nile silt fabric with large amounts of chopped straw temper[10] and a few small white bits of $CaC0_3$.

Ballâs tomb 66 contained a pierced lid similar to that from B200, but with only seven triangular holes (6-5016) cut through from the exterior. The interior of the piece was unsmoothed and bits of clay from the edges of the holes are still present. The smoothed convex exterior and the unsmoothed concave interior permits identification of this piece as a lid rather than some other object which would function in the inverse orientation as a sieve or a strainer. The lid from B66 is hemispherical rather than conical in shape and is handmade of a hard pink fabric with small $CaC0_3$ inclusions. There are no traces of slip or paint. According to the field notes, there is no evidence of a bowl which might have gone with this lid.

Based on the associated ceramics, these two tombs date to the Nagada IIIa2 or IIIb using Kaiser's earlier notation (1957). These objects belong to S.D. 76 to 79 using Petrie's dating system (1901).

C) Pedestalled Bowls or Dishes

The Phoebe A. Hearst Museum of Anthropology has records for twenty pedestalled

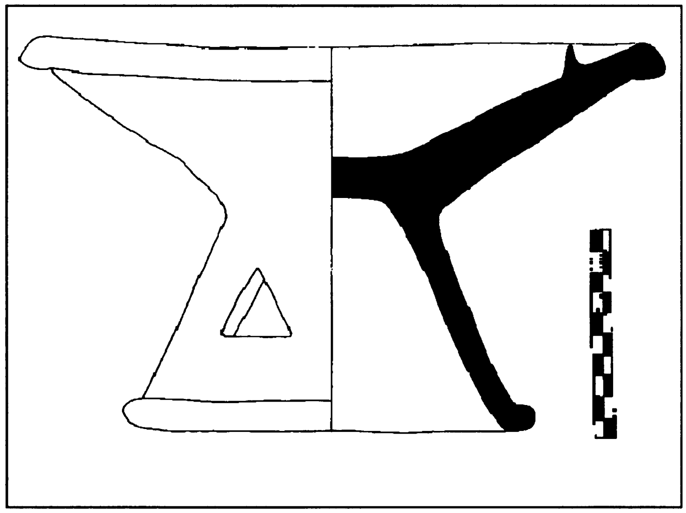


Figure 2.2 Pedestalled bowl with lip cup.

dishes or bowls excavated by the Hearst Egyptian Expedition from the sites of el-Ahaiwah, Shurafa, and the northern cemetery of Ballâs (table 2.2). Sixteen of these are now housed in the museum's collections. The whereabouts of the remaining four are unknown.

In form this type of object is essentially a large bowl or shallow dish attached to a pot stand (fig. 2.2). The pedestal is always pierced by two or more holes. The shape of these holes is either triangular or round. A rare variation found at Shurafa and el-Ahaiwah has alternating round and triangular holes. Another variation found only at el-Ahaiwah is the paired set of round holes, one directly above the other. The triangular holes are always oriented point up, and were made by cutting the three sides of the triangle with a thin, sharp object. The round holes were poked through from the exterior using a finger or stick. The interior margins of the holes are often very rough, showing unsmoothed edges and turned over bits of clay. The exterior hole margins are always smoothed. Although it is difficult to make exact statements due to the small sample size, for these three sites it seems that both types of holes were found throughout the entire period of use of these objects, although triangles tend to be more common earlier and round holes more popular later. The holes are usually placed at roughly equidistant intervals at approximately the mid-level of the pedestal. If only two holes are present, they are on opposite sides of the base. The most commonly encountered number of holes is four (eight examples).[11] Two examples of bases with five triangular holes were also found and one specimen has eight round holes. Only one specimen (6-5615) has one round hole cut vertically through the dish into the pedestal.

The exterior of the base is usually smoothed, rarely covered with a slip or wash (6-17451(?) and 6-17850), and never burnished. Oddly enough, the interior of the pedestal is often very regular, having evident turning marks, while the exterior surface is slightly lumpy. The base rim is most often rolled over onto the exterior of the pedestal. There are three examples of the simple everted base rim (6-18172; 6-9400; 6-5775).

The tops of these pieces are most often in the form of shallow dishes. In only one example is the dish deep enough to be called a bowl (6-5577). This piece has a

Table 2.2 Listing of Pedestalled Bowls or Dishes from Three Sites (artifiacts now in P. A. Hearst Museum)

SITE	TOMB	TABLES	DATE	SEX	AGE	Dist?*	PLACEMENT	OTHER
El-Ahaiwah	26	Lip cup (2T,[1]2R[2])	NIIIb	UK[3]	Adult	Y	Plan unclear	Cat. # 6-17451
	31	Ka cup (4R)	NIIIa2-b	UK	Adult	N	Shaft; inverted.	Cat. # 6-17458
	46	Plain (3rr[4])	NIIIb?	UK	Adult	N	Inverted over feet	Cat. # 6-17510
	120	Pedestal (4R)	NIIIb	UK	Adult	Y	Above head	Cat. # 6-17850
	126	Lip cup (3rr,1R)	NIIIb	UK	Adult	Y	Lower R. corner	Wood paneled Cat. # 6-18943
	205	Plain (5T)	NIIIa2-b	UK	Adult	N	Upper R.	Broken. #6-18172
	238A	Plain (2R)	NIII	UK	UK	Y	Unknown	Clay coffin Cat. # 6-18291
Ballâs North	111	Plain (?T)	NIIIb	UK	Adult	N	Lower R. corner	Bowl inverted on top. #6-5343[5]
	144	Plain? (4T)	NIIIb?	UK	Adult	Y	Center top	Cat. # 6-5493[5]
	151	Plain (5T)	NIIIa2-b	UK	UK	Y	Center bottom, lower left	Small pot on top. Cat. # 6-5535
	159	Lip cup (3R)	NIIIa2-b	UK	Adult	Y	Upper R. corner	Cat. # 6-5565
	163	Deep bowl (4T)	NIIIa2-b	UK	Adult?	Y	Fill	Cat. # 6-5577
	164	Plain (3T)	NIIIb	UK	Adult	Y	Center right side	Cat. # 6-5580
	172	Ka cup (8R)	NIIIb	UK	Adult?	Y	Fill	Cat. # 6-5615; 1 R hole in dish
	180	Lip cup, frag.	NIIIa2-b	UK	Adult	Y	Fill	Top only; left (?).
	217	Plain (2R)	NIIIa2-b	Female?	Adult	Y	Upper R. corner	Cat. # 6-5775
	227	Fragments	NIIIa2?	UK	UK	Y	Fill	Not kept (?).
Shurafa	24	Cow (2T+2R)	NIIIb	UK	UK	Y	Top center to L.	Cat. # 6-9384
	30	Plain (3 or 4T)	NIIIb	UK	UK	Y	Fill	Part of base missing. Cat. # 6-9399
	30	Pedestal (4T)	NIIIb	UK	UK	Y	Fill	Cat. # 6-9400

* "Dist?" indicates whether the burial was disturbed.
1 T = Triangular pedestal holes.
2 R = Round pedestal holes.
3 UK = unknown.
4 rr = Paired round pedestal holes, one directly above the other.
5 Current location unknown.

rounded upper rim which is quite distinct from the rims found on the other pieces. Most have a deep triangular rim that, in some specimens, appears to have been turned out, folded down and under, and then bevelled.

The interior of the dish is sometimes coated with a red slip or wash, although in a few instances both the inside and outside of the bowl are slipped (6-17451, 6-17510, and 6-18943). There seems to be regional variation in regard to the finish on the dish. At Shurafa and Ballâs only one or perhaps two of the nine preserved tops were slipped (6-5565 and 6-5615?), while all of the dishes from el-Ahaiwah had been slipped. Burnishing is found only on the interior of the bowl. The most common pattern is radial burnishing, where the burnishing strokes start at the rim and end in the center (five examples; 6-5565, 6-17850, 6-17451, 6-17458, and 6-18943). Crude burnishing which crosses the entire width of the bowl is found in only two examples.[12]

A feature found on some of these pieces is where a section of the rim of the dish has been divided off by the addition of a small semi-circular ridge, creating what I term a rim or lip cup (fig. 2.3). Separating a small portion of the interior rim of a bowl or dish in this manner is known from pieces that date back to the Nagada I (Brunton and Caton-Thompson 1928, pl. XXXVIII.F8m). On the pedestalled dishes of the late Predynastic the lip cup may be a simple arc or it may be elaborated in at least two ways. From Ballâs (6-5615) and el-Ahaiwah (6-17458) are examples of linear marks crudely incised in the rim at the ends of the arc of the lip cup[13] (fig. 2.3a). The significance of these little marks was a mystery to me until I noticed a fragmentary object recorded as coming from Tomb 1, Locality 27 at Hierakonpolis and identified as a "*Ka* bowl" (Hoffman 1982, 37, pl. I.2). The preserved proper right half of the lip cup has been modelled in high relief in the shape of a human arm and hand. It seems likely that crude *ka* signs were intended on the two pieces from the Hearst collection as well.[14] A pedestalled dish from Shurafa has another variant of the lip cup. This one may have been intended to depict an offering. Here we see the head of an animal with large round eyes and long, curved horns (fig. 2.3b). Apparently this depicts the head of a bovine.[15]

The fabric of these pieces is always Nile silt with chopped straw (length ±5 mm) added as the most conspicuous tempering agent. Often $CaC0_3$ in lumps up to 0.5 cm large are also included. Sand in various quantities is seen as well, although this may not have been intentionally added as a tempering agent. Other occasional nonplastic inclusions are flint and rock bits, grog, and small shiny plates similar to black and white mica.

All of the pieces examined from these three sites appear to have been hand formed rather than wheel thrown. There is no clear evidence for the precise method of construction (either coiling or building from small lumps of clay). The concentric orientation of straw voids on the upper surface of the dishes and on the interior of the bases indicates finishing on a turning device.

It is difficult to determine exactly the method of attachment of the pedestal to the bowl in these objects. Radiographs were taken of two specimens, but due to the densities of the overlapping structures recorded by the X rays, few structural details could be identified. From external evidence and examination of available broken edges,[16] it seems that, rather than an actual bowl and pot stand being attached to each other, the pedestal and center bottom of the bowl were made by hand building and turning; then a wide ring forming the remainder of the dish was added.

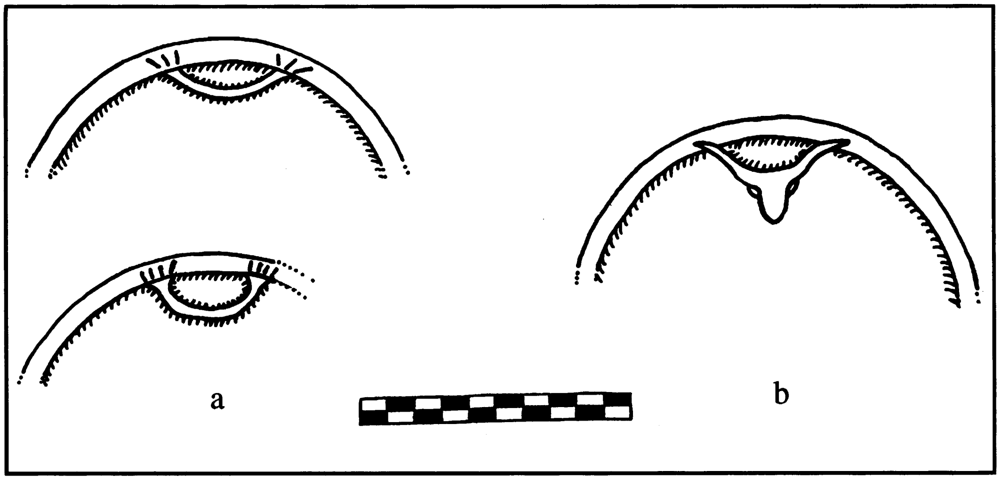


Figure 2.3 Decorated lip or rim cups.

Based on those specimens which come from datable tombs, the pedestalled dishes range in date from phase IIIa2 to IIIb of the Nagada (Kaiser 1957)., that is,from the late Predynastic to the first half of Dynasty I. Sequence dates (Petrie 1901) for the tombs are from S.D. 77 to 80/81, again the very latest Predynastic to the earliest Dynastic.

Direct Evidence of Use

Direct evidence of use and use wear analysis contribute much to our understanding of the function of objects. Direct evidence of use in these specimens is indicated by the presence of soot deposits or, in some instances more significantly, the lack of these deposits. The archaeological context of an object is the first direct evidence of use for an object that the archaeologist encounters and the last use to which an object was subjected by its original users.[17] All of the specimens under discussion, even though some are from disturbed contexts, come from cemeteries. This signifies a funerary function. The mortuary function of both lamps and incense burners is well attested in dynastic times (Fischer 1979), and it may be that these practices had corollaries which extended back into the Predynastic period.

A) Plain Bowls

The preserved bowls from Ballâs, Shurafa, and el-Ahaiwah were carefully examined in order to determine if any had surface alterations or deposits which could be interpreted as the byproduct of the burning of incense. As mentioned above, distinguishing among lamp, brazier, and incense staining may not be possible visually.

None of the bowls from Ballâs had signs of dark staining that might be interpreted as evidence of use as an incense burner. Several bowls with suspicious dark marks were found among the specimens from Shurafa and el-Ahaiwah, but only those which I felt exhibited the clearest evidence of soot deposition are presented below. Among the preserved bowls from Shurafa, two specimens have dark marks that might possibly be interpreted as evidence of the burning of incense. However, these marks could also be interpreted as resulting from irregularities in the firing process (6-9561) or slow organic decomposition (6-9390) and were excluded from the following analysis. A total of twelve bowls from el-Ahaiwah have dark patches on their interior surfaces which appear to be carbon stains.[18] Only four or perhaps five exhibit what I consider "unequivocal" soot marks. One of these bowls is an intrusive piece dating to the Third Intermediate period (6-17847) and is not included in this discussion of Predynastic incense burners.

Only three or four bowls from el-Ahaiwah exhibit stains which I would interpret, with a fair degree of confidence, as soot marks from post-manufacture processes. Dark spots about 2-6 cm in diameter are found most frequently on the rims of these Rough ware bowls. The interior bottoms of these bowls may have either a single large dark stain (6-17753) or many small dark marks (6-17508, 6-18280) or no stain at all (6-17943). There are between one and four dark spots on the rims. The four spots on the specimen from B140 (6-17943) are fairly evenly spaced around the perimeter of the bowl. Distinguishing between lamp wick staining and incense pellet staining is difficult if not impossible. In this latter specimen the four dark marks on the rim are in the form of rings rather than solid patches of soot. Soot is deposited around the margin of the actual flame (Rice 1987, 235), indicating that whatever sat in the rim of this bowl was not itself consumed by the fire. Perhaps this is evidence of wicks laid on the flared rim of the bowl. Also, it seems unlikely that rounded pellets of incense, that are the form commonly depicted in dynastic reliefs (Goyon 1983, 84), could be set on the inward sloping rim of the bowl and not roll down. Thus it may be that the three specimens (from tombs B46, B140, and B231?) that have soot patches on their rims were used as lamps rather than as incense burners. Again, I must caution that this tentative identification of lamp staining vs. incense staining is intuitive and has not been proven experimentally or otherwise. The fourth specimen, which had heavy dark staining on the interior of the bowl and along the wall below the rim, could have served as incense burner, lamp, or small brazier. I can envision no practical way to differentiate the function based on the available evidence.

The placement within the grave of the three most likely specimens is probably original. Grave 46 was untouched when found. Graves 140 and 98 had been plundered, but the ceramics appear undisturbed. Only the specimen from grave 231 was found in fill. There is no consistency in the placement of these objects within the tomb in the small sample under consideration. Two were close to the body (B46 and B140) while the third had been placed in a less intimate location behind the body at the level of or below the feet.[19] The actual function of incense burners and lamps from prehistoric tomb contexts is unknown, although it is likely that practices known from Dynastic times, such as leaving a burning lamp in the tomb and the burning of incense during burial rites (Fischer 1979; Goyon 1983), had roots in the Predynastic past.

B) Bowl with Pierced Lid

The conical lid from Ballâs grave 200 has distinct carbon deposits on its interior and exterior surfaces. There are also a few carbon marks on the interior of the bowl, although these are faint when compared to those on the lid. The second pierced lid from Ballâs is in a "like-new" condition and has no stains or deposits on it.

Again, as the pieces from Ballâs are from a cemetery, a mortuary function is implied. The analysis of micro-spatial placement is not very useful, due to the small sample and the fact that both graves had been plundered. In Ballâs 66 the lid was found in fill of the shaft.[20] The two pieces from Ballâs 200 were, according to the tomb plan (Lythgoe 1901a, 67), found lying on the floor of the grave next to each other just below and to the left of center. The close proximity of the two parts may indicate that they were little disturbed from their original position, which might have been behind the back of the body or toward the foot of the grave.[21]

C) Pedestalled Dishes

Careful examination of the pedestalled bowl and dishes revealed no evidence of carbon deposits on the upper surface of any of these pieces. In two instances blackening was noted at the top of the interior of the pedestal, but in one case a reddened ring around the black pointed to the interpretation of this feature as a byproduct of firing. The position of a black spot on the underside of the dish is where one would expect smoke and other gases to be trapped during firing if the object were fired standing in an upright position.

The micro-spatial associational information gives no clue as to the specific function of the object. At Ballâs there was a slight preference for placement of pedestalled dishes above the head of the deceased, usually in the upper right corner of the grave (table 2.2). There was one instance of the dish being placed along the edge of the grave at the level of the face (B164). Other placements are once in the lower left (B151) and once in the lower right corner of the grave (B111). In two cases pottery vessels were found resting on top of the upper surface. In one undisturbed grave (B111) a large bowl[22] had been left inverted over the dish, probably intended to protect something long since decayed that had been laid on its surface. In another instance (B151) a small bag jar[23] was found standing upright in the center of the dish. This grave was disturbed, however, and we cannot be sure if the placement is original.

The two tombs which contained pedestalled dishes at Shurafa were heavily disturbed and no locational evidence is known. However, it is interesting to note that Shurafa tomb 30 contained the remains of two individuals and two offering tables, perhaps one for each occupant.

At el-Ahaiwah only four of the seven known pedestalled dishes can be placed within the tomb (table 2.2). In two instances the objects were found *inverted*, in apparently undisturbed tombs, once over the feet of the occupant (A46), perhaps due to the very limited available space, and once in the shaft outside of the burial chamber, opposite the face of the deceased (A31). In the two other examples known to us, the pedestalled dishes were found in the upper right (A205) and lower right corners of the grave (A126). No examples of objects being placed on top of the dish are known from this cemetery.

Literature Review

A) Plain Bowls

References to bowls which may have served as lamps, incense burners, or braziers in the archaeological literature of Predynastic Egypt are extremely rare. I suspect this is due to lack of attention on the part of excavators to the subtle traces such use leaves on the object rather than a total absence of evidence. Petrie reported finding two small shallow bowls in an Early Dynastic grave at Tarkhan (Petrie, Wainwright, and Gardiner 1913, 11, pl. LXVI).[24] These bowls had been left in the grave with one lying inverted on top of the other. Bits of charcoal were found in the bottom bowl, and smoke stains were visible on the interior of the upper one. Petrie described this as a "fire offering." What may be a lamp was found in the remains of the Predynastic village of Hemamieh (Brunton and Caton-Thompson 1928, 61, pl. LIV #21). One edge of this small shallow saucer had been pulled outward to form a spout. The bottom of the bowl was covered with a thick, black deposit. The non-mortuary context of this piece should be remembered.

B) Bowl with Pierced Lid

As mentioned above, no parallels to the low, flat-based bowl with inner rim and lid with triangular holes have been identified, although pots with inner rims are not unknown in the Predynastic. The pierced conical or rounded lids are not found in either Petrie's Prehistoric or Proto-Dynastic corpora, although unpierced conical lids were noted by Petrie.[25] At this time I have not been able to locate references to similar objects in the literature, and no comparisons with other sites can be made.

C) Pedestalled Bowl or Dish

Petrie was the among the first to identify this type of artifact. In his description of Nagada grave 112 he referred to this object as a "table-stand" and designated it as his type L86 (Petrie and Quibell 1896, 20, XLI, LXXXII). He later added subclasses to the type (Petrie 1921, LI). Petrie recovered three other variants of this form at Abydos which he dated to S.D. 78 (Petrie 1902, 14, pl. XXXV.195-97; Petrie 1953, pl. XXX.100T,U,Y). He also stated that the "combined bowls and stands" disappear after the Third Dynasty (Petrie 1902, 14), although in fact pedestalled bowls, dishes, and cups of various forms are found throughout Egyptian history (Kelley 1976, pl. 14.9, 40.13, 58.6).

Petrie identified a unique red line decorated pot from the southern cemetery of Ballâs (grave 394) which he thought might have been used as a cooking brazier (Petrie and Quibell 1896, 41, pl. XXXV.76). This specimen, type D76, is in the form of a deep, hole-mouth bowl on a pierced stand. Baumgartel considered this piece to be an incense burner (Baumgartel 1955, 98-99).

As part of his monograph on the indigenous character of the Predynastic Egyptians, Jacques de Morgan published a drawing of a pedestalled bowl that he had excavated in the Nagada region. He identified this object as a "table" (de Morgan 1897, 122, fig. 386). In the preceding figures (382-85) he reproduces Petrie's drawings of Predynastic tables and pot stands of *Corpus* types L84b, L85, L86 and L88. Curiously, there he includes Petrie's class L86 as one of the "supports pour vases à fond pointu" (ibid., 122), that is, pot stands. Quibell (1904, 137) included a more complete description of this piece in his volume on Archaic objects in the Egyptian Museum in Cairo (J. d'E. 31820). There he referred to the object as "a circular dish and stand in one." In their field notes on the excavations at Shurafa and el-Ahaiwah F. W. Green and Albert Lythgoe identified these objects as offering tables, stands, or altars (Green and Lythgoe 1900, 9; Lythgoe 1901b, 15, 25).

Henri Frankfort (1924, 127-29) has discussed the possible Mesopotamian origins of pot stands and offering stands based on analogies of shape with objects found at the lowest level of the Ishtar temple at Assur. The excavator, Dr. Andrae, identified the tall, narrow, and usually hollow tubular stands as *Opferständer* (offering stands) and the shorter stands with solid tops as *Herdständer* (fire stands). Frankfort states that "the two classes do not differ in essential features and use." Andrae also postulated that the holes through the pedestals of these objects would have helped them function as incense burners. Although Frankfort indicates that this may or may not have been the case, he goes on to say that Andrae has succeeded in "proving . . . that both classes of stands served to hold flowers and other offerings. . ." Frankfort identifies Petrie's type L84b (a ring stand) and the table-stand L86 as *Herdständer* (ibid., 128, fig. 13g,h). A few sentences later he described type L86 as a "secondary type" of *Herdständer* "with bowl and stand made all in one" which were later absorbed into the ordinary pot stands. Frankfort also notes that the earliest known Egyptian *Herdständer* and *Opferständer* appear among the cached temple furniture at Hierakonpolis.

Baumgartel (1955, 99) has identified objects from Petrie's class L86 as incense burners without attempting to justify her interpretation. She cites Frankfort as having demonstrated the Mesopotamian connection for these objects and the pot stands, ignoring the fact that Frankfort never called them incense burners, but only "Herdständer" (fire stands). Most recently, A. J. Spencer (1980, 48, no. 340) has identified the type of artifact as a table.

Conclusions

The evidence for the use of incense burners in the late Predynastic is circumstantial at best. Soot on the interiors of plain and lidded bowls clearly indicates that something was burnt in both types of object. Conclusive evidence to distinguish between the use of plain bowls as incense burners rather than lamps or braziers is lacking. The presence of soot spots on the rims of the flaring rim bowls (A46, A140, and A231(?)) may indicate that they were used for lamps rather than for the burning of incense. A heavy black coating of soot on the bottom of a bowl (A98) is perhaps, but not necessarily, better evidence for its use as an incense burner. However, a brazier or well-used lamp might have similar carbon deposits. For the plain bowls, the best that can be said is that while they may have functioned as incense burners in the late Predynastic, the physical evidence available points more strongly to their use as lamps.

Based upon the heavy carbon deposits found on the interior and exterior of the lid and the inside of the bowl from Ballâs grave 200, it seems very likely that this piece was used as an incense burner. The use of this piece as a lamp is highly unlikely, since the light cast by a flame would be restricted by the lid, even though it has several holes. The presence of the lid would also seem to contradict the function of this piece as a brazier. Based on similarity of form to the piece from B200, it seems likely that the unstained lid from Ballâs grave 66 also was intended to be used as part of an incense burner.

The pedestalled dishes and bowls that a few authorities have described as incense burners do not appear to have functioned in that capacity. The lack of post-manufacture carbon deposits strongly supports this conclusion. In form and size they closely resemble the short pedestalled stone tables of the Early Dynastic and Old Kingdom, some of which also have dished upper surfaces (Emery 1938, 56, pl. 36.39). The placement of these objects within the burial chamber is consistent with that of the stone tables as well. The decorated lip cups in the form of ka-arms and bovine heads are also appropriate to an offering function. It seems likely that these pieces are the earliest examples of one of the most important elements of Egyptian funerary furniture: the individual offering table.

Of the three forms of objects under discussion, plain bowls, lidded bowls, and pedestalled dishes, the available evidence strongly supports only the identification of the lidded bowl as an incense burner. Regarding the use of plain bowls as incense burners the evidence is inconclusive, but may favor their interpretation as lamps. The pedestalled dishes and bowls clearly did not function as incense burners, but rather were probably used as offering tables.

NOTES

1 "Northern" is used here to distinguish this Ballâs from the more southerly cemetery of the same name. The "southern cemetery of Ballas," which was excavated by J. E. Quibell for the Egyptian Exploration Fund in the early 1890s, is approximately one kilometer south of the cemetery excavated by the Hearst Expedition (Quibell 1895; Petrie and Quibell 1896; Reisner 1902, 24). The decision to distinguish the two sites in this manner was reached in consultation with Ms. Barbara Adams, Curator of the Petrie Museum in London, which currently houses many of the materials recovered from the southern cemetery at Ballâs. Both sites are named after the nearby modern Egyptian village of el-Ballâs. Neither of these two cemeteries should be confused with the New Kingdom habitation site and cemeteries of Deir el-Ballâs, also excavated by the Hearst Expedition (Lacovara 1990, 1), which are north of the two Predynastic cemeteries of Ballâs.

2 Formerly the Robert H. Lowie Museum of Anthropology.

3 This Shurafa should not be confused with another site of the same name excavated by Petrie in the vicinity of Cairo (Petrie and MacKay 1915).

4 Recent work by W. Kaiser and Dreyer (1964, 94; 1982, 266-67; 1990, 289) has added further subdivisions to the Nagada III and extended it to the end of the First Dynasty.

5 In museum contexts, ninety-year-old India ink stains can also resemble carbon spots.

6 Petrie corpus type (1921, XXXVIII).

7 But with a wider base than the specimen reported by Petrie (1921, XXXVIII).

8 Cat. no. 6-17508 has mostly fine straw (length 2 mm or less); 6-18280 has mostly 5 mm sized particles; while 6-17753 and 6-17943 have large pieces of straw (5 mm or more). All have occasional larger straw and other organic inclusions of 1 cm or more.

9 N 65, 67, and 70; L 75A and 75D; D 75a, respectively (Petrie 1901, XXVII, LI, XXXVI).

10 Size between 2 mm and 5 mm with a few larger (ca. 1 cm) pieces.

11 Three triangular, two round, two triangular and round, one round and double round.

12 Cat. nos. 6-17510 and 6-18172. The surface of one fragmentary specimen (6-17850) is so badly eroded that, although ridges from burnishing can be detected, the direction of the strokes cannot be determined with certainty.

[13] Four and three incisions, respectively.

[14] The reading *shn* has also been proposed for this sign during the Early Dynastic period (Kaplony 1958, 54ff).

[15] A graphic pun or double meaning in the substitution of *k3*, "bull," for *k3*, "spirit," is also possible.

[16] Cat. no. 6-5615 is particularly useful in this respect due to the direction in which the dish is broken (across the center).

[17] Barring post-depositional disturbances of various types (Schiffer 1976).

[18] Cat. nos. 6-17363, 6-17372, 6-17508, 6-17527, 6-17713, 6-17753, 6-17847, 6-17943, 6-18158, 6-18178, 6-18280, and 6-18438.

[19] The precise location is uncertain since no photograph exists, only a tomb sketch.

[20] It is possible that this piece was not originally from this grave, since objects in the shaft filling sometimes get there by being thrown out of nearby tombs during plundering.

[21] The body had been plundered and was not in situ.

[22] Smooth hard pink ware; form is closest to *Protodynastic Corpus* type 20b (Petrie 1953, IV).

[23] Corpus type L58D (Petrie 1921, L).

[24] Both pieces *Protodynastic Corpus* type 7b (Petrie 1953), coarse fabric. Tarkhan grave 89, S.D. 81.

[25] Corpus types L75m and L75n (Petrie 1921, LI).

REFERENCES

BAUMGARTEL, E. J.
1955 ***The Cultures of Prehistoric Egypt I,*** rev. ed. London: Oxford University Press on behalf of the Griffith Institute, Ashmolean Museum, Oxford.

BRUNTON, G., and G. CATON-THOMPSON
1928 ***The Badarian Civilisation and Predynastic Remains near Badari.*** British School of Archaeology in Egypt and Egyptian Research Account Publication 46. London: British School of Archaeology in Egypt.

DE MORGAN, J.
1897 ***Recherches sur les Origines de l'Égypte. Vol. 2: Ethnographie Préhistorique et Tombeau Royal de Négadah***. Paris: Ernest Leroux.

EMERY, W. B.
1938 ***The Tomb of Hemaka***. Excavations at Saqqara. Service des Antiquités de l'Égypte. Cairo: Government Press, Bulâq.

FISCHER, H. G.
1980 "Lampe." ***Lexikon der Ägyptologie*** 3: 913-17. 1-7, 1975- Foreword by Wolfgang Helck & Eberhard Otto, edited by Wolfgang Helck and Wolfhart Westendorf. Wiesbaden: Otto Harrassowitz.

FRANKFORT, H.
1924 ***Studies in Early Pottery of the Near East, Vol. I. Mesopotamia, Syria, and Egypt and their Earliest Interrelations***. Royal Anthropological Institute of

Great Britain and Ireland, Occasional Papers, no. 6. London: Royal Anthropological Institute of Great Britain and Ireland.

GOYON, J.-C.

1983 "Räucherung." ***Lexikon der Ägyptologie*** 5: 83-86.

GREEN, F. W., and A. M. LYTHGOE

1900 *Cemetery at Shurafa (North of Keft)*. Phoebe A. Hearst Museum of Anthropology. Berkeley, California.

HOFFMAN, M. A.

1982 ***The Predynastic of Hierakonpolis - An Interim Report***. Egyptian Studies Association Publication 1. Cairo University Herbarium and Faculty of Science and The Department of Sociology and Anthropology, Western Illinois University. Cairo: Cairo University Herbarium.

JUNKER, H.

1941 ***Gîza V: Bericht über die von der Akademie der Wissenschaften in Wien auf gemeinsame kosten mit Dr. Wilhelm Pelizaeus unternommenen Grabungen auf dem Friedhof des Alten Reiches bei den Pyramiden von Gîza. Vol. 5: Die mastaba des Śnb (Seneb) und die umliegenden Gräber***. Abhandlungen der Akademie der Wissenschaften in Wien, Philosophisch-historische klasse Denkschriften 71, Vol. 2. Vienna: Hölder-Pichler-Tempsky.

1953 ***Gîza XI: Bericht über die von der Akademie der Wissenschaften in Wien auf gemeinsame kosten mit Dr. Wilhelm Pelizaeus unternommenen Grabungen auf dem Friedhof des Alten Reiches bei den Pyramiden von Gîza. Vol. 11: Die friedhof südlich der Cheopspyramide, ostteil***. Abhandlungen der Österreichische Akademie der Wissenschaften, Philosophisch-historische klasse Denkschriften 74, Vol. 2. Vienna: Rudolf M. Rohrer.

KAISER, W.

1957 "Zur inneren Chronologie der Naqadakultur." ***Archaeologia Geographica*** 6: 69-77.

1964 "Einige Bermerkungen zur ägyptischen Frühzeit, III:. Die Reichseinigung." ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 91: 86-125.

1990 "Zur Entstehung des gesamtägyptischen Staates." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 46: 287-99.

KAISER, W., and G. DREYER

1982 "Umm el-Qaab: Nachuntersuchungen im frühzeitlichen Königsfriedhof. 2. Vorbericht." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 38: 211-69.

KAPLONY, P.

1958 "Sechs Königsnamen der I. Dynastie in neuer Deutung." ***Orientalia Suecana*** 7: 54-69.

KELLEY, A. L.

1976 ***The Pottery of Ancient Egypt: Dynasty I to Roman Times***. Toronto: Royal Ontario Museum.

LACOVARA, P.

1990 ***Deir el-Ballas: Preliminary Report on the Deir el-Ballas Expedition, 1980-1986***. American Research Center in Egypt Reports 12. Winona Lake, IN: Eisenbrauns.

LONGACRE, W. A., ed.

1991 ***Ceramic Ethnoarchaeology***. Tucson: University of Arizona Press.

LUCAS, A.

1962 ***Ancient Egyptian Materials and Industries***. 4th ed., rev. and enl. by J. R. Harris. London: E Arnold.

LYTHGOE, A. M.

1901a ***Ballas 1900 to 1901***. Phoebe A. Hearst Museum of Anthopology. Berkeley, California.

1901b ***El-Ahaiwah 1900***. Phoebe A. Hearst Museum of Anthopology. Berkeley, California.

MARTIN, G. T.

1979 ***The Tomb of Hetepka and Other Reliefs and Inscriptions from the Sacred Animal Necropolis, North Saqqâra, 1964-1973***. Excavations at North Saqqâra Documentary Series 2. Texts from Excavations, Fourth Memoir 0307-5125. London : Egypt Exploration Society.

PETRIE, W. M. F.

1901 ***Diospolis Parva: The Cemeteries of Abadiyeh and Hu, 1898-99***. Egypt Exploration Fund Memoir 20. London: Egypt Exploration Fund.

1902 ***Abydos: Part I, 1902***. Egypt Exploration Fund Memoir 22. London: Egypt Exploration Fund.

1921 ***Corpus of Prehistoric Pottery and Palettes***. British School of Archaeology in Egypt and Egyptian Research Account Publication 32. London: British School of Archaeology in Egypt and Bernard Quaritch.

1953 ***Flinders Petrie Centenary, 1953: Ceremonial Slate Palettes, Corpus of Proto-Dynastic Pottery***. Egyptian Research Account and British School of Archaeology in Egypt Publications 66. London: British School of Archaeology in Egypt.

PETRIE, W. M. F., and E. MACKAY

1915 ***Heliopolis, Kafr Ammar and Shurafa***. British School of Archaeology in Egypt and Egyptian Research Account Publication 24. London: School of Archaeology in Egypt and Bernard Quaritch.

PETRIE, W. M. F., and J. E. QUIBELL

1896 ***Naqada and Ballâs, 1895***. London: Bernard Quaritch.

PETRIE, W. M. F., G. A. WAINWRIGHT, and A. H. GARDINER

1913 ***Tarkhan I and Memphis V***. British School of Archaeology in Egypt and Egyptian Research Account Publication 23. London: School of Archaeology in Egypt and Bernard Quaritch.

QUIBELL, J. E.

1895 ***Ballâs***. British School of Archaeology in Egypt and Egyptian Research Account Publication 1. London: Bernard Quaritch.

1904 ***Archaic Objects. Vol. 1: Texte***. Catalogue Général des Antiquités Égyptiennes du Musée du Caire, Nos. 11001-12999 et 14001-14754. Service des Antiquités de l'Égypte. Cairo: Institut Français d'Archéologie Orientale du Caire.

REISNER, G. A.

1900 Letters of G. A. Reisner. Bancroft Library, University of California. Berkeley, California.

1902 "Work of the University of California at El-Ahaiwah and Naga-ed-Dêr." In ***Archaeological Report, 1900-1901: Comprising the Recent Work of the Egypt Exploration Fund and the Progress of Egyptology during the Year 1900-1901***, edited by F. L L. Griffith. London: Egypt Exploration Fund, 23-25.

RICE, P. M.

1987 ***Pottery Analysis: A Sourcebook***. Chicago: University of Chicago Press.

SCHIFFER, M. B.

1976 ***Behavioral Archeology***. Studies in Archaeology. New York: Academic Press.

SPENCER, A. J.

1980 ***Catalogue of Egyptian Antiquities in the British Museum. Vol. V: Early Dynastic Objects***. London: British Museum Publications.

3

Pots and Politics: Ceramics from Askut and Egyptian Colonialism during the Middle through New Kingdoms

Stuart Tyson Smith

The island fortress of Askut provides an unparalleled opportunity to document the presence of Egyptians in Nubia from the Middle through the New kingdoms, and thus gain an important insight into the changes in Egyptian colonialism in the region (fig. 3.1). The site was excavated from 1962-1964 by the late Alexander Badawy as a part of the UNESCO Aswan High Dam Salvage Campaign and under the sponsorship of UCLA (Badawy 1964, 1965, 1966). Due to a generous division with the Sudan Antiquities Service, virtually the entire collection from this project is curated in the Fowler Museum of Cultural History at UCLA. Unlike the majority of other sites in the area, there was no "winnowing" of "undesirable" or "uninformative" objects. Preservation was relatively good, and the standards of excavation were excellent for the time, better than virtually any of the major Egyptian sites in Nubia.[1] The result is one of the largest collections of well provenienced Egyptian and native Nubian domestic pottery outside of Egypt or the Sudan. I estimate that there are some thirty thousand Pharaonic sherds, with approximately twenty thousand from good stratified contexts. There are one thousand or more whole vessels, or vessels with complete profiles. Many of these are bowls and plates, of course, but other vessels and larger jars are also represented. This situation allows for a far better reconstruction of the total assemblage and its stratigraphic associations than has previously been the case for Egyptian sites in Nubia.

Part One: Pots

This report is based on a preliminary sort and presence/absence analysis. Quantification is ongoing, and the results will be refined considerably in the final report. Naturally, some changes may be required, but the basic patterns described here should hold true. The illustrations are intended to give a good idea of the most common and characteristic types from each period, but establishing the full range of variability in vessel form, fabric, and decoration for such a large and varied collection was not possible

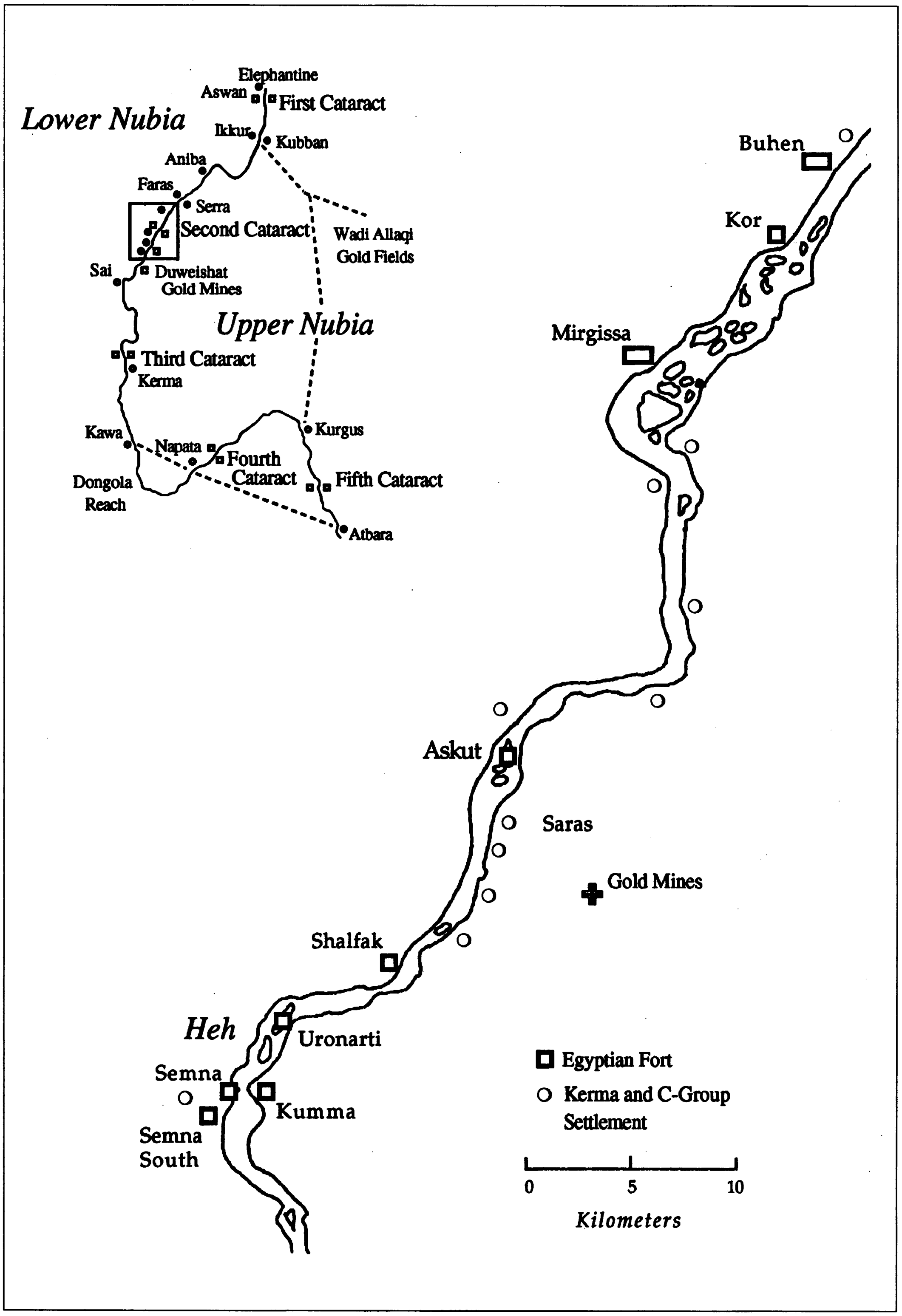


Figure 3.1 Nubia and the Second Cataract.

within the scope of this article. Pot stands, one of the most common components of all the assemblages, are not considered in any detail. Many are of a very simple form (similar to fig. 3.3S) which defies any attempt at seriation, but others do show some promise for dating. They will appear in the final analysis of the ceramics and other artifacts, which will appear as a publication of the Fowler Museum of Cultural History at UCLA.[2]

FABRICS

The organization of the fabrics follows the Vienna system (Nordström 1985, Nordström and Bourriau 1993), which, by and large, seems to work fairly well for the Askut material. The characterizations were carried out with a hand lens at 10X magnification. A series of thin sections concentrating on the marls is planned, which will serve to describe the types more precisely and identify any substantial deviations from the system. Foreign and native Nubian fabrics are not considered here.

NILE SILTS

The full range of Nile silt fabrics appear, including Nile B1, B2, C, and D. To some extent, the categories of Nile B1-C represent a continuum based on the amount and size of chaff present. As in Egypt, they were by far the most common material used (e.g., Hope 1989, 4).

Nile Silt B1 is a very fine fabric with sand and small amounts of fine chaff (up to 2 mm; rarely, if ever, larger). It is most characteristic of the Middle Kingdom, particularly the hemispherical bowls (figs. 3.2A, 3.3A), but it also appears in a variety of small bowls, stands, and jars (figs. 3.2C-D,G; 3.3B-D,N,R). It is typically brown in color (7.5YR 5/4) and often without zoning.

Nile Silt B2 is a medium fabric with sand and moderate amounts of small chaff, 2 mm to 5 mm, with occasional larger pieces. It appears rarely with hemispherical bowls, normally in a wide variety of small to medium-sized bowls, plates, stands, and jars (figs. 3.2B,I,M; 3.3G-I,M,O,P; 3.4H,J; 3.5A,C,D; 3.6A,C-I,K; 3.7A-D,G-J; 3.8J,K; pl. 3.4a,b,d). It is the typical fine silt in the New Kingdom. It usually varies in color from a reddish yellow (7.5YR 7/6 to 5YR 7/8-6/8) to red (2.5YR 5/8), with weak red to reddish brown zoning (10R 5/4 to 2.5YR 5/4). This latter variety, which is well-fired, seems to be more common in the New Kingdom. Poorly fired examples exhibit grey-black zoning.

Nile Silt C is a coarse, chaff-tempered fabric with sand and copious amounts of large chaff, 5 mm and larger. It is used occasionally for medium, and even small, jars, plates, and stands, but most often for large to very large plates, stands, and jars, especially the water/beer jar, large coarse platters (pl. 3.1c), crude "bread dishes" from all periods, (not illustrated here, but see Bourriau 1991, 18-19, fig. 4.1; Hope 1989, 4, fig. 1b), and cookpots (figs. 3.2H,K; 3.3J,K,S; 3.4B-D,E,G,K; 3.5H,J; 3.6J,L,N; 3.7D,F; 3.8C,F,O; pls. 3.1a-c, 3.3c, 3.4c). In the Middle Kingdom, its color is typically in the reddish yellow range of the Nile Silt B2, often with grey-black zoning. In the New Kingdom, better fired examples have the reddish yellow to red coloring.

Nile Silt D is a fine, hard fabric with significant amounts of crushed fine-coarse limestone and sand, but very little, if any, straw. It appears in large storage vessels, perhaps replacing those normally found in a Marl C during the late Middle Kingdom

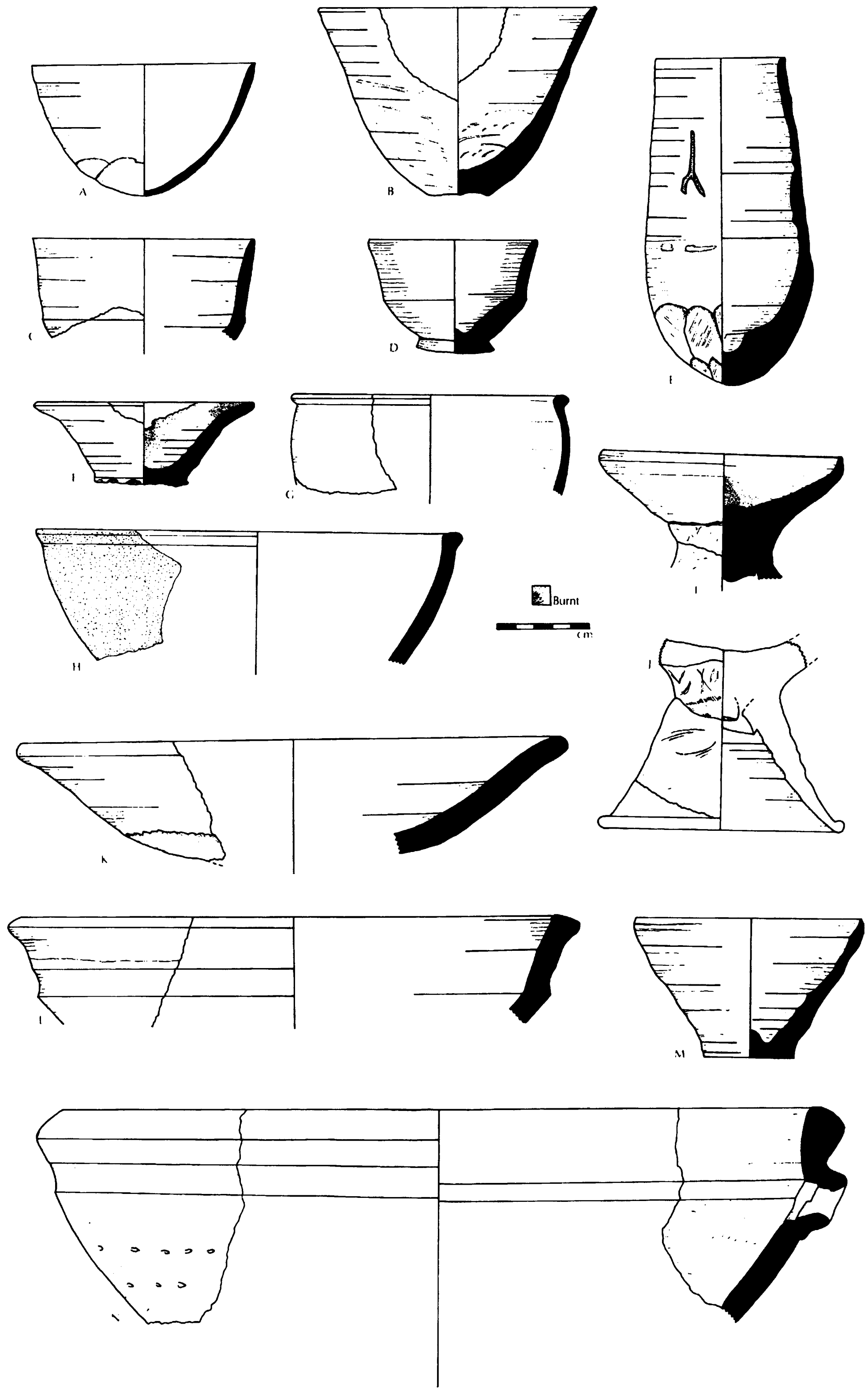


Figure 3.2 Middle Kingdom cups and bowls from Askut.

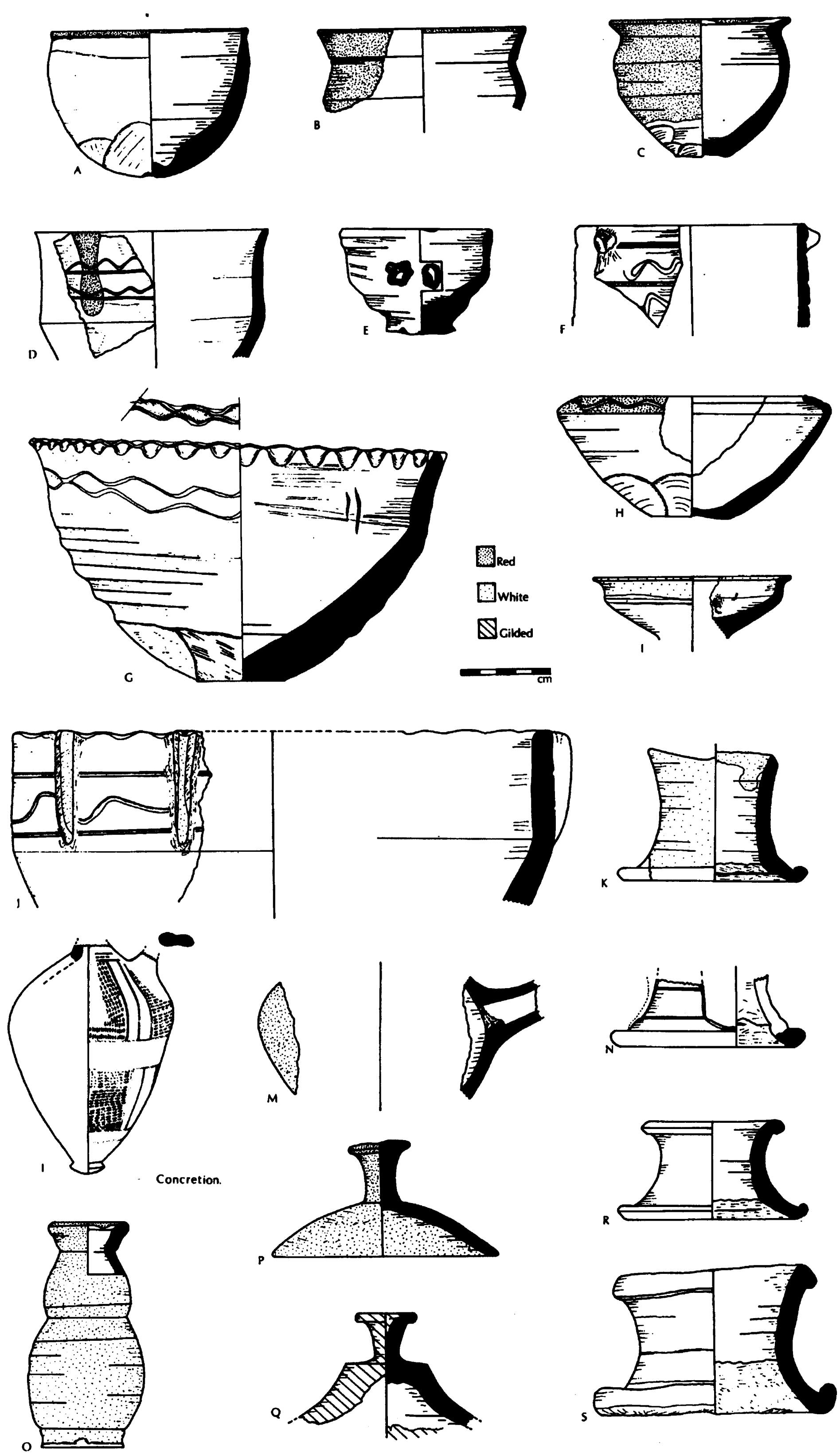


Figure 3.3 Middle Kingdom decorated pottery from Askut.

(cf. fig. 3.4I,K, both Marl C), as well as other vessels in the New Kingdom (fig. 3.10E). It varies typically from red to reddish yellow (5YR 6/6 to 2.5YR 5/6), with grey to strong brown zoning (10YR 5/1 to 7.5YR 5/6). It is very similar to Hope's (1989, 4-5) mixed silt and marl type Marl A4.2, and is the same as the Marl D-like fabric at Deir el-Ballas described by Bourriau (1990, 21).

Nile Silt variants include a rare type with small amounts of large (usually 1 mm to 2 mm, up to 5 mm) crushed limestone added in what would otherwise be a Nile Silt B2 (figs. 3.5E, which is also rather sandy, and 3.6B) and C (fig. 3.4F).

A *sandy silt* appears only with cookpots which closely resemble the Palestinian "holemouth" jar in both shape and technology, with a brushed on white slip which is often obscured by the soot (fig. 3.4L; cf. Cole 1984, 63f, fig. 18, pls. 24-25; the "upright rim" type also occurs more rarely at Askut, ibid., 65 f, fig. 17, pl. 26). The fabric, clearly a Nile silt, contains abundant quantities of rounded sand, mostly from 0.5mm to 1.0 mm. The amount of sand often appears to exceed fifty percent of the fabric. Such an abundance of rounded silicates would normally cause instability during firing, but under the right conditions, it can add to the durability of the vessel. Other cooking vessels, including imitations in the holemouth shape, were of Nile Silt C (figs. 3.2H, 3.3J), which makes much more sense, as the openness of the fabric would allow for expansion and contraction as the pot was repeatedly heated and cooled (Rice 1987, 96-97, 105; Rye 1981, 26-27, 34-35).

Other variants no doubt also exist, but have not been identified. Of particular interest would be the possibility of distinguishing between locally produced and imported Nile silt wares. Pottery production is attested at both Mirgissa and Serra during the Middle Kingdom, and at Askut in the New Kingdom (Vercoutter 1970, figs. 23-24; Williams 1987).[3] The fabric of the "Gilded" ware (fig. 3.3Q and pl. 3.1d; see below) might provide a control over local clays, since it only appears in Nubia.

Marls

The marls are particularly significant because, unlike the silts, they must have been imported, the Marl A and B family from Upper Egypt, Marl C and D from Lower Egypt (Bourriau 1991, 129-30). Marls make up generally only a small percentage of the total ceramic assemblage.

Marl A3 and *A4* dominate the Marl A group and are particularly common during the Middle Kingdom. Marl A4 is similar to A3 in both inclusions and color, but is coarser, and it can be difficult to distinguish between the two. It, and/or a very coarse A3, appears from the Middle Kingdom through the New Kingdom, mostly in large bowls and small (very fine Marl A3 only) to medium and large storage jars, including amphorae (figs. 3.2L; 3.8A,B,M(?),N; pl. 3.2b). The A3-4 fabrics have a moderate content of rounded sand and abundant angular limestone, which appears either as a solid white inclusion or as a void, depending on the degree of firing. The color typically ranges from white (5Y 8/1) with reddish yellow zoning (5YR 7/6) to white to pale yellow (5Y 8/2-3 to 5Y 7/3) with no discernible zoning. This difference is related to kiln placement, and should not be used to indicate separate fabric types (Nicholson and Patterson 1989, 80, fig. 8). *Marl A2* has also been tentatively identified in the collection, but thus far only in whole vessels which naturally could not be subjected to fresh breaks for description (fig. 3.7K).

Marl B is similar to the Marl As, but can be easily distinguished by the large

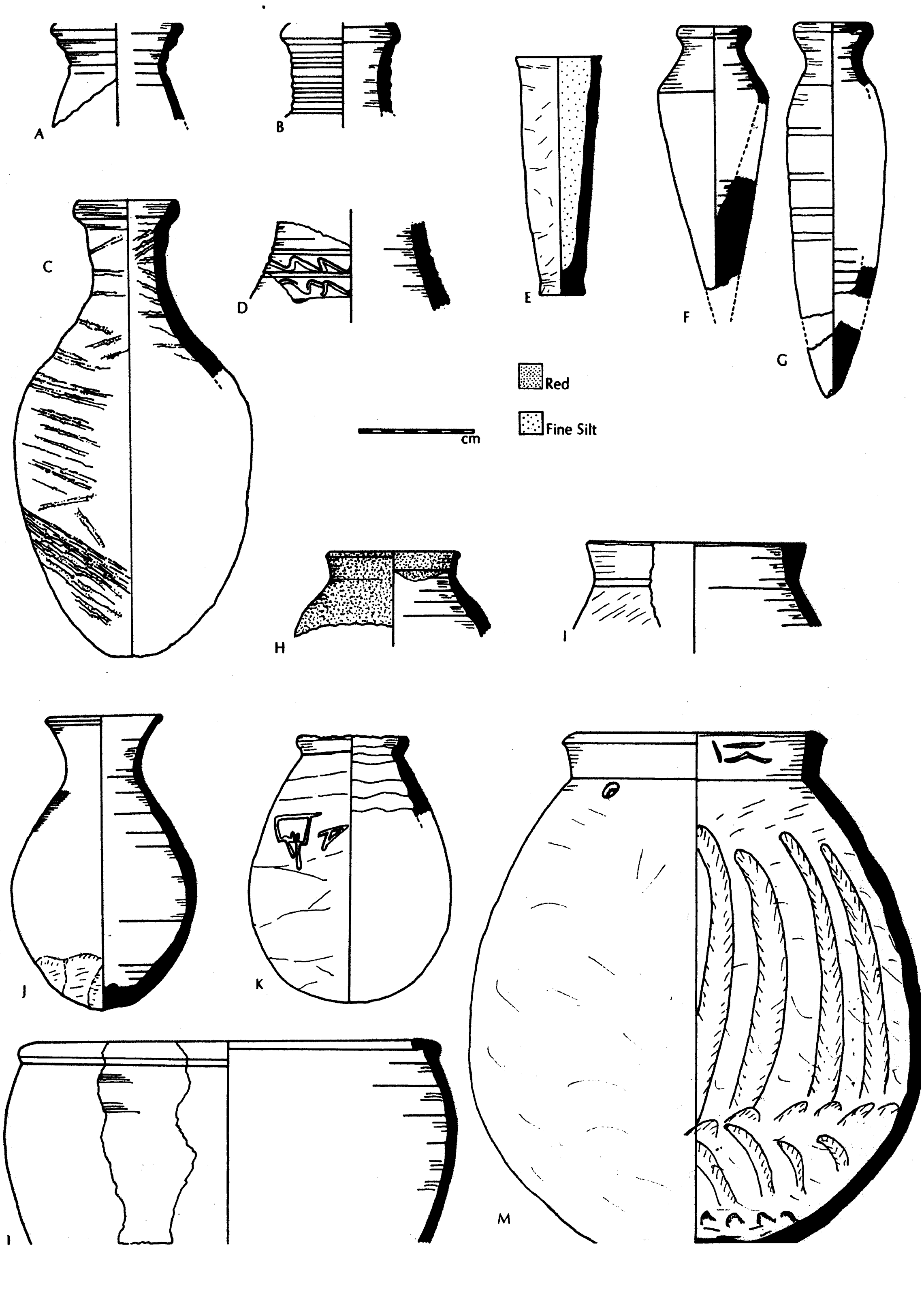


Figure 3.4 Middle Kingdom jars and other forms from Askut.

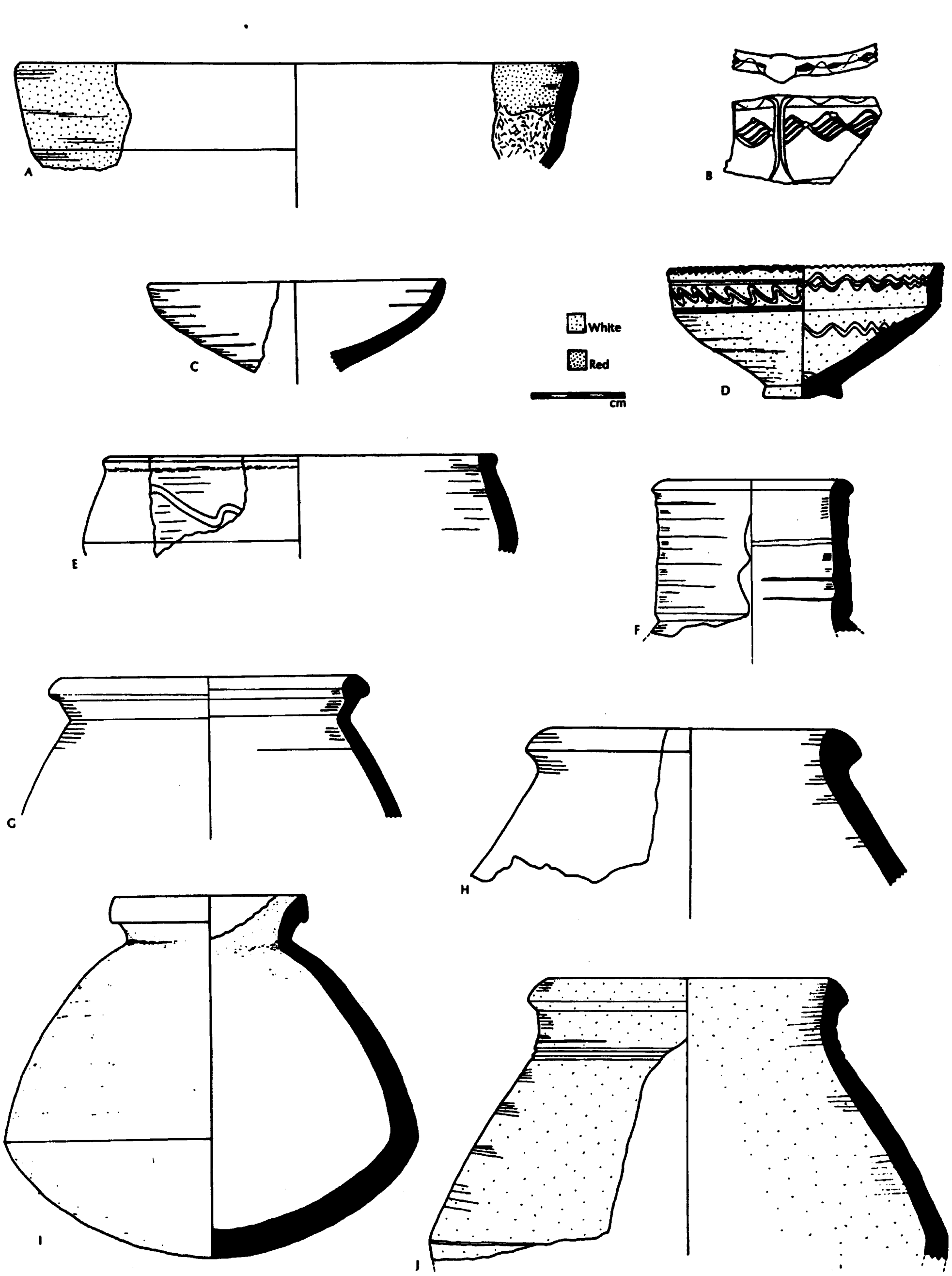


Figure 3.5 Second Intermediate period pottery from Askut.

quantity of fine-medium rounded sand, mostly at 0.5 mm or less, but occasionally up to about 1 mm. Color is very similar to the Marl A3-4. It ranges from pale olive (5Y 6/3) with pale yellow zoning (2.5Y 7/4), to white (5Y 8/1) with pale to reddish yellow or light red (2.5Y 8/3 to 5YR 7/6 or 2.5YR 6/6) zoning. It occurs from the Second Intermediate period, when it begins to rival the Marl A3 and A3-4 fabric. It appears commonly in carinated bowls, as well as medium and large storage vessels (figs. 3.5B,G,F,I; 3.6M; 3.7L; 3.8D).

Marl C is a dense, hard fabric, with fine sand and medium to coarse white and

a. b.

c. d.

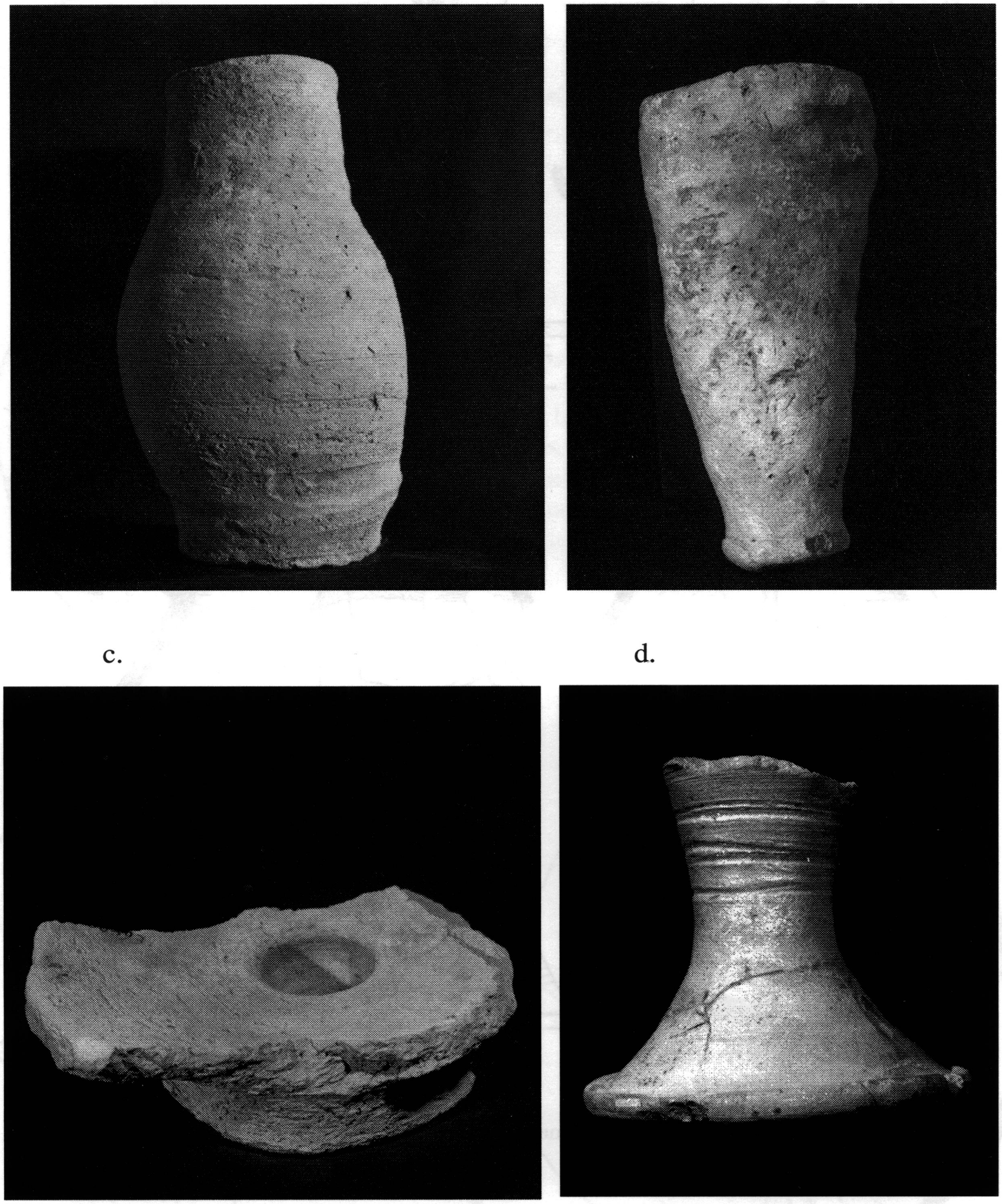


Plate 3.1 Pottery of the Middle Kingdom at Askut: a) "beer bottle," note cursory wet smoothing; b.) bread mold, note the finger marks at the top from pressing the clay around a wooden form; c) large tray, a classic chaff tempered Nile Silt C; d) "Gilded" ware stand.

red inclusions up to 5 mm in length. It typically has a white surface (5Y 8/2) with a yellowish red background (2.5YR 5/6) showing through. The fracture is often distinctly zoned, with a grey to black core. It is used for large to medium storage jars and "fish plates" during the Middle Kingdom (figs. 3.2N; 3.4A,I,L; the last are not illustrated but do occur in small numbers in both Marl C and Nile Silt C).[4]

Marl D is another dense fabric with numerous white calcareous inclusions and sand. It is usually brown to reddish grey (7.5YR 5/2 to 5YR 5/2) with a pale yellow (5Y 8/3) coating, sometimes burnished, which often flakes away from the surface. It has appeared thus far only in amphorae of the New Kingdom (fig. 3.8G,L).

The Middle Kingdom

The pottery from the Middle Kingdom was easier to characterize than that of the Second Intermediate period or New Kingdom. This is partly due to the presence of several large groups of sherds and whole vessels, often in excess of five hundred pieces per level, which made the process of visual sorting much easier. The standardized nature of the ceramic repertoire at this period may also be a factor (Bourriau 1981, 55). The Askut assemblages closely parallel the Lower Egyptian corpus seen in the typologies established at Harageh (Engelbach 1923), and, more recently, at Dashur (Arnold 1982).

Technology, Surface Treatment, and Decoration

Most of the vessels were thrown on the wheel, with the exception of certain types that were typically handmade at this period. The bodies of large vessels were usually handmade, often in several pieces with the rim finished on the wheel (figs. 3.2N; 3.4I,K). Beer jars, on the other hand, were usually thrown (fig. 3.4C was handmade but is unusual in this regard). Small vessels, like figure 3.4K, were rarely handmade. Footed incense burners were made in two parts (figs. 3.2I,J; 3.4M). Bread molds were handmade on a conical form and had a fine layer of silt inside, presumably to ease removal of the bread (fig. 3.4E, pl.1b). Bases had been trimmed with a knife (figs. 3.2A,E; 3.3A,G,H; and traces under compaction of 4J) or reed brush (figs. 3.2K, 3.4C; inside stands 3.3K,N,R,S), or cut with string while turning on the wheel, but were never finished on the wheel. Sometimes a crude ring was pinched onto the base of small cups and bowls (figs. 3.2B, 3.3C). Large jars and bowls show string impressions from support while drying (fig. 3.2N; cf. the Second Intermediate period jar in pl. 3.3c). Most vessels have received at least a cursory wet smoothing, although this was often very rough, still allowing the wheel marks to be seen (pl. 3.1a). Moderate to heavy polishing was found in a variety of forms (e.g., figs. 3.2A,H; 3.3M,P,R; 3.4F,G,J), but only on a small number of the vessels overall. Regular rilling patterns as on figure 3.4J show that this was occasionally done on the wheel.

Most vessels were undecorated, but at least a handful of decorated vessels occurred in every large group. Red painted decoration was the most common and included a weak red to red (2.5YR 7/8-6/8 to 10R 5/8) wash on the interior and/or exterior of a variety of both closed and open forms (figs. 3.2-4). Plates and bowls occasionally had a red rim. This element was particularly common in the hemispherical bowls. White decoration occurred occasionally on or below the rim and in crosses or similar patterns. Unfortunately, the white wash used is unstable, and so it is difficult to estimate the amounts originally present. Black painted lines occur very rarely, most commonly as a border around a white band on the necks of beer/water jars (like fig. 3.4C).

Incised straight and wavy lines, often in combination, were also a standard motif (figs. 3.3 and 3.4). They occur below the rims on the exterior of carinated cups and bowls, and also on jars along the neck or at the base of the neck. Incising was sometimes combined with rim pinching and applied ridges on large carinated bowls (fig. 3.3G,J). Very rarely, applied small cups were added to the rim of Marl A3 jars and carinated bowls, sometimes in combination with combing (not illustrated). Two pieces of clay were sometimes applied below the rims of small cups, sometimes in combination with the incised decoration on carinated cups (fig. 3.3E,F). They might either be related to the Hathor vase with applied nipples, which does occur rarely at Askut (pl. 3.2a), or perhaps served to tie off a chord securing a cloth or leather cover. They certainly do not represent real or vestigial handles. Applied crocodiles appear very rarely on spouts and the rims of bowls (pl. 3.2b), and may be related to the worship of Sobek near Armant (Vercoutter 1957), although they are a typical votive offering at various sites in Upper Egypt (Kemp 1989, 72).[5]

'Gilded' ware also appears as a regular, if rare, component of the Middle Kingdom assemblage at Askut. This type of decoration only occurs in Nubia in the Second Cataract forts and in pottery of the Kerma Classique (Gratien 1990, 234, no. 335). It would appear to be a wash or slip with a high content of golden mica. Since mica appears abundantly in Nile silts at Askut, it would presumably not have been difficult to extract it through levigation or some other means. This 'gilding' was applied not only to very fine, but also to fairly coarsely made, bowls, jars, stands, and lids (e.g., fig. 3.3Q, pl. 3.1d; ibid.).

Forms and Chronology

The use of painting, incising, and applied decoration is typical of the period from Amenemhet III onwards (Bourriau 1981, 55). This is consistent with the founding of Askut, probably during the reign of Senwosret III (S. T. Smith 1991b, 118). Close parallels can be found for distinctive forms and decoration from both Dashur Complex 6 of the late Twelfth to early Thirteenth Dynasty (cf. figs. 3.2-4; Arnold 1982, esp. figs. 6.11,21; 8.1,2,7), and Complex 7 of the advanced Thirteenth Dynasty (cf. ibid., esp. figs. 10.7,8,15; 11.1,3,4). The vessel indices of 81 hemispherical bowls range from 117 to 180, with a mean of 148.4, encompassing both Complex 6 at the high end and Complex 7 at the low end (fig. 3.9; ibid. 1982, 60, fig. 17). Two large groups from individual contexts correlate well with Arnold's minimum-maximum analysis (1988, 140-1), running from 142 to 180 (mean 161) in Room 12 (16 vessels), and from 117-145 (mean 135; a single outlier was 152) below Room Southeast 8 (7 vessels). A group of 7 vessels from Room 4 represents an intermediate phase with a range from 133-158 (mean 147). Several other groups show a similar distribution, indicating that Askut contains a mid Thirteenth Dynasty phase not represented at Dashur. This corpus may fill the gap between the end of Complex 6 in ca. 1760 B.C. or later, and the start of Complex 7 around 1700 B.C. (Arnold 1982, 40). Future work will concentrate on correlating these hemispherical bowl groups and vessel types in the several secure Middle Kingdom contexts available at Askut. As quantification proceeds, it should be possible to define better the total ceramic assemblage occurring in these phases.

Arnold places the end of Complex 7 at about 1650 B.C., and Tell el-Yahudiya

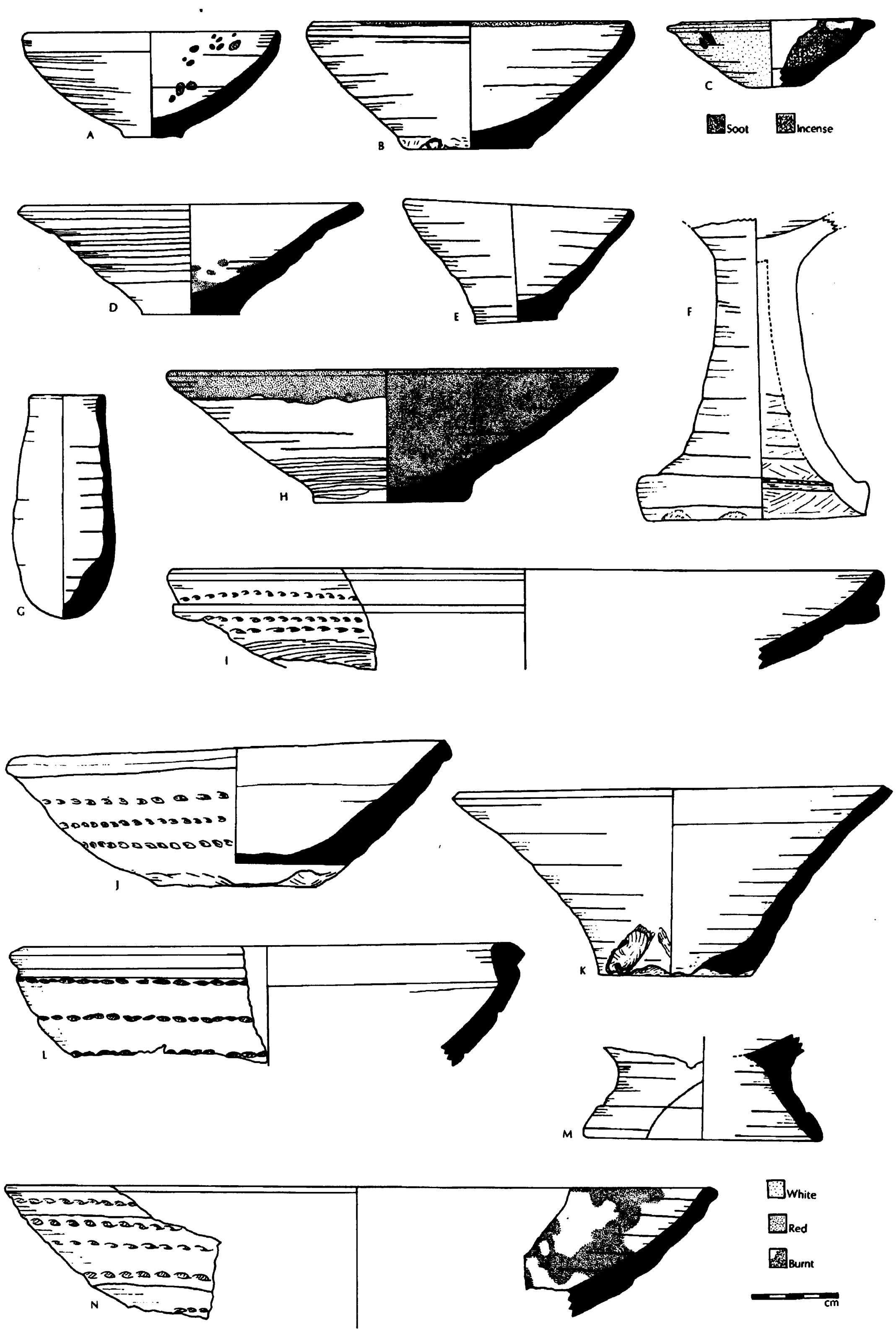


Figure 3.6 New Kingdom cups and bowls from Askut.

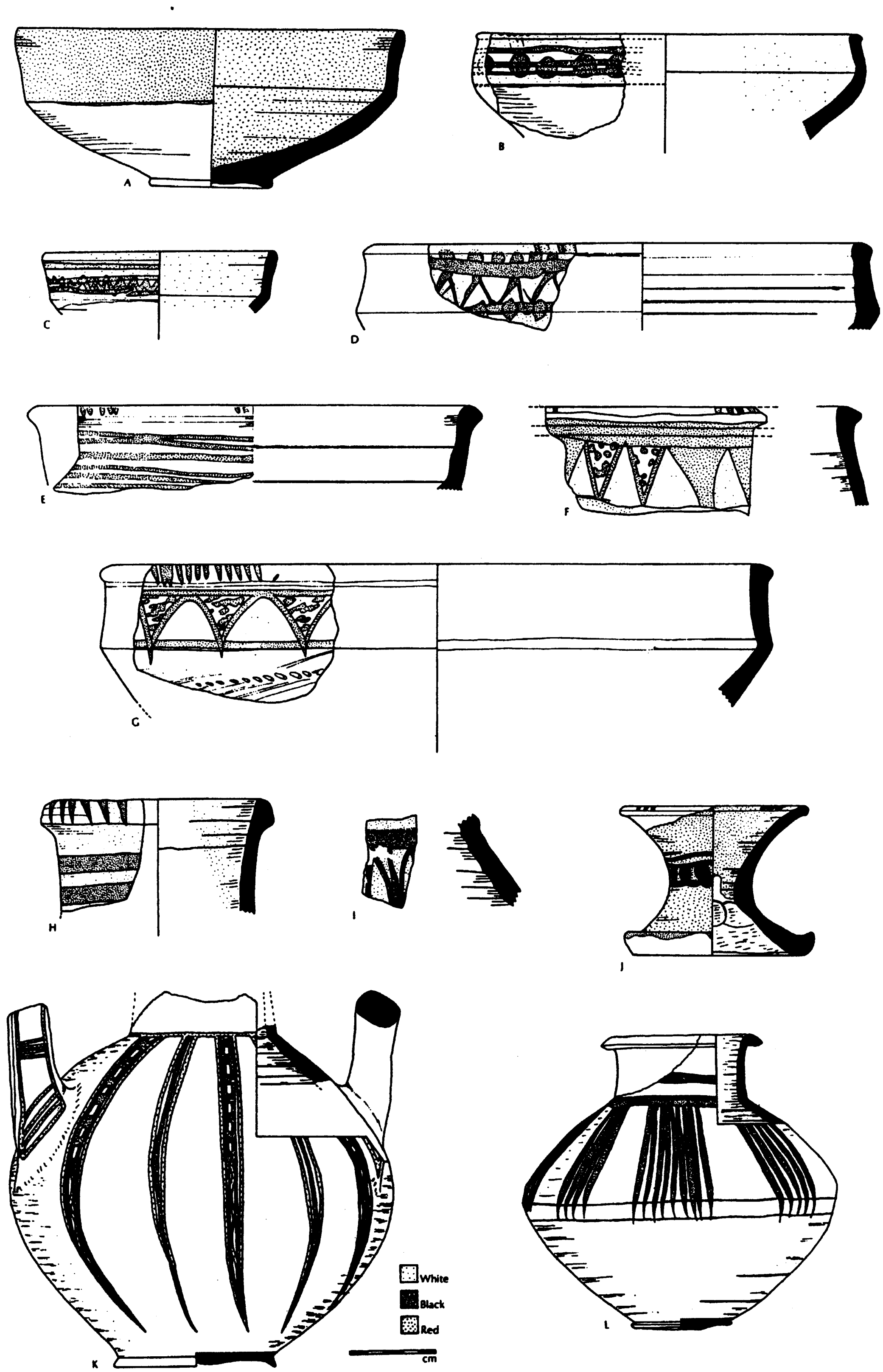


Figure 3.7 New Kingdom decorated pottery from Askut.

ware from these levels at Askut is consistent with this date. The common form is Piriform 1b-c, which should run between ca. 1710-1650 B.C. The example in figure 3.3L, the best preserved, is somewhat unusual, with the rectangular decorative zones of the 1b style but with only two decorative bands, as with 1c juglets. It might represent either a variant or a very early 1c. Two associated hemispherical bowls with vessel indices of 128 and 136 indicate a date in the advanced Thirteenth Dynasty, and pottery from nearby deposits included many parallels with Dashur Complex 7. Three more sherds of Piriform 1b, and a Middle Bronze (MB) II red polished juglet neck (fig. 3.12B,C; pl. 3.2d) come from similar contexts. These correspond to Strata G-F at Tell el-Dab'a, equated by Bietak to Dashur Complex 7 (Bietak 1984, 480). Hemispherical bowl vessel indices from these strata commonly run from 120-40, very much the same as the later Askut groups. Another similarity is the dominance of the Thirteenth Dynasty "kettle" mouthed beer jar (cf. fig. 3.4B,C; Bietak 1991, fig. 7) over the funnel-shaped neck, occurring at Askut in earlier strata but not illustrated here (e.g., Arnold 1982, fig. 7.11). William Dever has recently challenged Bietak's dating of this material, placing Stratum G in the late Twelfth Dynasty and F in the earliest Thirteenth Dynasty. He also notes that the dating of Complex 7 is somewhat uncertain, possibly falling as early as 1760 B.C. (Dever 1991, 74, 76, and n. 7). The presence of a mid Thirteenth Dynasty group at Askut, however, implies a substantial gap between the end of Complex 6 and the start of Complex 7, consistent with Arnold's suggested starting date of ca. 1700 B.C. for the latter. The Yahudiya ware clearly occurs at Askut in contexts well past the beginning of the Thirteenth Dynasty, supporting Bietak's position.

Imported and Native Pottery

Several types of non-Egyptian pottery appear as a regular, if minor, component of the Middle Kingdom assemblage. At least some of the Tell el-Yahudiya ware appears to be in a Palestinian fabric. Sherds of Palestinian storage jars have also been identified.[6] Of more interest from the point of view of Egyptian imperialism is the rare, but consistent, presence of handmade native Nubian pottery (fig. 3.10). Most of the types have closest parallels in the domestic pottery of the contemporaneous Kerma Moyen (cf. Type 7, Gratien 1978, 175, 243-4; also Gratien 1985a, 419ff., fig. 313; and Maystre 1980, pls. XLVII-XLVIII). These sherds are primarily from open forms, often used as cooking vessels. This distribution implies relations with a settled group, rather than long-distance trade,[7] and may indicate that the frontier softened towards the end of the Middle Kingdom occupation of Nubia. Alternatively, these designs could have been part of a broader cultural tradition. Some of the same patterns have been found at a C-Group settlement at Aniba (Steindorff 1935, 202ff., pl. 92ff.), but few of the other typical C-Group types, and only one sherd of the elaborate Polished Incised wares characteristic of this culture, appear at Askut (fig. 3.7F). Distinctively Kerma Moyen sherds, however, do occur, including a nearly complete Kerma Moyen beaker from a secure early Thirteenth Dynasty context (Room 12, see above). The implications of this material will be discussed below.

Second Intermediate Period

This period, although definitely present at Askut, has proven somewhat elusive. This situation is partly due to the lack of heavy deposition within preserved structures, as was the case during specific times in the Middle and New Kingdoms, but may also be

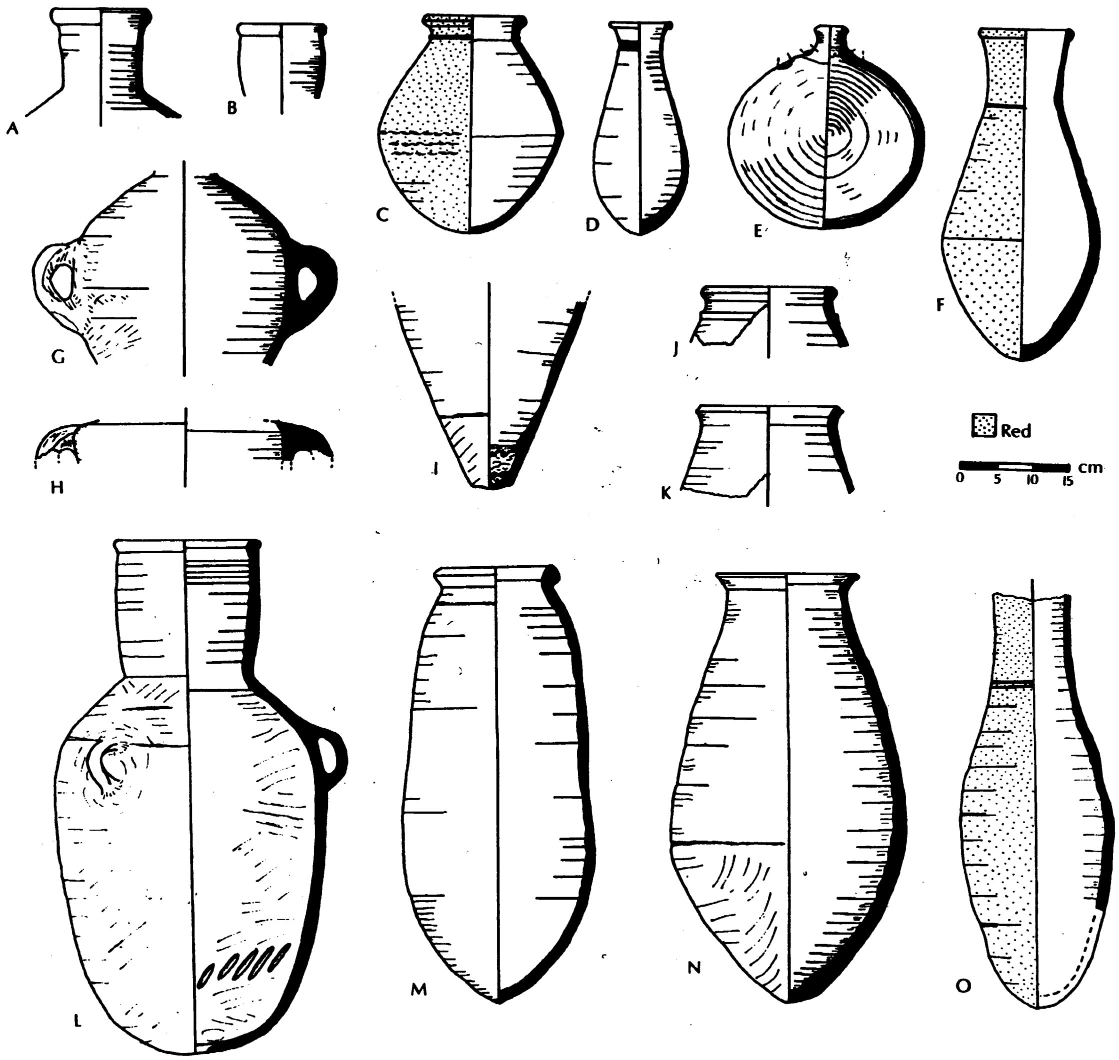


Figure 3.8 New Kingdom jars from Askut.

a factor of the smaller amount of time available for deposition. The Middle Kingdom strata account for about two hundred years (ca. 1850-1650 B.C.) and the New Kingdom over four hundred (ca. 1550-1100+ B.C.), while the Second Intermediate period was at most one hundred years (ca. 1650-1550 B.C.). Also, as Janine Bourriau (1991, 130-31) has pointed out, in Upper Egypt the Second Intermediate period has a slow transition from the Middle Kingdom and to the early Dynasty 18 assemblages. At this point it is possible to document a few of the more diagnostic types. Once these as-

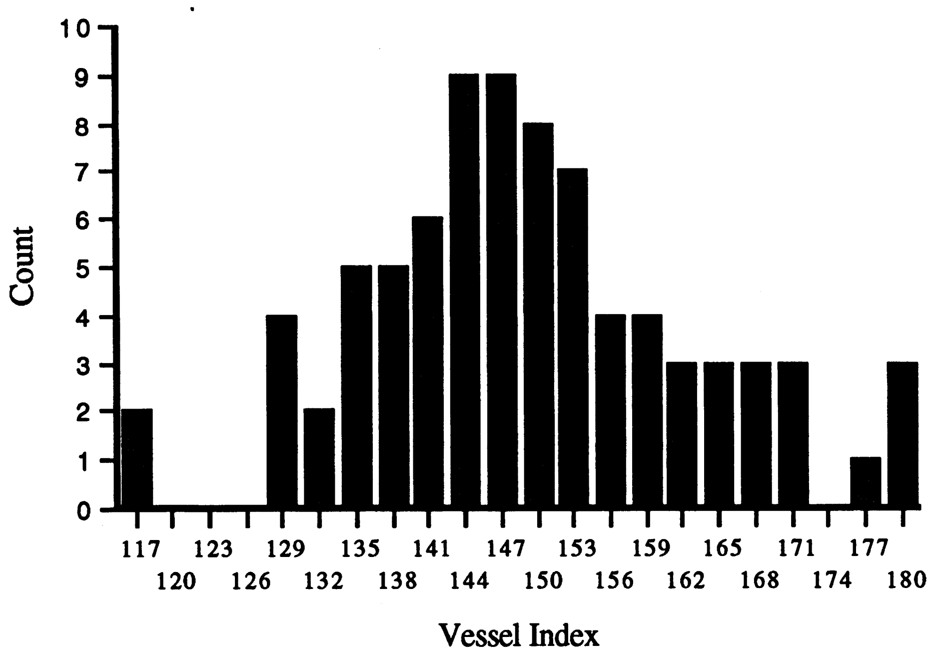


Figure 3.9 Vessel indices of hemispherical bowls at Askut.

semblages are quantified, it will be possible to define better the full range of types appearing at this period.

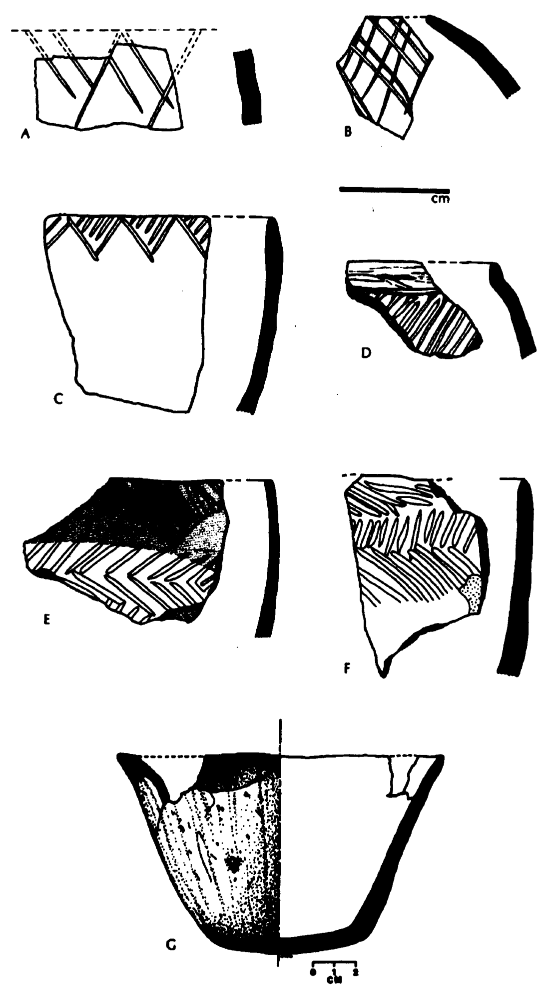
Technology, Surface Treatment, and Decoration

The Egyptian pottery continues to be primarily wheelmade, with the exceptions noted above. Wheel finishing replaces the rough knife and reed trimming on the bases of bowls and other vessel forms, and a wheel turned ring base becomes popular (fig. 3.5D). Bases cut with a wire or string while the wheel is turning do, however, continue to appear. Large vessels continue to show the use of rope supports while drying (pl. 3.3c). A polished red surface on plates, bowls, carinated jars, and stands becomes more common in the Second Intermediate period. Burnishing was often done with a pebble or similar hard tool, usually by hand (pl. 3.3a). One of the most characteristic decorative motifs is the use of combed wavy lines along with applied ridges or "dummy pots" along the rim of carinated vessels, usually in a Marl B (fig. 3.5B). The use of a white slip, often polished, on Nile Silt B2 and D in imitation of the marl clays also becomes common (fig. 3.5D,J).

Forms and Chronology

Several vessel types are characteristic of the early to late Second Intermediate period (cf. Brunton 1930; Bourriau 1990, and forthcoming). Small and carinated bowls with a distinctive profile and the decoration noted above gradually replace the old hemispherical bowl and the other forms characteristic of the Middle Kingdom (fig. 3.5A-E, with polished interior, are particularly common). Bietak reports the slow introduction of some Second Intermediate period types, particularly bowls with a ring base, in otherwise Middle Kingdom groups with Tell el-Dab'a Stratum E/2=b/1 (ca. 1640 B.C.; Bietak 1991, 41, fig. 10). Some strata at Askut show a similar pattern, and

Figure 3.10 Native Nubian pottery from Middle Kingdom contexts at Askut.



represent a transitional phase dating to the very early Second Intermediate period or very late Thirteenth Dynasty. Carinated jars, often with a low, sharp profile and a distinctive rim, become popular in the early to late Second Intermediate period, often in a Marl B fabric (fig. 3.5G-J; pl. 3.3a; cf. Bourriau 1981, 29, 35, figs. 1-4; idem, forthcoming). The forms and rim styles of some of the large storage jars change into a Marl B (fig. 3.5F) or Silt C (pl. 3.3c) and D (jars related to the Marl C type represented by fig. 3.4M but with somewhat different rim and shape; cf. Bietak 1991, fig. 9.5).

Imported and Native Pottery

The amount of native Nubian pottery increases substantially in these levels, although still in the context of a primarily Egyptian assemblage. Incised bowls now have patterns more characteristic of the Pan Grave and possibly C-Group (fig. 3.11A-I; cf. Brunton 1930, pls. LXXXII-LXXXIV; Sadr 1987, figs. 4, 5; Gratien 1985b, figs. 11-3). The Kerma Moyen style is replaced by Kerma Classique of the finest quality (fig. 3.11J-L; cf. Gratien 1985b, 204ff., figs. 61-62), equal to that found at Kerma.[8] Beakers and various sizes of storage jars occur in the fine black topped fabric, as well as large globular jars with roulette impressed rims (fig. 3.11L). An unusual type of bag shaped jar with a groove in the base may be of Kerma origin, although an exact parallel has not been found (pl. 3.3b). The more generic Nubian mat and chord impressed wares also occur, along with applied clay to roughen the bottom of cook pots (figs. 3.11M-O; cf. Bourriau 1990, 16-8, fig. 4.1).

NEW KINGDOM

Since the New Kingdom occupation of Askut covers a very wide time period, it is not possible within the scope of this paper to show the full range of variability within the different assemblages. Therefore, this section will concentrate on some of the more representative and diagnostic types. Unfired Nile silt sherds of both well thrown and crude mat impressed bowls provide clear evidence for local manufacture of pottery in the New Kingdom and perhaps the Second Intermediate period. Although no obvious kiln site has been found (see note 5), open or small pit firing can reach more than adequate temperatures for the Nile silt fabrics and provide a great deal of control in the hands of a skilled potter (Rye 1981, 96-9, 102-3).

TECHNOLOGY, SURFACE TREATMENT, AND DECORATION

The Egyptian pottery is still predominantly wheelmade. The use of chord supports during drying is common in large bowls and jars (figs. 3.6I-J,L,N; 3.7G; 3.8C). Bases are wheel finished, although string cutting continues to be used for simple bowls (e.g., pl. 3.4b; note rilling from wheel finishing running to the base). Wheelmade ring bases become more popular on both bowls and small to medium-sized jars. A type of jar or bowl with the base extending below the ring is introduced (fig. 3.7L). The bases of amphorae were sometimes made in a mold (cf. fig. 3.8I; Hope 1989, 93, pl. 5c). The trend towards heavier finishing seen in the Second Intermediate period continues in the New Kingdom. Polishing, often on a red coating and including "pattern burnishing" on the wheel, is common on bowls, stands, and jars (figs. 3.6H; 3.7A-G,L; pl. 3.4d). The incised decoration favored during the Middle Kingdom and Second Intermediate period falls off, and the use and variety of painted designs expands, especially on carinated bowls and jars (fig. 3.7; pl. 3.4d). The most popular are crossed line and line and dot motifs, sometimes in bichrome. A polished white coating is also commonly, although not invariably, used as a ground for these painted motifs on Nile Silt B2 bowls and jars (fig. 3.7B-D,H,I). A simple white coating is common on incense burners (fig. 3.6B; there were possible traces of white on 6F as well).

FORMS AND CHRONOLOGY

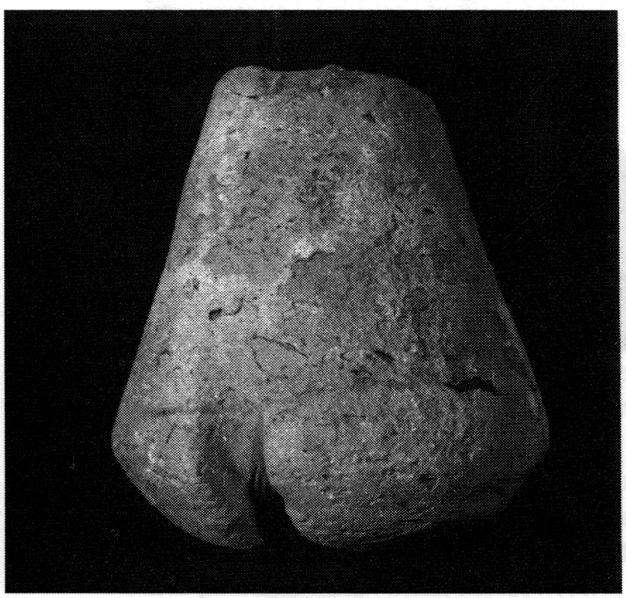
Vessel form and decoration reflect strong occupation throughout Dynasty 18 (figs. 3.6-8; cf. Holthoer 1977; Bourriau forthcoming; Hope 1989). The trends during the Second Intermediate period continue, with carinated bowls and jars being particularly common. The plain bowl with polished and/or painted interior completely replaces the hemispherical bowl of the Middle Kingdom, occurring with high frequencies in New Kingdom contexts (figs. 3.5A and 3.6A; the latter with red "splash" decoration is rare). Some vessel forms continue from earlier periods, notably the round shouldered, pointed base jar of the Middle Kingdom (fig. 3.4G, but not F). The "decanter" has shrunk and now has a wheel finished base (cf. figs. 3.2E, 3.6G). Incense burners are taller and have a ledge-shaped rim (cf. figs. 3.2I,J; 3.3I; 3.6F). "Zir" type jars with a folded rim have become elongated (cf. figs. 3.4M; 3.8N). Simple lined motifs on carinated bowls and jars are typical of the early Eighteenth Dynasty through the reign of Thutmose III (fig. 3.7; Bourriau 1981, 72, 135). Bichrome pottery and the strap handled form shown here (fig. 3.7K) are characteristic of the mid Eighteenth dynasty, between the reigns of Thutmose III and IV, but drop off during the reign of Amenhotep III (ibid., 77-79; idem 1982, 80; Hope 1987, 109; idem. 1989, 7). Pilgrim flasks (fig. 3.8E) may occur as early as Thutmose III, but do not really become com-

Plate 3.2 a) hand holding nipple from a "Hathor" vase; b) crocodile on small bowl with incurving rim; c) Mycenaean pilgrim flask; d) Palestinian MBII red polished juglet.

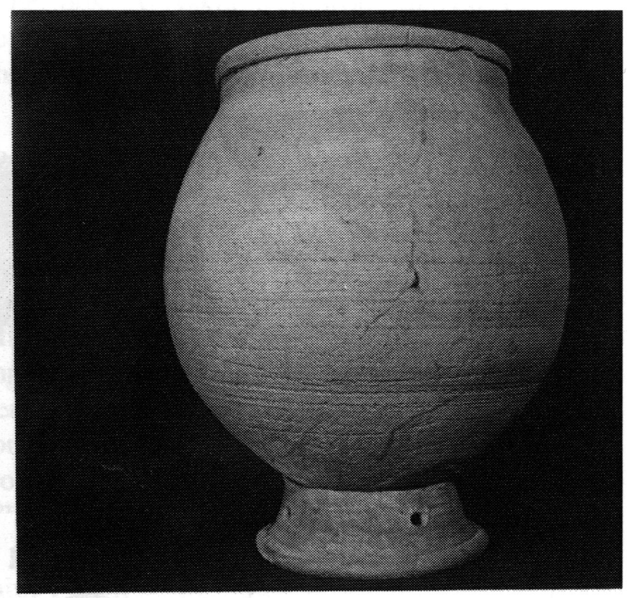
a.

Plate 3.3 Second Intermediate period pottery from Askut: a) red polished, low waisted carinated jar; b) unusual bag-shaped vessel (Kerman); c) large storage jar and stand, note the impressions from rope supports during drying.

b.



c.



mon until Amenhotep II, continuing in popularity through the end of the New Kingdom (Bourriau 1981, 75-6; idem 1982, 83). Askut continued to be occupied during the Ramesside period. Restricted carinated bowls are characteristic of the later New Kingdom (e.g., Hope 1989, fig. 13q-r), and a three-handled amphora reused as a drainage pot is similar to a type which occurs from the reign of Ramesses II (cf. fig. 3.8L; ibid., 94, fig. 3.2), while a large storage jar is very similar to an example from a foundation deposit of Ramesses IV (cf. fig. 3.8M; Hölscher 1939, pl. 56).

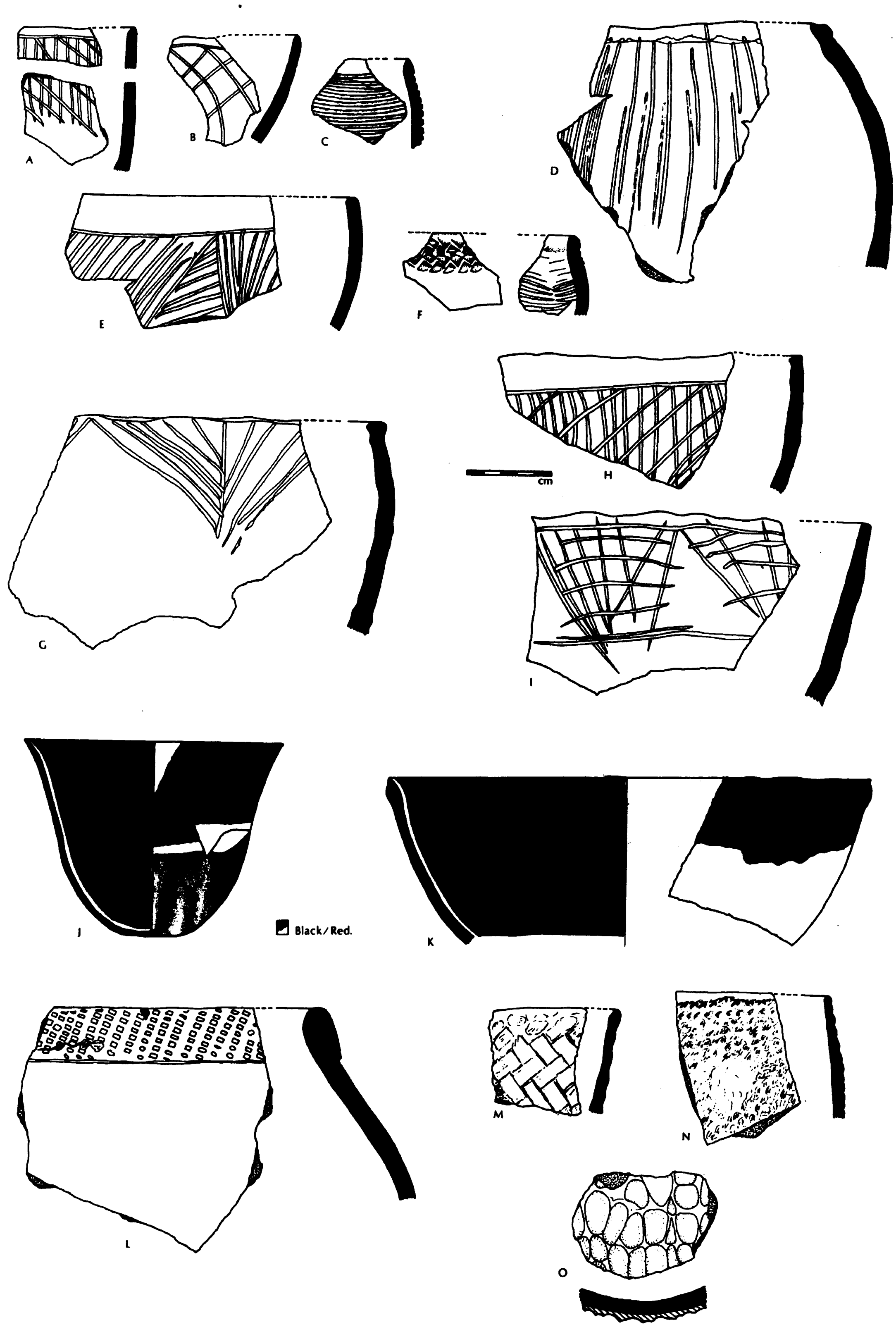


Figure 3.11 Native Nubian pottery from Second Intermediate period and New Kingdom contexts at Askut.

Imported and Native Pottery

A Cypriot Base Ring Ware IAa(i) juglet of the early Eighteenth Dynasty (fig. 3.12A; Merrillees 1968, 147ff., pl. III) and sherds of a Mycenean stirrup jar and pilgrim flask, probably Late Helladic IIIA2 (pl. 3.2c, ca. 1350-1300 B.C.; Mountjoy 1986, 79ff.), were found. Palestinian amphorae also occur, including one shoulder from a Late Bronze (LB) II Canaanite jar (ca. 1300-1200 B.C.; cf. Amiran 1970, 142, pl. 43; and, in Egypt, Hope 1989, 95, figs. 4-5). Native Nubian pottery continues to appear throughout the Eighteenth Dynasty, with the same resemblance to Pan Grave and C-Group pottery as in the Second Intermediate period (fig. 3.11D-E,G,M-O). Kerma Classique disappears, apparently replaced by the cruder Kerma Récent, which has been tentatively identified in early to mid Eighteenth Dynasty contexts.

Part Two: Politics

Adams (1979) has cautioned that changes in a ceramic repertoire alone cannot be used as evidence of cultural or political change, since pottery production can be influenced by a small number of individuals and often follows its own dynamic. By taking into account the processes and patterns of deposition, however, pottery can provide key information about the chronological and cultural associations of a site where reasonable control over provenance is established (Adams 1986/87). When this information is combined with the historical record in a region like Nubia, it can document key political changes at different periods. At Askut, a rigorous analysis of the pottery allows us to document archaeologically for the first time the history of the Egyptians living in Nubia from the end of the Twelfth Dynasty through the end of the New Kingdom.

Based on an analysis of the stelae and cemeteries of Buhen, H. S. Smith (1976, 67ff.) has proposed that the garrisons changed from rotating military units to permanent settlers sometime in the late Twelfth Dynasty. Modifications in the plans of several of the rooms in the "barracks" area of the Main Fort at Askut, dated by associated ceramics to the Middle Kingdom, confirm this conclusion (fig. 3.13, pl. 3.5a). Rooms 5-6 show the typical tripartite arrangement of the Twelfth Dynasty "barracks" unit, but there are several examples of remodeling. Upon the abandonment of Rooms 11 and 12 in the early Thirteenth Dynasty, a door was knocked through to Room 13 from Room 28. Sometime before the mid Thirteenth Dynasty, two doors were added from Room 2 to the Room 1 complex, and Rooms 2, 3, 4, and 10 were completely remodeled from two "barracks" units into one house with a completely different floor plan. These changes reflect patterns of private ownership attested at other periods in Egyptian history (H. S. Smith 1972).

Evidence of an ancestor cult similar to that found at Deir el-Medineh in the Ramesside period (Bruyère 1939, 85, 151ff.) also indicates settlers. A handful of fragments from offering platters or "soul houses" occurs in Middle Kingdom contexts at Askut (fig. 3.14). These modest funerary monuments were found by Petrie (1907, 14) in great numbers in the cemetery at Rifeh. They also appear, along with funerary stelae and statuary, at Kahun, Buhen, and other settlement sites (e.g., Petrie 1891, 9, 13, pls. IV, XII). Their presence in a domestic context is usually explained as the result of looting from nearby cemeteries or temples for reuse as children's playthings or architectural components (Emery, H. S. Smith, and Millard 1979, 98, 151). This is rather unlikely at Askut, however, since to loot the cemetery requires a boat trip to the

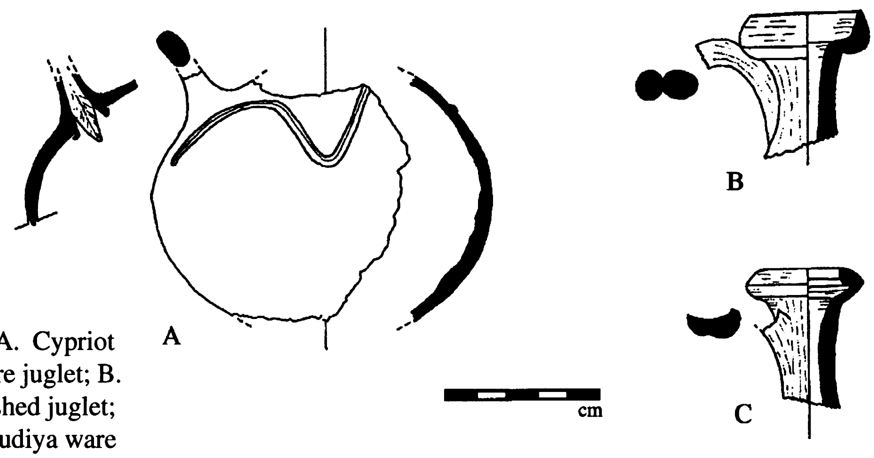


Figure 3.12 A. Cypriot Base Ring Ware juglet; B. MBII red polished juglet; C. Tell el-Yahudiya ware juglet

opposite bank of the river, and there is no temple or chapel dating to the Middle Kingdom. Room 12, filled with pottery of the late Twelfth to early Thirteenth Dynasty, has a niche with a cornice above a mastaba (pl. 3.5c). This group certainly represents a household shrine, the earliest example known, and the only one dating to the Middle Kingdom.[9] A fragment of a Middle Kingdom stela was found in Room 11, which was apparently abandoned at the same time. Although some of the stelae, statuary, and offering platters from Buhen and other settlements of the period were no doubt really looted (as was definitely the case at Kahun) or placed as *ex votos* in local temples (H. S. Smith 1976, 66-77), it is likely that many, in fact, originally derived from household shrines like those at Askut.

The association of official sealings with Middle Kingdom ceramic deposits demonstrates that control from Egypt was maintained until at least the advanced Thirteenth Dynasty (especially in the Southeast Sector; S. T. Smith 1990, 211-14). Goods were also flowing from both Upper and Lower Egypt, as shown by the presence of both Marl A and C storage jars. A considerable change takes place about the end of the Thirteenth Dynasty, with several structures abandoned and new ones built with very different plans. As noted above, the terminal Middle Kingdom assemblages, and thus this event, can be dated to ca. 1700-1650 B.C. by the presence of Tell el-Yahudiya ware (fig. 3.12c)and types of Dashur Complex 7. This correlates with an increase in the percentage of Asiatic pottery in Strata G-F at Tell el-Dab'a, which Bietak (1991, 38) interprets as representing an influx of settlers. Strains resulting from this immigration may have affected the central authority, draining resources away from Nubia and towards the Delta and forcing the Egyptian garrison-settlements to become even more dependent upon local resources for their maintenance. By Stratum E/2 at Tell el-Dab'a (ca. 1640 B.C.; ibid., 51-52), Hyksos kings ruled openly in the Delta, and the Egyptian settlements in Nubia were presumably left to fend for themselves as the central government fell into disarray. What happened to the expatriate garrisons who had regarded Nubia as their home for six or more generations? The stratigraphy at Askut indicates that they stayed on to serve the Ruler of Kush.

Although we tend to think of archaeological stratigraphy as a kind of giant layer cake, with one stratum succeeding another in relatively orderly fashion, deposition usually occurs in a complex pattern of peripheral disposal and abandonment, leading potentially to deposits of very different dates within and outside of buildings

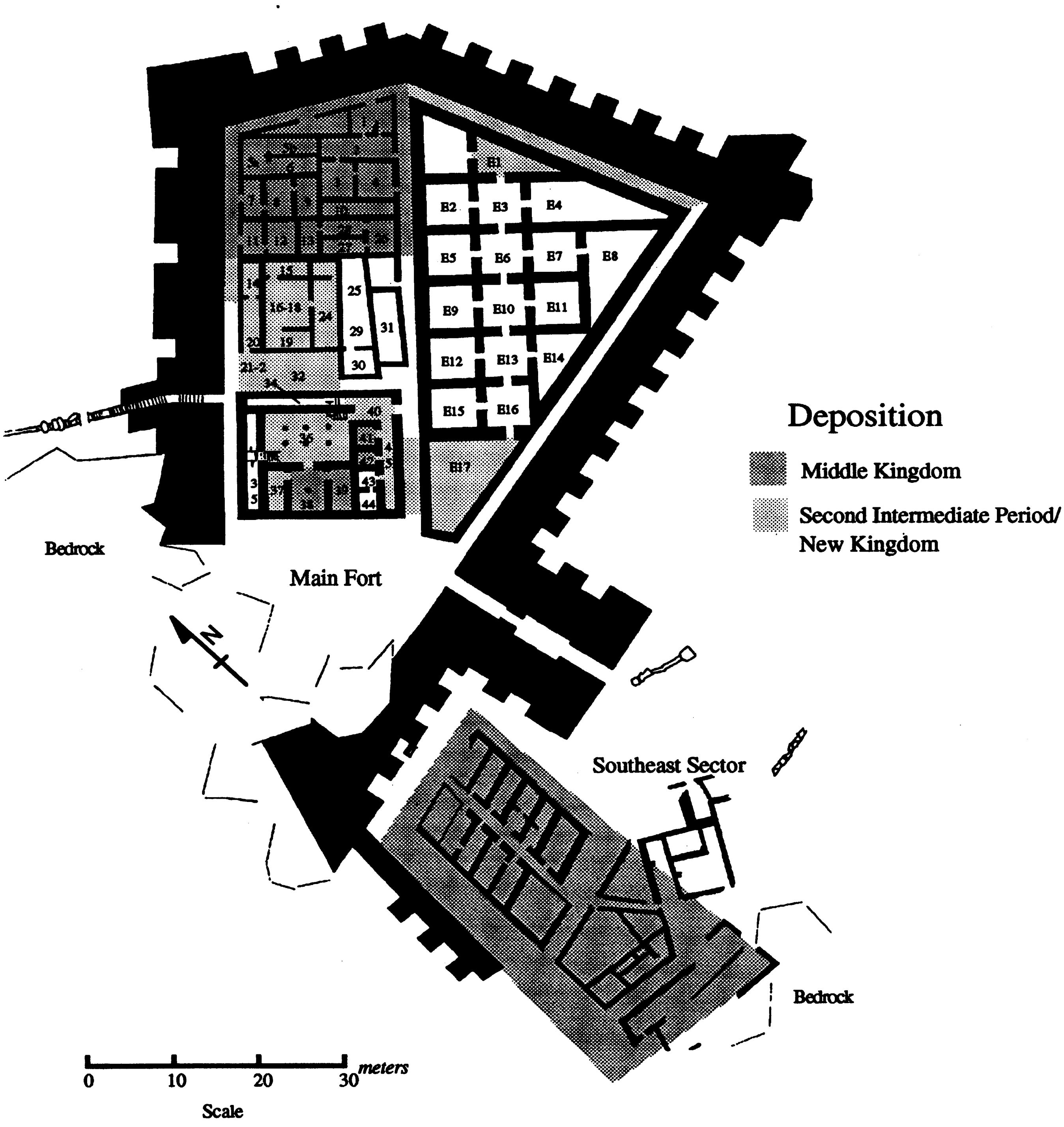


Figure 3.13 Distribution of ceramics at floor of upper level of the lowest layer at Askut.

(Dixon 1972; Hoffman 1974; Schiffer 1987; Kemp 1989, 301). Such layers often appear to reflect severe disturbance, and might be dismissed by excavators as unreliable. In Nubia, either this misinterpretation or genuinely poor preservation has hampered a reconstruction of events during the Second Intermediate period. H. S. Smith (Emery, H. S. Smith and Millard 1979, vii, 44, 93) concluded that at Buhen the general lack of stratification did not allow for reliable dating of deposits, since New Kingdom sherds often appeared at greater depths than those of the Middle Kingdom. Following the *layer cake* model, the different assemblages at Askut would also appear to be inconsistent, and Alexander Badawy (n.d.) concluded in almost exactly the same terms that disturbance had rendered contextual analysis useless. A careful consideration of processes of deposition, however, reveals strong indications of abandonment in some areas and maintenance of floor levels in others, explaining the otherwise puzzling lack of consistency in the association of depth with date. Thus Emery and H. S. Smith may have been overly pessimistic in their assessment of the stratigraphy at Buhen (cf. Bourriau 1991, 131).

Abandoned structures within a settlement present an ideal location for trash disposal, being both convenient and out of sight. Once started, deposition would continue until the rooms were filled (Schiffer 1987, 63-64; Dixon 1972). Figure 3.13 shows the distribution of ceramics from different periods at floor level.[10] The group of "barracks" style rooms discussed above shows a classic pattern of de facto abandonment refuse, characterized by intact and reconstructible pots, with secondary refuse as fill, represented by large numbers of 'orphaned' sherds which do not mend with one another (e.g., pl. 3.6a,b). The gradual nature of the abandonment (see above) and large numbers of sherds from this area, often over one thousand to a room, indicate continuous occupation at the site throughout this process (Schiffer 1987, 58ff., 298ff.). We need not look far to see who was producing this trash. The floors in the house comprising Rooms 14-24 were maintained at roughly Middle Kingdom levels until the late Eighteenth Dynasty, more than a meter below the extant fill in the northern group.[11] The original "barracks" complex that no doubt once stood here was remodeled into a typical Egyptian "mansion," with rooms grouped around a courtyard (cf. Peet and Wooley 1923, pl. I; Frankfort and Pendlebury 1933, pl. III). Floors in the nearby "Commandant's Quarters" (Rooms 34-45) were also maintained, as was the sturdy structure itself. Middle Kingdom deposits in Rooms 38 and 39 represent floor raisings, attested by the presence of lintels and ramps leading up to the new level. Rooms 41 and 42 were either abandoned or had similar floor raisings.

The Middle Kingdom buildings in the Southeast Sector were leveled off and new structures built above. A pattern of peripheral disposal appears around these later houses, with Second Intermediate period and Middle Kingdom pottery around and New Kingdom assemblages within them (fig. 3.15; pls. 3.5b, 3.6c). A *rdi-R'* scarab, characteristic of the first half of the Hyksos period and shortly before (Bietak 1991, 51),[12] from one of the peripheral deposits confirms the date. The Middle Kingdom material may indicate that these structures were in use by the advanced Thirteenth Dynasty, although more work needs to be done on the quantification of the ceramics and correlation of the architectural plans with the field photographs to rule out the possibility that they are associated with the earlier structures.[13] The house comprising Rooms 29-36 shows a direct connection to the Thirteenth Dynasty (S. T. Smith 1992/93). The final building incorporates the wall stubs and tile floors of an earlier structure, itself built above the remnants of the first, Middle Kingdom structure (Rooms SE 32a-b; pls. 3.7 & 8). A large Marl C storage jar set into the tile floor of Room SE 32b indicates a date in the advanced Thirteenth Dynasty (pl. 3.8b, fig. 3.4M; cf. Complex 7, Arnold 1982, abb. 11.3-4; Tell el-Dab'a "zir" type 4, Strata G-E, Bietak 1991, 36ff., fig. 9). Another pot was set into the floor in Room SE 32a. Although the rim was not preserved, several Middle Kingdom carinated cups placed within suggest a similar date (figs. 3.2D, 3.3E; cf. Dashur Complex 7, Arnold 1982, abb. 10.8, 11.2). These pots served as a drain for a household altar constructed on 40

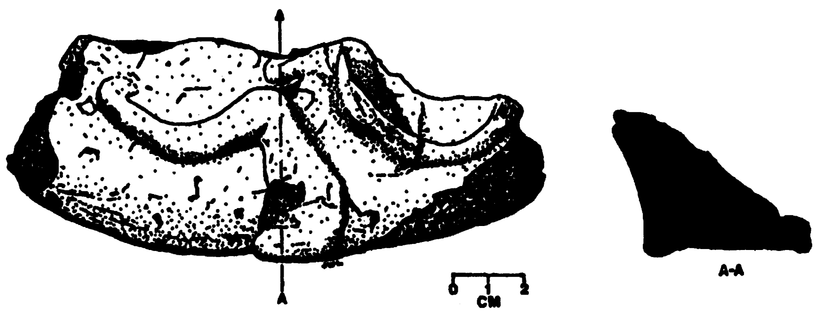


Figure 3.14 Fragment of Middle Kingdom offering tray with a haunch of beef and granary (?).

cm. of fill (pls. 3.7a, 3.8a). A Second Intermediate period style funerary stela was still in situ in the altar's niche, and two Second Intermediate period vessels were found nearby in a group of pots representing de facto abandonment deposition in the mid Eighteenth Dynasty (pl. 3.7b; fig. 3.5D, I; with the Eighteenth Dynasty pots in fig. 3.7B,K,L). This suggests a continuity of cult activity and occupation from the late Thirteenth to mid Eighteenth Dynasty, with the same house rebuilt and floor levels maintained at more or less the same level. A similar pattern appears at Deir el-Medineh, where houses were rebuilt on the same foundations over a period of four hundred years with no appreciable rise in house floors (Dixon 1972).

This evidence has a number of implications for the reconstruction of the history of Lower Nubia. Walter Emery, the excavator of Buhen, interpreted a massive fiery destruction layer there as evidence for a violent overthrow by the forces of the Ruler of Kush (Emery, H. S. Smith, and Millard 1979, 3, 92; H. S. Smith 1976, 80ff.).[14] The civilization at Kerma by this time had indeed reached a considerable sophistication, and might well have threatened the fort system.[15] But at Askut there is no evidence of a violent overthrow, and every indication that the fort was continually occupied. In fact, none of the Second Cataract forts, including Mirgissa, show any solid evidence of a siege. This is odd, for we would expect this powerful chain of forts, designed especially to stop an invading force from the south in its tracks, to have born the brunt of the first Kerma assault. Vercoutter (1976, 275, 303) has remarked on this point, and his analysis of the cemeteries reveals strong indications of continuity of burial, although he apparently still argues for a short hiatus in occupation based on the evidence from Buhen. Other forts, notably Semna, show similar evidence of continuity (in the cemeteries and especially the transitional layer "b" at Semna on Plan V; Dunham and Janssen 1960).

We have known for some time that Egyptians were serving the Ruler of Kush shortly after the Kermans gained control of Lower Nubia. Some were just mercenaries, but H. S. Smith (1976, 80ff.) traced the family of Ka and Sepedhor at Buhen, both of whom boast of serving the Ruler of Kush on their funerary stelae, back to the Thirteenth Dynasty. In order to reconcile their continuing presence with a violent overthrow of the fort, he suggested that they might have turned traitor, explaining the apparent ease with which the Kermans breached such powerful defensive works. They did replace another family in the office of Commandant, but this need not indicate that Sepedhor's father betrayed his Egyptian compatriots to the Kermans. It could

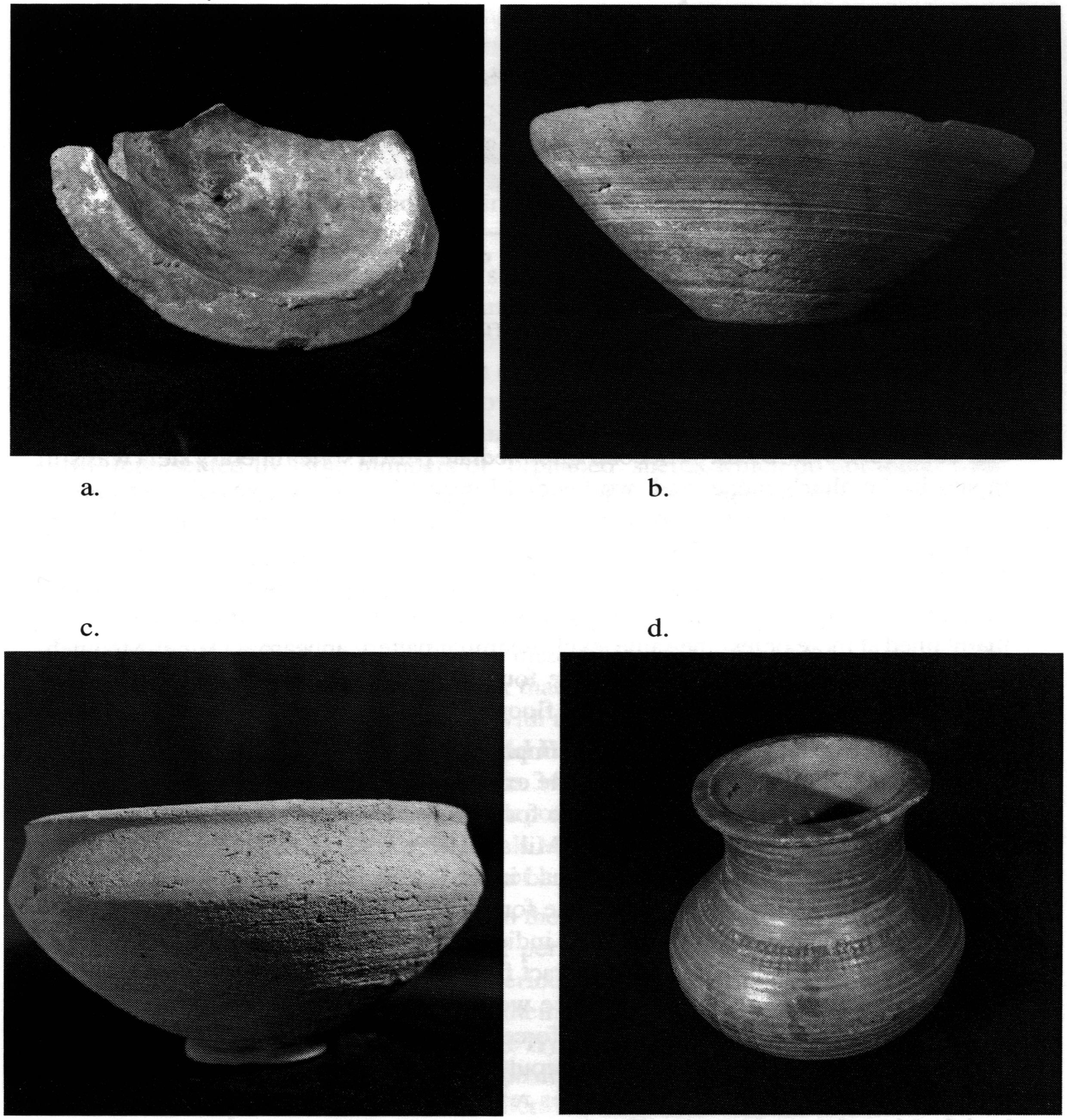
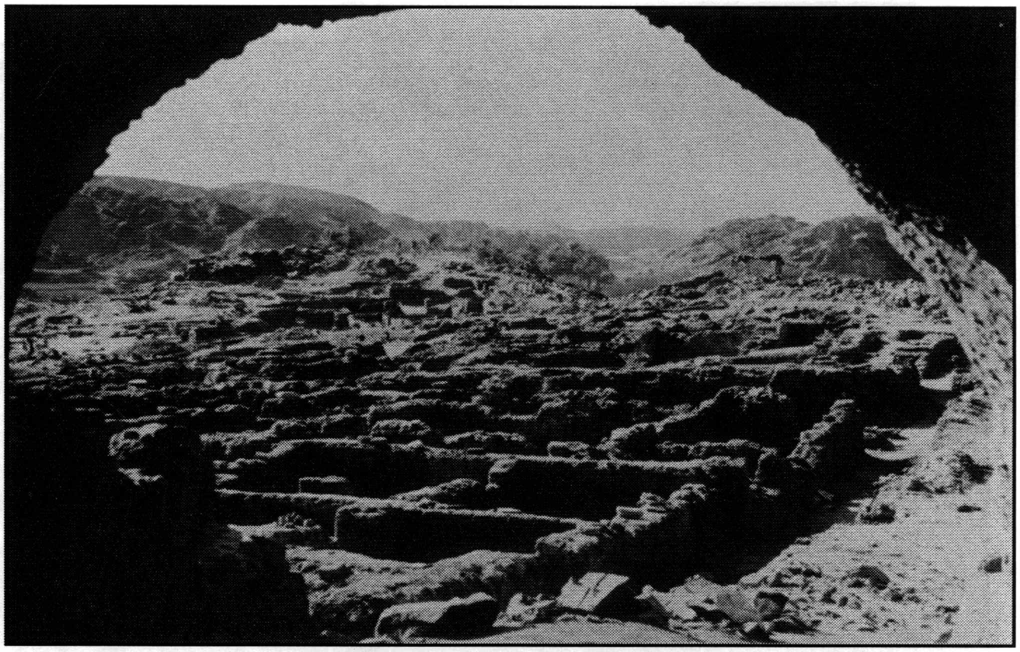


Plate 3.4 New Kingdom pottery from Askut: a) incense burner, note the characteristic pattern of burning; b) bowl, note the rilling patterns from finishing on the wheel; c) red polished, carinated bowl with inurving rim; d) red "pattern burnished" jar of the late Eighteenth Dynasty.

rather simply reflect a shift in politics at a critical transition.

Native Nubian pottery at Askut shows that the Egyptian expatriates were already in contact with settled Kermans by the early-mid Thirteenth Dynasty (fig. 3.10, and above). The Egyptians, although watchful, would have developed close contacts with Kerman merchants and diplomats during the years of peaceful trade which characterized the late Middle Kingdom. Both the Egyptians and the Kermans had every-a.



b.

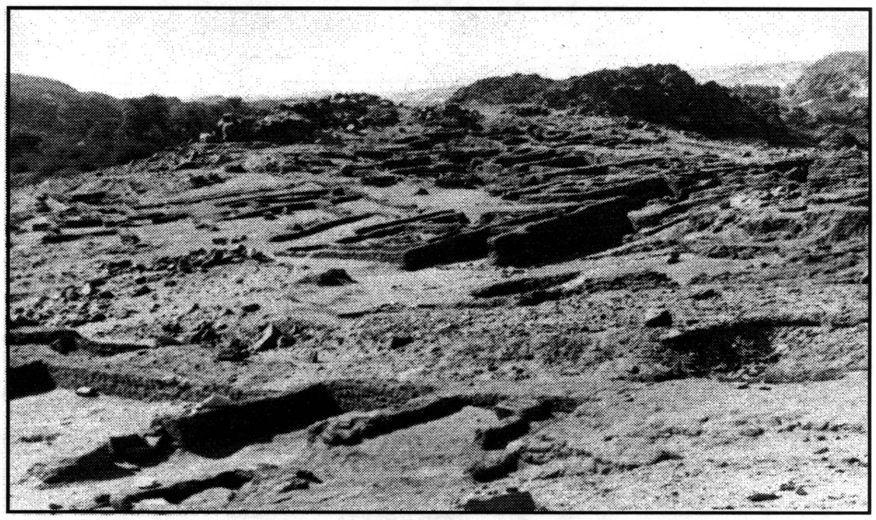
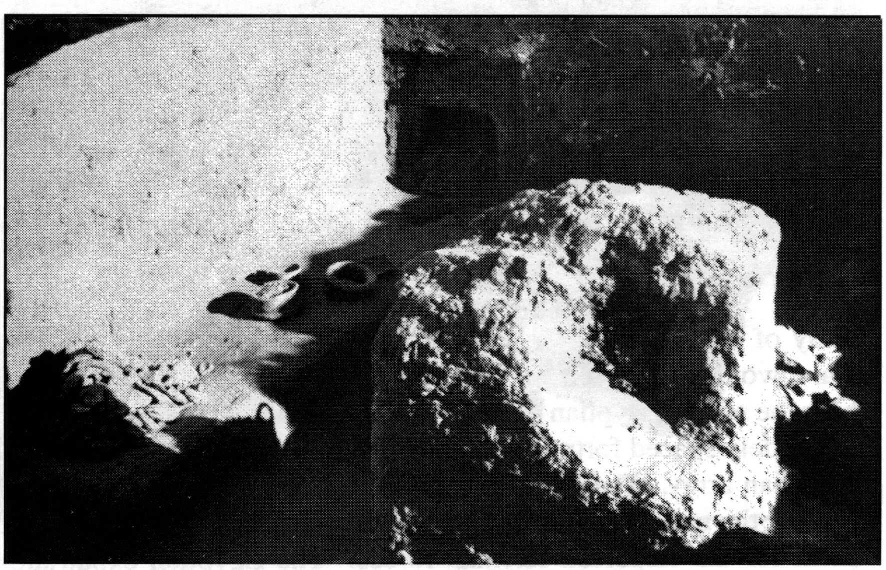


Plate 3.5 a) Askut, view across Main fort to Southeastern Sector; b) Askut, view of upper layer of Southeastern Sector; c) niche and mastaba in Room 12.

c.



a.

thing to gain from cooperation after the collapse of the Egyptian central administration at the end of the Thirteenth Dynasty. The expatriates were literate and had close contacts within Egypt, particularly the south. They were the ideal intermediaries with over a hundred years of experience in the Nubian trade. It is not surprising that Kushite rulers such as Nedjeh placed them in key positions. As for the Egyptians, they could see that the Kermans could impose their rule by force if necessary. The Ruler of Kush also still controlled the all-important sources of, or routes to, the luxury goods from the south. It is a measure of the trust the Kerma leaders placed in them that only light garrisons were established in Lower Nubia. Just as under the kings of the late Middle Kingdom, the brunt of both defense and trade was still undertaken by the expatriates. This in itself is more consistent with a system taken over intact than with one rebuilt after a hiatus.

If the Kermans were not responsible, who did sack Buhen? The Egyptian army of Kamose, with its expertise in siege warfare, honed in the ongoing Hyksos wars, would have been well equipped to reduce the fortifications around Buhen, perhaps the seat of Egyptian expatriate/Kerman rule. Unlike an attack coming from Kerma, the widely spaced fortresses of Lower Nubia could be easily bypassed by an invading Egyptian army. The Second Cataract, however, would block all progress south, and Buhen, the strongest fortress yet encountered, would have provided a natural rallying point for the dispersed Kerman forces. The Egyptian expatriates to the south, and b.

Plate 3.6 a) Room 2, Middle Kingdom pottery in situ; b) Room 7, bread molds and other Middle Kingdom pottery in situ; c) Room Southeast 14, New Kingdom pottery in situ.

c.

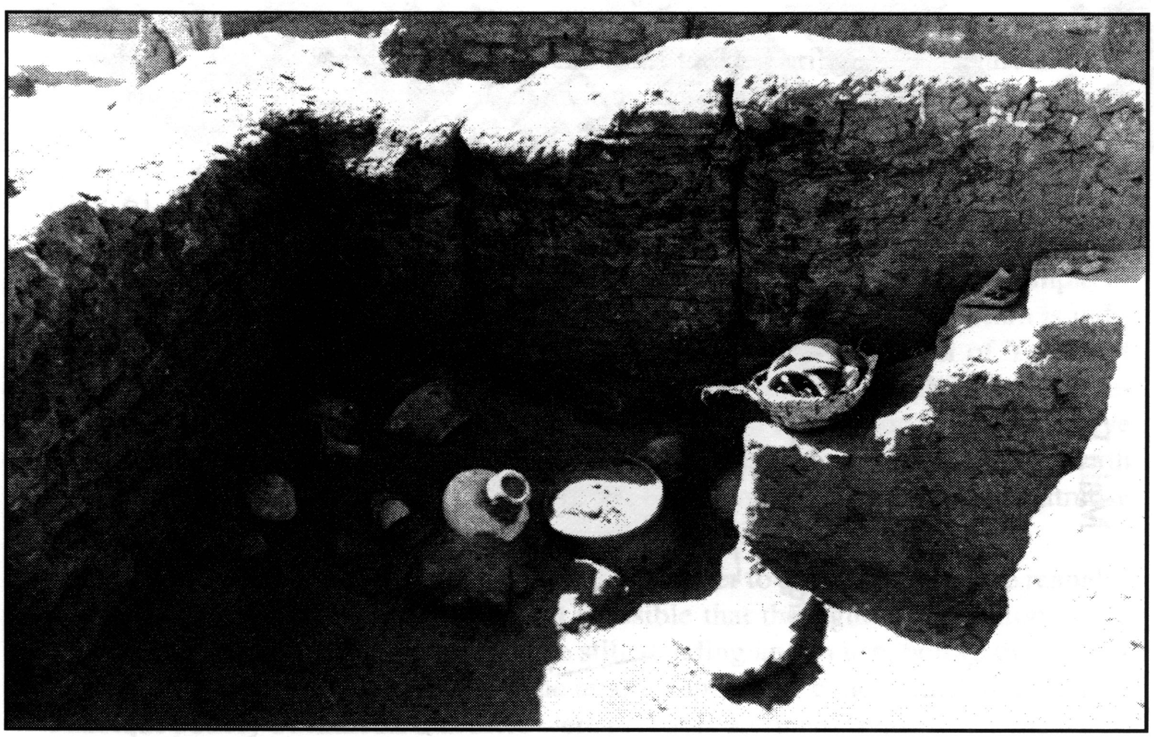
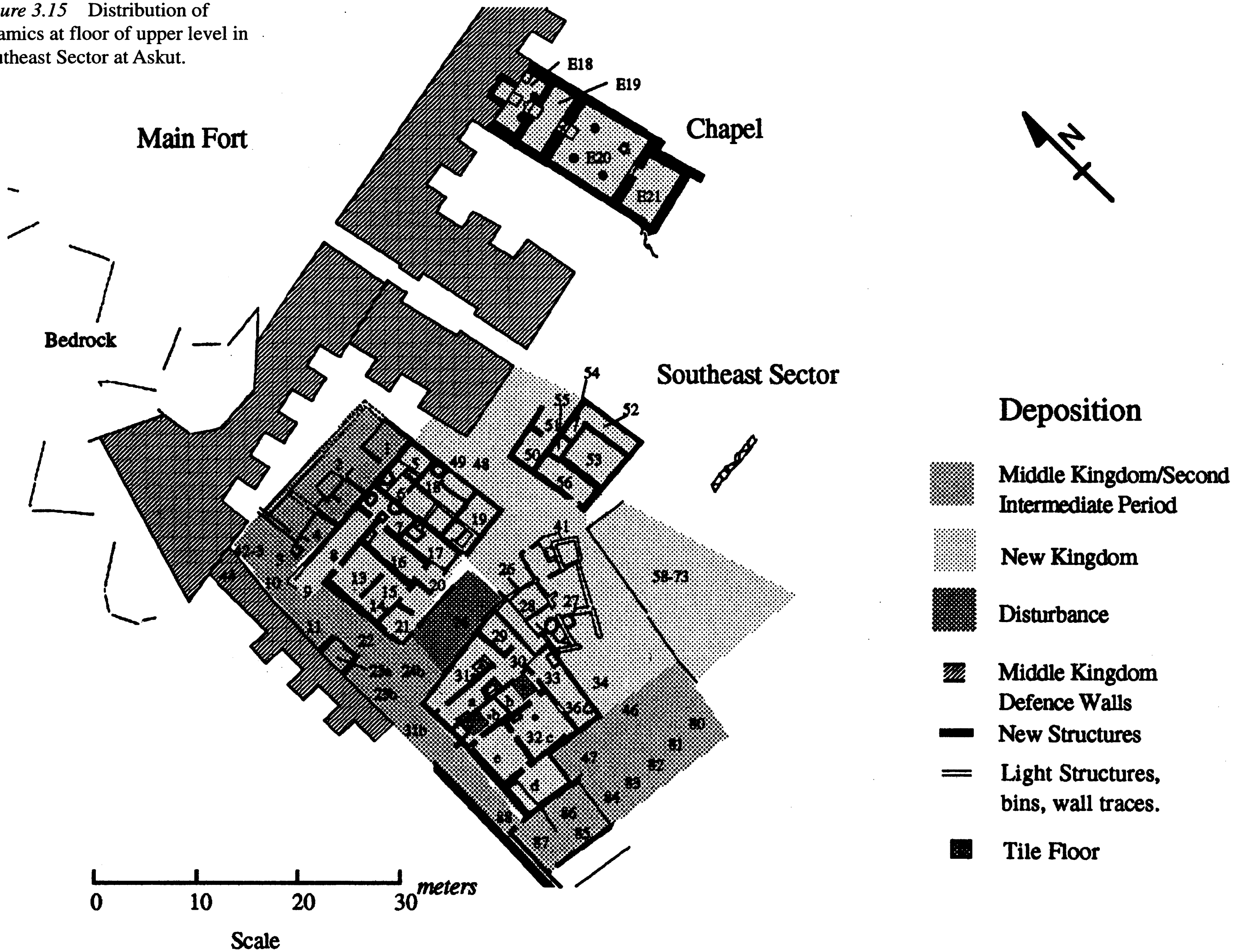


Figure 3.15 Distribution of ceramics at floor of upper level in Southeast Sector at Askut.

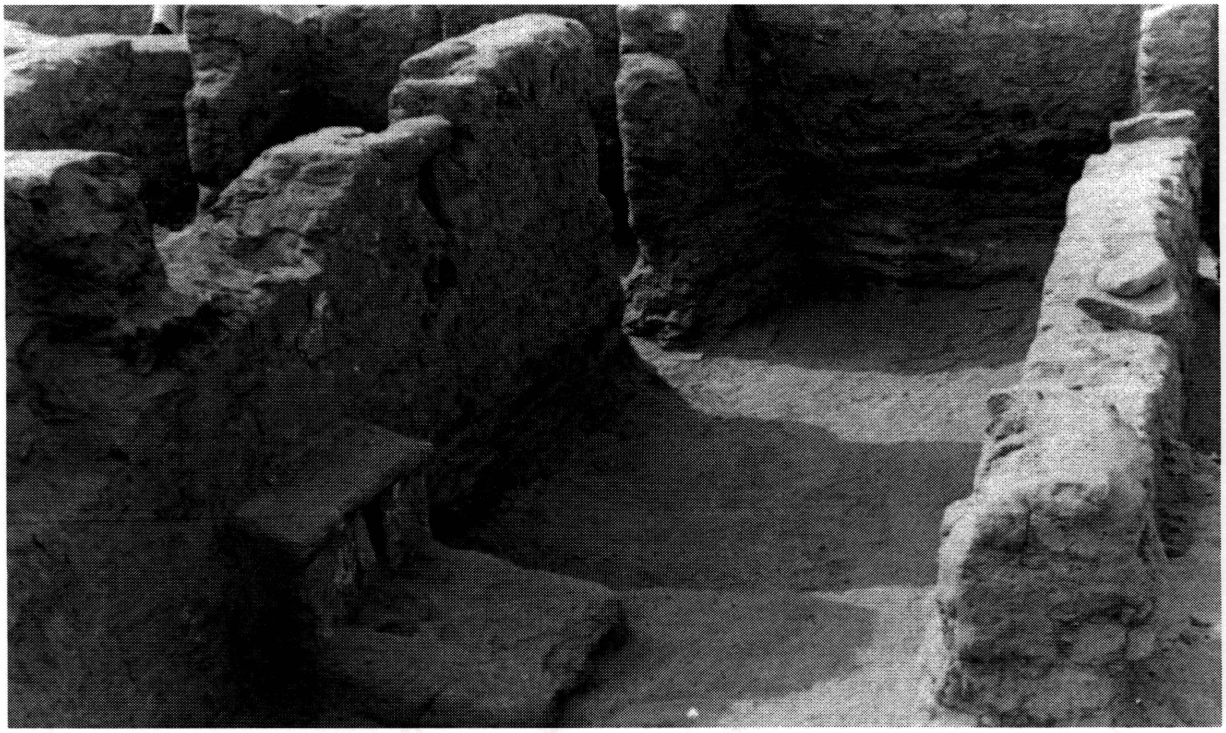


probably throughout all of Lower Nubia, would quickly see the inevitable and swear obedience to Pharaoh, even as they had done to the Ruler of Kush less than a hundred years before. High officials under the Kushites would, of course, be deposed, and Egyptians put in their place. Thus we hear no more of the family of Ka and Sepedhor. Some individuals, particularly at Buhen, may have been taken captive to Egypt or been slain in the fighting, but the majority of expatriates and their friends (and possibly relations) among the native rulers would have been key supporters and advisors of the new regime.

Although these remarks must remain for the moment somewhat hypothetical, a reassessment of the evidence at Buhen does indicate that the sack could have taken place under Kamose, a possibility which both Emery and H. S. Smith admit (Emery, H. S. Smith, and Millard 1979, 3; Smith 1976, 81). Part of the problem with Emery's interpretation lies in his assumption that any light modifications, such as floor raisings, bins, narrow dividing walls, and vaulting, often but not always associated with Kerma pottery, represented the crude work of Kerma "squatters" at a time when the buildings were mere burnt-out shells. As Janine Bourriau has pointed out, one can hardly imagine Sepedhor building a new temple and trying to maintain an elite lifestyle in such a context (Bourriau 1991, 132). Her solution was to place Sepedhor after the end of Middle Kingdom control, but before the establishment of Kerma garrisons, marked by Buhen's violent destruction.

This need not, however, be the case. Light structures and floor raisings up to a meter are commonplace at Askut in all periods, and Kerma pottery frequently occurs, but always in association with a predominantly Egyptian cultural assemblage. Modifications at Buhen reflect a similar pattern to those at Askut. The floors and walls of the "Commandant's House" were maintained into the New Kingdom. Fill interpreted at Buhen as debris from the weathering of abandoned structures is of a similar depth (40 cm to 90 cm) and description (sherds, brick detritus, and sand) as floor raisings in standing structures at Askut. It is also unlikely that the Kermans would go to the trouble of digging out the ruins to their original floors just to build light structures. Kerma pottery often appears at floor level and thus in association with and not above the burnt layers, and in at least one case was sealed under a collapsed burnt vault (e.g., House E, and in Block J; Emery, H. S. Smith, and Millard 1979, 61, 72ff.).[16] There is also no solid evidence, in the form of associated pottery or datable artifacts, that the defensive system was damaged and allowed to decline in the Second Intermediate period. Indeed, Sepedhor's boast of building a new temple of Horus, Lord of Buhen, hardly indicates neglect. Some sort of reconstruction is indicated not long after the New Kingdom reconquest by an inscription of Year 3 of Kamose (H. S. Smith 1976, 206). This need not, however, indicate that the defenses and buildings had been completely rebuilt. A thorough restoration might well have waited until later, allowing enough time for the debris to build up. Indeed, Smith implies that the final restoration of the fort was only completed by the reign Thutmose I under Commandant, later Viceroy, Turi (ibid., 208).

It is not possible within the scope of this paper to present a complete reanalysis of Buhen, but, all in all, it is at least plausible that the light modifications were made while the structures at Buhen were still standing and in use, before the violent destruction of the fort by burning.[17] The amount and some concentrations of Kerma Classique pottery do indicate that there were probably Kermans living inside the walls, but most likely in the context of a thriving community of Egyptian expatriates.



a.

b.

Plate 3.7 a) Room Southeast 32a, altar with stela, orginal floor level in background;
b) Second Intermediate period and New Kingdom pottery in situ nearby

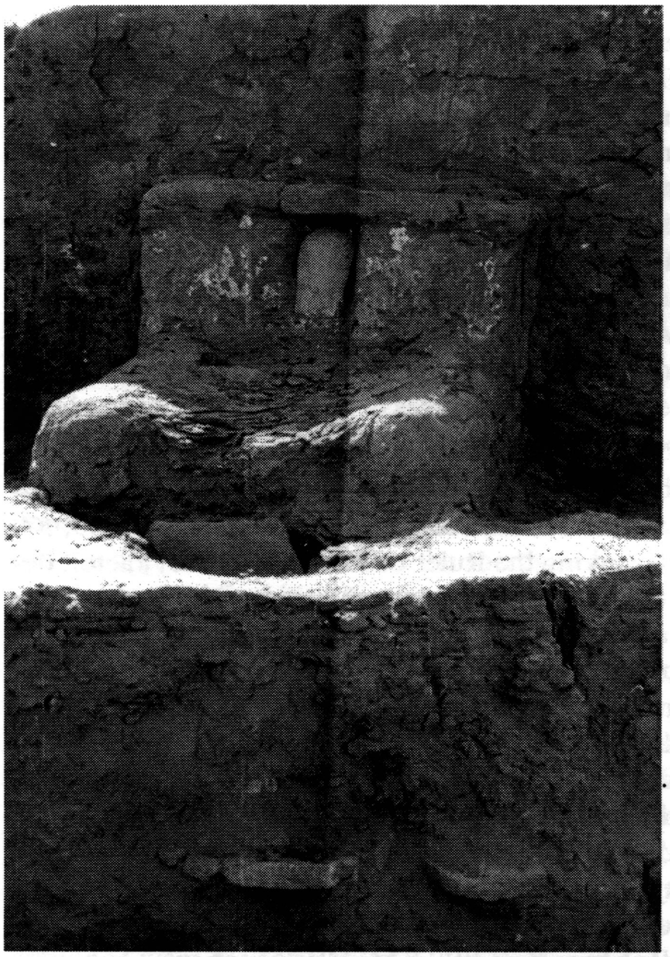
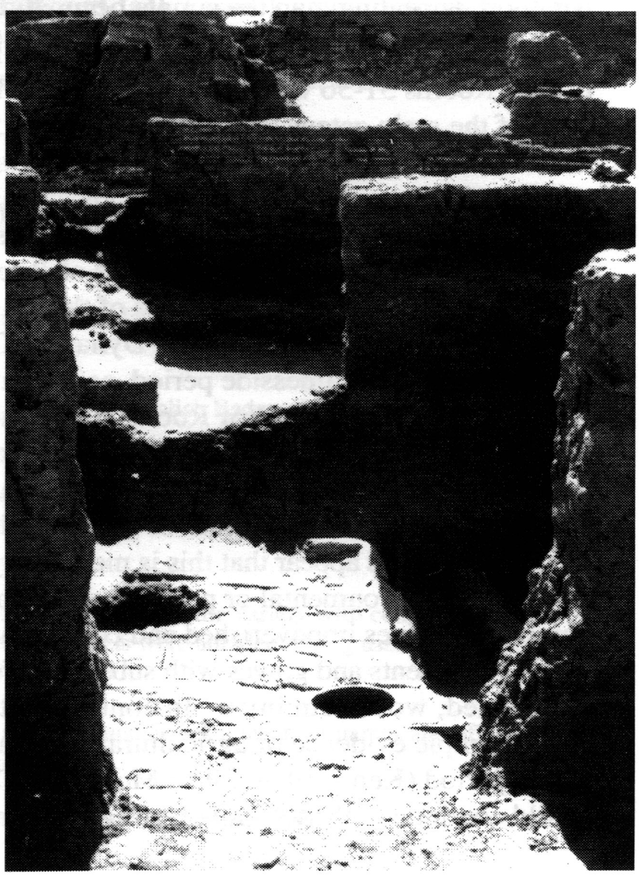


Plate 3.8 a) View of altar in Room Southeast 32a, showing stratigraphic section with mud floors, fill, tile floor; b) view of the tile floor in Room 23b with jar inset, taken from Room Southeast 32a. Note the step up from 32c into 47 in the background, which had been partly filled with rubbish in the Second Intermediate period.

b.



Emery himself noted that the amount of Nubian pottery only indicated a small occupation by the Kermans (Emery, H. S. Smith, and Millard 1979, 3). This reconstruction also solves the problem of the Buhen horse, which was found at the base of the Middle Kingdom defense walls, under burnt debris related to the fort's sack, and thus dated to the late Thirteenth Dynasty.[18] Horses are otherwise unattested in the Middle Kingdom, and chariot warfare is nowhere mentioned or depicted.[19] Yet the Buhen horse had been broken to a bit, implying that it was part of a chariot team (Clutton-Brock 1979, 192). Even if horses were used that early, which seems unlikely, what would it be doing on the Nubian frontier? A horse would, however, be *expected* to appear in an army of the late Seventeenth Dynasty, as chariot warfare became the norm. It was old, and might equally well have died of natural causes or in combat and been placed or buried at the base of the wall before most of the debris had accumulated.

The continuing presence of Egyptians in Nubia helps explain the rapid acculturation of the Nubian elite (S. T. Smith 1991a, 90ff.). Säve-Söderbergh (1949, 57-58) has long argued that Egyptians serving the Ruler of Kush were a key factor, developing a familiarity and taste for Egyptian goods and customs within both the Kermans and especially the C-Group. At Askut, for the first time, we have seen that these were no mere mercenaries, come from Egypt in temporary service, or even a small clique of Egyptian "collaborators," but full-time residents who had called Nubia home for at least eight generations. They survived both the fall of the Middle Kingdom and the reconquest of Nubia at the beginning of the New Kingdom, prospering all the while. Their presence profoundly altered the existing social, economic, and political structure of Lower Nubia, opening new opportunities to the conquering Egyptians. Still culturally Egyptian, but with profound contacts with C-Group and Kermans, they would have provided the needed infrastructure to make acculturation colonialism more appealing than the simple occupation of the Middle Kingdom.

The settlement flourished during the Eighteenth Dynasty. The house comprising Rooms 51-56 was apparently built early on, before trash had accumulated in front of the main gateway (fig. 3.15). Rooms 50-51 were added later on trash deposits of about half a meter. Sealings indicate that the Chapel was added by at least the reign of Thutmose III, and ceramics indicate that it was in use until the late Eighteenth Dynasty. By the end of the Eighteenth Dynasty the Main Fort had apparently been completely abandoned, but the houses of Rooms SE 5-21 and SE 29-36 were filled with trash and rebuilt using the tops of the old walls as foundations. They continued to be occupied into the Twentieth Dynasty. Construction on a grand scale was still undertaken in the Ramesside period, as a pot used for drainage set in the floor of the poorly preserved house(s) of Rooms 58-73 indicates (fig. 3.8L). The occupation at Askut during the Twentieth Dynasty touches on another question, the supposed "depopulation" of Nubia in the Nineteenth Dynasty (Adams 1977, 241-43). Although there is a decline in the number of graves and settlements starting in the Eighteenth Dynasty, it would appear that this is more likely the result of the acculturation process rather than environmental or political stress causing emigration. With an increasing number of natives impoverished and concentrated in a few important towns, the number of settlements and graves with substantial funerary trappings, allowing their tombs to be dated, would diminish. In contrast to the archaeology, the historical record reveals ample evidence of agricultural and administrative activity throughout Nubia at this period (Kemp 1978, 39ff.; Morkot 1987). It is also rather unlikely that Askut would continue to thrive while Lower Nubia became a wasteland.

Relatively intact domestic architecture and associated settlement debris are rare from Nubia, and indeed in Egypt itself. A preliminary analysis reveals a thriving community stretching from the Thirteenth Dynasty through the late Second Intermediate period and on into the New Kingdom. It also provides us with a large group of stratified Egyptian and native Nubian ceramics spanning the period of ca. 1850 B.C. to 1100 B.C., unbiased by the practice of discarding "non-diagnostics" and "duplicates" so common in early excavations. The ongoing study of this small community can reveal much about the development of Egyptian pottery during this period, as well as answer broader questions about the history and development of Egyptian colonialism in the region.

Acknowledgments: I greatly appreciate the help of Dorothea Arnold and, most recently, Janine Bourriau in the characterization of the Askut fabrics. The identifications are based principally on a discussion between myself and Ms. Bourriau, who had the opportunity to examine the sherds in June 1992. I remain responsible for the descriptions and final identifications. I am grateful as well to Dorothea Arnold, Manfred Bietak, Jack Holladay, Pamela Rose, and Janine Bourriau, who patiently looked through drawings and pottery from Askut and answered many questions. The recovery of the Askut field notes and photographs from Badawy's papers at the American Research Center in Egypt (ARCE) in Cairo was made possible in part by the Southern California Chapter of ARCE. Many thanks also are due for the support and help given by volunteers from this group and the Friends of Archaeology at UCLA, notably Noel Sweitzer, Ed Johnson, Jack Lissack, Art Muir, and Maissa and Roger Sanders. Initial drafts of several ceramic drawings were made by Jill Ball, Jack Lissack, Robert Masterson, Cynthia Fowler, and Alexander Badawy and/or Martha Wilcox. Final drawings were made by myself, Jill Ball, and Jack Lissack. The field and pottery photographs were taken by the late Alexander Badawy. I am also grateful for continuing support from the Fowler Museum of Cultural History at UCLA.

NOTES

1 Mirgissa was apparently excavated to a high standard, but unfortunately only the cemeteries have appeared in a final publication.

2 Forthcoming. It has not, however, proven possible to publish Badawy's Askut manuscript, which will remain on file at the Museum.

3 Badawy was somewhat overenthusiastic in attributing any oven-like structure with associated sherds and burning as a kiln (e.g., 1964, 51). In fact, most of these are simply ovens, and nothing resembling a pottery kiln occurs at Askut at any period.

4 In contrast to examples from Deir el-Ballas and Memphis, the variety with convex interior does show consistent wear patterns, suggesting that these vessels were abraded during use, perhaps in grinding or mashing some sort of soft material.

5 Simple figurines of crocodiles also occur at Askut, and Sobek appears in names and offering formulae on a stela, statue, and in graffiti (Badawy 1966, 25).

6 J. S Holladay, Jr. and Janine Bourriau, personal communications, 1992.

7 For a similar interpretation of such a pattern, see Bourriau (1991, 131).

8 Personal observation by the author at the Boston Museum of Fine Arts.

9 Household shrines are well known at Amarna and Deir el-Medineh, and the earliest example before Askut was during the reign of Amenhotep III (Badawy, 1968, 65-8, 94).

10 Rooms which were left blank were either disturbed or have not yet been assigned a secure date. The magazine-granary complex (Rooms E1-17) was subject to massive disturbance in later, perhaps Meroitic, times. Through careful analysis it may prove possible to assign dates to more of the rooms. New numbers were not given to the earliest buildings in the Southeast Sector. Instead, room numbers were projected downward from the plan of the upper level (see fig. 3.15).

11 Some Second Intermediate period groups may represent a combination of peripheral trash disposal, raising of house floors and/or fill used for the new construction. Ongoing quantification is focusing on providing a more detailed history of these structures.

12 Dever, along with Ward, also questions the Hyksos period date of the rdi-R‘ scarabs, arguing that they occur as early as the late Twelfth Dynasty (Dever 1991, 75). This, however, goes against the evidence from Lower Nubia, where this kind of scarab is clearly associated with the period of Kerma control (=Fifteenth Dynasty; Vercoutter 1976, 281ff.).

13 Some variation in the level of deposits can be expected since Badawy measured depth from the tops of the walls rather than a single datum point. Mixed Middle Kingdom and Second Intermediate period deposits might date either to the latest Thirteenth Dynasty or the very early Second Intermediate period (see above).

14 Adams (1977, 190) argues, however, that the evidence need not indicate a violent sack, but simply deliberate or accidental burning during the occupation of the site or upon its abandonment.

15 Emery, like many Egyptologists of his day, tended to view the Kermans as rude barbarians, a sentiment the ancient Egyptians would no doubt have heartily endorsed! It is clear from the work of Charles Bonnet at the settlement of Kerma, however, that they should be regarded as a highly complex state society, with a long tradition of urbanism (Bonnet 1990; O'Connor, 1991). It seems unlikely that a permanent occupying force would be any more content merely to "squat" than the Egyptians themselves.

16 Emery argued that this indicated two burning episodes, one by the Kermans destroying the original building, another by Kamose destroying the "squatters" light structures. This reconstruction, however, seems a bit forced, and one wonders how he could distinguish two episodes of burning when there was no debris from the first.

17 Given the inherent problems in the publication, outlined by H. S. Smith (Emery, H. S. Smith, and Millard 1979, vii, 44, 93), it may never be possible to make a positive statement. I hope to examine the original field notebooks and photographs, which may provide more detailed information to assess my hypothesis.

18 Note that a radiocarbon date from the burnt debris above the horse only provides a date for the wood burnt, probably from a timber parapet or other works on the defence walls. The corrected date of 2070 ± 160 B.C. indicates a period roughly contemporary with the construction of the defenses in the early Twelfth Dynasty. The true date of the horse thus rests on the date assigned to the burning from other evidence (Burleigh 1979, 196).

19 They first appear at Tell el-Dab'a at the start of the Hyksos period with Stratum E/2=b/1, ca. 1640/1620 B.C.

REFERENCES

ADAMS, W. Y.

1977 ***Nubia: Corridor to Africa.*** London: Allen Lane.

1979 "On the Argument from Ceramics to History: A Challenge Based on Evidence from Medieval Nubia." ***Current Anthropology*** 20: 27-44.

1986/87 "Times, Types, and Sites: The Interrelationship of Ceramic Chronology and Typology." ***Bulletin of the Egyptological Seminar*** 8: 7-46.

AMIRAN, R.

1970 ***Ancient Pottery of the Holy Land: From its Beginnings in the Neolithic Period to the End of the Iron Age.*** New Brunswick, N.J.: Rutgers University Press.

ARNOLD, Do.

1982 "Keramikbearbeitung in Dahschur 1976-1981" ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 38: 25-65.

1988 "Pottery." Chap. 12 in ***The Pyramid of Senwosret I*** by D. ARNOLD. The South Cemeteries of Lisht 1. The Metropolitan Museum of Art Egyptian Expedition Publication 22. New York: Metropolitan Museum of Art, 106-46.

BADAWY, A.

n.d. Askut: An Egyptian Island Fortress of the Middle Kingdom in Upper Nubia. Museum of Cultural History, University of California at Los Angeles.

1964 "Preliminary Report on the Excavations by the University of California at Askut (First Season, October 1962—January 1963)." ***Kush*** 12: 47-53.

1965 "Askut: A Middle Kingdom Fortress in Nubia." ***Archaeology*** 18: 124-31.

1966 "Archaeological Problems Relating to the Egyptian Fortress at Askut." ***Journal of the American Research Center in Egypt*** 5: 23-27.

1968 ***A History of Egyptian Architecture. The Empire (the New Kingdom) from the Eighteenth Dynasty to the End of the Twentieth Dynasty 1580-1085 B.C.*** Berkeley and Los Angeles: University of California Press.

BIETAK, M.

1984 "Problems of Middle Bronze Age Chronology: New Evidence from Egypt." ***American Journal of Archaeology*** 88: 471-85.

1991 "Egypt and Canaan During the Middle Bronze Age." ***Bulletin of the American Schools of Oriental Research*** 281: 27-72.

BONNET, C., ed.

1990 ***Kerma, Royaume de Nubie: l'antiquité africaine au temps des pharaons: exposition organisée au Musée d'Art et d'Histoire, Genève, 14 juin-25 novembre 1990.*** Geneva: Mission archéologique de l'Université de Genève au Soudan: Musée d'Art et d'Histoire.

BOURRIAU, J.

1981 ***Umm El Ga'ab: Pottery from the Nile Valley Before the Arab Conquest.*** Catalogue of the Exhibition organized by the Fitzwilliam Museum, Cambridge, 6 October to 11 December 1981. Cambridge: Cambridge University Press and the Fitzwilliam Museum.

1990 "The Pottery." Chap. 15 in ***Deir el-Ballas: Preliminary Report on the Deir el-Ballas Expedition, 1980-1986*** by P. LACOVARA. American Research Center in Egypt Reports 12. Winona Lake, IN: Eisenbrauns, 15-22.

1991 "Relations between Egypt and Kerma During the Middle and New Kingdoms." In ***Egypt and Africa: Nubia from Prehistory to Islam***, edited by W. V. DAVIES. London: British Museum Press in association with the Egypt Exploration Society, 129-44.

forthc. "Second Intermediate Period to Thutmose I." In ***Introduction to Ancient Egyptian Pottery.***

BRUNTON, G.
1930 ***Qau and Badari III***. British School of Archaeology in Egypt Publication 50. London: British School of Archaeology in Egypt and Bernard Quaritch.
BRUYÈRE, B.
1939 ***Rapport sur les fouilles de Deir el-Médineh (1934-35). Troisième partie: Le village, les décharges publiques, la station de repos du col de la vallée des rois***. Fouilles de L'Institut Français du Caire sous la direction de M. Pierre Jouguet 16. Cairo: Institut Français d'Archéologie Orientale.
BURLEIGH, R.
1979 "The Buhen Horse - C. Attempted Radiocarbon Dating of the Buhen Horse." In ***The Fortress of Buhen: The Archaeological Report*** by W. B. EMERY, H. S. SMITH, and A. MILLARD. Excavations at Buhen 1. Egypt Exploration Society Excavation Memoir 49. London: Egypt Exploration Society, 195.
CLUTTON-BROCK, J.
1979 "The Buhen Horse - B. The Description." In ***The Fortress of Buhen: The Archaeological Report*** by W. B. EMERY, H. S. SMITH, and A. MILLARD. Excavations at Buhen 1. Egypt Exploration Society Excavation Memoir 49. London: Egypt Exploration Society, 191-95.
COLE, D. P.
1984 ***Shechem I: The Middle Bronze IIB Pottery***. American Schools of Oriental Research Excavation Reports. American Schools of Oriental Research. Distributed by Eisenbraun's, Winona Lake, IN.
DEVER, W. G.
1991 "Tell el-Dab'a and Levantine Middle Bronze Age Chronology: A Rejoinder to Manfred Bietak." ***Bulletin of the American Schools of Oriental Research*** 281: 73-79.
DIXON, D. M.
1972 "The Disposal of Certain Personal, Household and Town Waste in Ancient Egypt." In ***Man, Settlement and Urbanism***, edited by P. J. UCKO, R. TRINGHAM and G. W. DIMBLEBY. Society Proceedings of a Meeting of the Research Seminar in Archaeology and Related Subjects held at the Institute of Archaeology, London University. Cambridge, MA: Schenkman, 647-50.
DUNHAM, D., and J. M. A. JANSSEN
1960 ***Second Cataract Forts. Vol. I: Semna, Kumma. Excavated by George Andrew Reisner*** Boston: Museum of Fine Arts.
EMERY, W. B., H. S. SMITH, and A. MILLARD
1979 ***The Fortress of Buhen: The Archaeological Report***. Excavations at Buhen 1. Egypt Exploration Society Excavation Memoir 49. London: Egypt Exploration Society.
ENGELBACH, R. E.
1923 ***Harageh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 28. London: British School of Archaeology in Egypt and Bernard Quaritch.
FRANKFORT, H., and J. D. S. PENDLEBURY
1933 ***The City of Akhenaton. Part 2: The North Suburb and the Desert Altars: The Excavations at Tell el-Amarna during the Seasons 1926-1932.*** Egypt Exploration Society Memoir 40. London: Egypt Exploration Society.
GRATIEN, B.
1978 ***Les Cultures Kerma: Essai de Classification***. Publications de l'Université de Lille 3. Centre National de la Recherche Scientifique, avec la collaboration de la Direction Générale des Relations Culturelles, Scientifiques et Techniques. Villeneuve-d'Ascq: Publications de l'Université de Lille.
1985 "Le village fortifié du groupe C à Ouadi es Séboua Est, typologie de la

céramique." ***Cahier de Recherches de l'Institut de Papyrologie et d'Égyptologie de Lille*** 7 (Societés Urbaines en Égypte et au Soudan): 39-70.

1986 ***Saï I: La Nécropole Kerma.*** Centre National de la Recherche Scientifique, Mission Archéologique Française au Soudan, Institut de Papyrologie et d'Égyptologie de l'Université de Lille 3. Paris: Éditions du Centre National de la Recherche Scientifique.

HOFFMAN, M. A.

1974 "The Social Context of Trash Disposal in an Early Dynastic Egyptian Town." ***American Antiquity*** 39: 35-50.

HÖLSCHER, U.

1939 ***The Excavations of Medinet Habu. Vol. 2: The Temples of the Eighteenth Dynasty.*** Oriental Institute Publications 41. Chicago: University of Chicago Press.

HOLTHOER, R.

1977 ***New Kingdom Pharaonic Sites: The Pottery.*** The Scandinavian Joint Expedition to Sudanese Nubia Publications 5:1. Scandinavian University Books. Lund: The Scandinavian Joint Expedition to Sudanese Nubia.

HOPE, C. A.

1987 "Innovation in the Decoration of Ceramics in the Mid 18th Dynasty." ***Cahiers de la Céramique Égyptienne*** 1: 97-122.

1989 ***Pottery of the Egyptian New Kingdom: Three Studies.*** Victoria College Archaeology Research Unit Occasional Paper 2. Australia: Victoria College.

KEMP, B. J.

1989 ***Ancient Egypt: Anatomy of a Civilization.*** Cambridge: Cambridge University Press.

MAYSTRE, C.

1980 ***Akasha I.*** Mission archéologique de la Fondation Henry M. Blackmer et du Centre d'études orientales de l'Université de Genève sous la direction de Charles Maystre 1. Geneva: Georg.

MERRILLEES, R. S.

1968 ***The Cypriot Bronze Age Pottery Found in Egypt.*** Studies in Mediterranean Archaeology 18. Lund: Studies in Mediterranean Archaeology.

MORKOT, R.

1987 "Studies in New Kingdom Nubia 1. Politics, Economics and Ideology: Egyptian Imperialism in Nubia." ***Wepwawet*** 3: 29

MOUNTJOY, P. A.

1986 ***Mycenaean Decorated Pottery: A Guide to Identification.*** Studies in Mediterranean Archaeology 73. Göteborg: P. Åström.

NICHOLSON, P. T., and H. L. PATTERSON

1989 "Ceramic Technology in Upper Egypt: A Study of Pottery Firing." ***World Archaeology*** 21: 71-86.

NORDSTRÖM, H. Å.

1985 "Ton." ***Lexikon der Ägyptologie*** 6: 629-34.

NORDSTRÖM, H. Å., and J. BOURRIAU

1993 "Ceramic Technology: Clays and Fabrics." Fasc. 2 in ***An Introduction to Ancient Egyptian Pottery***, edited by Do. ARNOLD and J. BOURRIAU. Mainz am Rhein: Philipp von Zabern, 144-90.

O'CONNOR, D.

1991 "Early States along the Nubian Nile." In ***Egypt and Africa: Nubia from Prehistory to Islam***, edited by W. V. DAVIES. London: British Museum Press in association with the Egypt Exploration Society, 145-65.

PEET, T. E., and C. L. WOOLLEY

1923 ***City of Akhenaten, Part I: Excavations of 1921 and 1922 at El-'Amarneh.*** Egypt Exploration Society Memoir 38. London: Egypt Exploration Society.

PETRIE, W. M. F.
[1891] 1974 ***Illahun, Kahun and Gurob***. London: David Nutt. Reprint, Warminster: Aris and Phillips, with Joel L. Malter, Encino CA, U.S.A.
1907 ***Giza and Rifeh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 13. London: Britĭtsh School of Archaeology in Egypt and Bernard Quaritch.
RICE, P. M.
1987 ***Pottery Analysis: A Sourcebook***. Chicago: University of Chicago Press.
RYE, O. S.
1981 ***Pottery Technology: Principles and Reconstruction***. Manuals on Archaeology 4. Washington, D.C.: Taraxcum.
SADR, K.
1988 ***The Development of Nomadism: The View from Ancient Northeast Africa***. Ph.D. dissertation, Southern Methodist University. Ann Arbor: University Microfilms.
SÄVE -SÖDERBERGH, T.
1949 "A Buhen Stela (Khartum No. 18)." ***Journal of Egyptian Archaeology*** 35: 50-8.
SCHIFFER, M. B.
1987 ***Formation Processes of the Archaeological Record***. Albuquerque: University of New Mexico Press.
SMITH, H. S.
1972 "Society and Settlement in Ancient Egypt." In ***Man, Settlement and Urbanism***, edited by P. J. UCKO, R.TRINGHAM and G. W. DIMBLEBY. Society Proceedings of a Meeting of the Research Seminar in Archaeology and Related Subjects held at the Institute of Archaeology, London University. Cambridge, MA: Schenkman Publishing, 705-19.
1976 ***The Fortress of Buhen: The Inscriptions***. Excavations at Buhen 2. Forty-eighth Excavation Memoir. London: Egypt Exploration Society.
SMITH, S. T.
1990 "The Administration of Egypt's Southern Frontier: Middle Kingdom Sealing Practice at Uronarti and Askut Forts." In ***Aegean Seals, Sealings and Administration: Proceedings of the NEH-Dickson Conference of the Program in Aegean Scripts and Prehistory of the Department of Classics, University of Texas at Austin, January 11-13, 1989***, edited by T. G. PALAIMA, 197-216. Aegaeum 5. Liège: Université de Liège, Histoire de l'art et archéologie de la Grèce antique.
1991a "A Model for Egyptian Imperialism in Nubia." ***Göttinger Miszellen*** 122: 77-102.
1991b "Askut and the Role of the Second Cataract Forts." ***Journal of the American Research Center in Egypt*** 28: 107-132.
1993 "The House of Meryka at Askut and the Beginning of the New Kingdom in Nubia." In ***Atti del Sesto Congresso Internazionale di Egittologia, Vol. 2***. Turin: International Association of Egyptologists, 497-509.
STEINDORFF, GEORG
1937 ***Aniba. Vol. 2: Plates***. Mission archéologique de Nubie 1929-1934. Service des Antiquités de l'Égypte. Glückstadt: J. J. Augustin.
VERCOUTTER, J.
1957 "Upper Egyptian Settlers in Middle Kingdom Nubia (Stelae Khartoum Mus. 11778, 372A and 2647, Statue Khartoum Mus. 5516)." ***Kush*** 5: 61-9.
1970 ***Mirgissa I***. Mission Archéologique Française au Soudan sous la direction de Jean Vercoutter 1. Ouvrage publié par la Direction Générale des Relations Culturelles, Scientifiques et Techniques, Ministère des Affaires Étrangéres avec le concours du Centre National de la Recherche Scientifique. Paris: Mission

Archéologique Française au Soudan.
1976 ***Mirgissa III: Les Nécropoles***. Mission Archéologique Française au Soudan. Paris: Mission Archéologique Française au Soudan.

WILLIAMS, B.
1987 "The Nubian Publication Project." In ***The Oriental Institute 1986-1987Annual Report***. Chicago: Oriental Institute, 57-60.

4

A Deposit of "Domestic" Pottery at Kerma

Peter Lacovara

A recurrent problem in the study of Egyptian ceramics is the distinction between the everyday types of vessels used by the living and the pots chosen as grave goods. Since most of our standard typologies are composed of examples from tomb groups, utilitarian wares are often not represented (Bourriau 1986/87). This distinction is even greater for the cultures of Nubia where we have far fewer corpora, particularly from habitation sites.

One such juncture that presents a series of problems is the Bronze Age cultures of Lower Nubia. Only now are we beginning to clarify the different developmental stages of the "Pan-Grave," C-Group, and Kerma cultures (Lacovara 1987; Wegner 1995). A particular concern is the distinction between domestic and luxury/funerary ceramics. Our sample for Nubia is even more heavily skewed towards the material recovered from cemeteries than pottery corpora from Egypt.

An important exception is a group of sherds from Reisner's excavations in the town at Kerma (Reisner 1923a, 30-32). During his excavations of the dependencies on the western side of the great mudbrick chapel known as the Western or Lower Deffufa (K I) at Kerma, Reisner came upon a large deposit of broken Egyptian stone vase fragments along with other raw materials and ceramics (Lacovara 1991).

The complex building phases of the western "annex" to K I make interpreting the chronology and building history of the findspot very difficult. The excavation records indicate, however, that the vessel deposits found by Reisner must have been made at a fairly late stage in the building's construction. The stone vase fragments and ceramics were found beneath a layer of collapsed wall debris and above several superimposed floor levels.

The main deposits of stone vessels found in the annex came from rooms H (north and south), X^{1-3}, and Y^{1-3}, all clustered around the entrance to K I. The stone vase fragments found in these areas were also associated with other materials, including fragments of decorated faience bowls, Tell el-Yahudiyah ware, a sherd from an imported Aegean vessel, mud seal impressions of Second Intermediate period date, as well as seals and pottery of local design.

The ceramics form a unique group to contrast with the corpora from the Kerma culture cemeteries published by Reisner and Dunham (Reisner 1923a, 1923b; Dunham 1982). An overall distinction that one can observe between the two is condition. The vessels from the cemetery show little or no evidence of use-wear, suggesting many were manufactured exclusively for burial. The ceramics recovered from the K I annex, in contrast, show signs of burning, repair, and abrasion from use. The types of vessels and decorative motifs are also distinct. Incised wares appear to be far more common in the domestic context than in the cemetery context, while the burnished/ polished wares are more evident as grave goods.

Some forms, such as the beaker shape (fig. 4.1a) occur in both contexts; however, the domestic beakers are less carefully finished and show traces of use and repair. The overall form, though, does correspond to beakers from contemporary tombs (fig. 4.1b). This is important to note, since many of the associated incised wares (fig. 4.2a-c) bear an overall similarity to vessels of the earlier phases of the Kerma civilization (fig. 4.3a-c). I would suggest that this is an example of the survival of older traditions in domestic contexts.

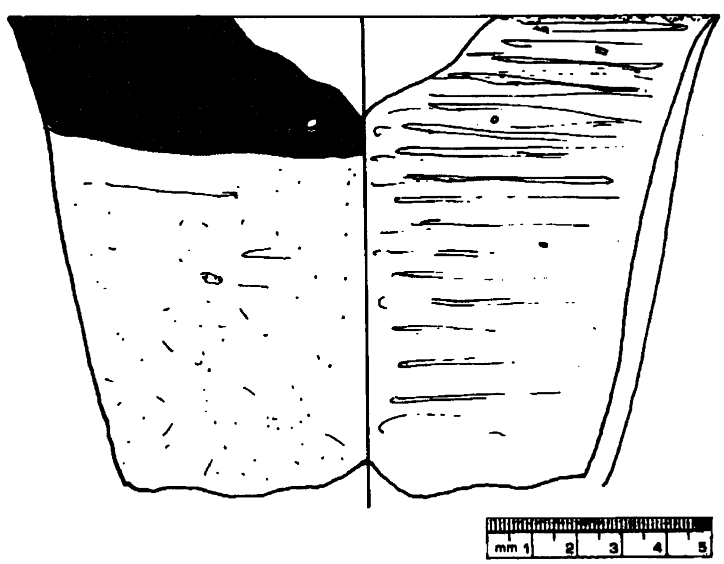


Figure 4.1a Blacktopped beaker from Kerma settlement. SU 29. Scale 1:1. Drawing by Yvonne Markowitz.

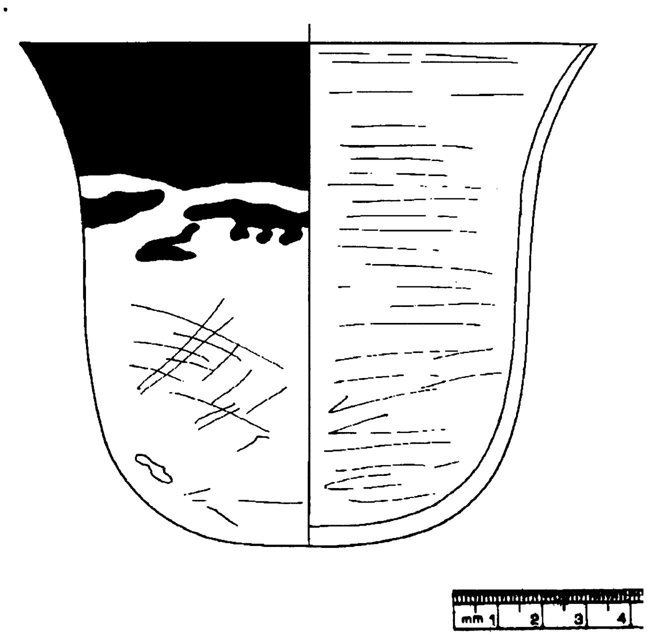


Figure 4.1b Blacktopped beaker from cemetery context BMFA 13.4066/SU627. Scale 1:1. Drawing by Yvonne Markowitz.

Also of significance is the distinction between the incised domestic ceramic complex of the Kerma culture as opposed to that of the C-Group and Pan-Grave cultures. While there is a similarity among these ceramics, just as in the case of the luxury wares, they can be separated out. The incised bowls of the Pan-Grave culture in general tend to be larger and less carefully made than those at Kerma. Also distinctive are the Kerma "cooking pots" with their applied lumps of clay on the bottom, perhaps to distribute heat more efficiently (fig. 4.4). These appear distinctive to the Kerma culture, and their occurrence in Egypt points to a resident population of this culture during the Second Intermediate period (Bourriau 1990). Indeed, Egyptologists should be careful not to automatically assume that all Nubian handmade wares found in Egypt belong to the Pan-Grave culture.[1]

Lastly, the Kerma cooking bowls are also of importance as being an example of the survival of traditional forms in rough domestic wares. Both the beaker shape and rough cooking bowls with applied clay bottoms are found in rough wares associated with some of the early Napatan period tombs at el-Kurru (fig. 4.5a-b), suggesting a cultural link between the two great Nubian empires.

While the study of these ceramics is still in an embryonic state, the lines of research we have noted should help to refine much of our understanding of Bronze Age Nubia.

Acknowledgments: I would like to thank Rita E. Freed, Curator of the Department of Ancient Egyptian, Nubian and Near Eastern Art of the Museum of Fine Arts, Boston for permission to publish the material in this paper. I would also very much like to thank Lisa Heidorn and Yvonne Markowitz both for the artwork used in this article and for their corrections to the text.

a.

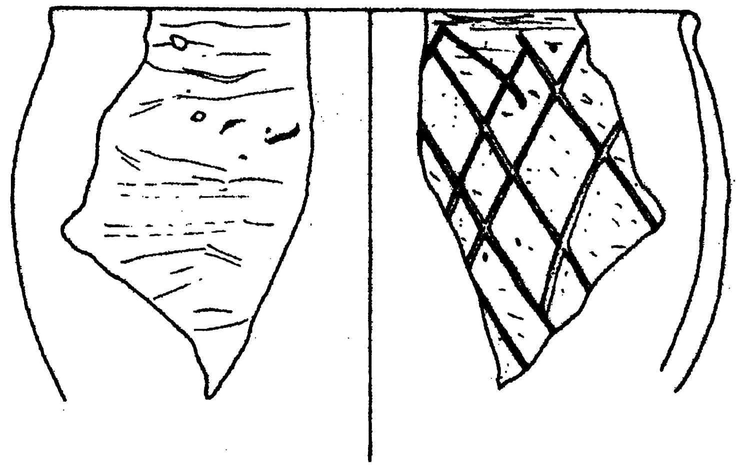
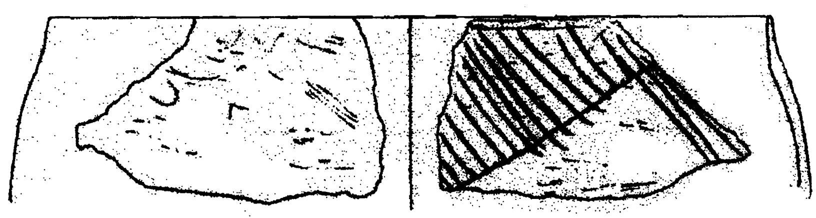
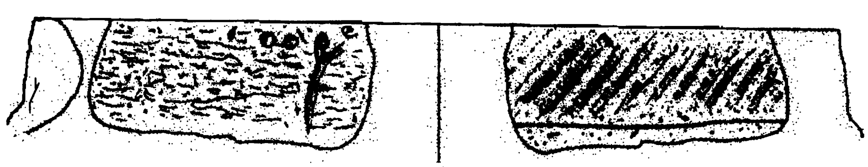


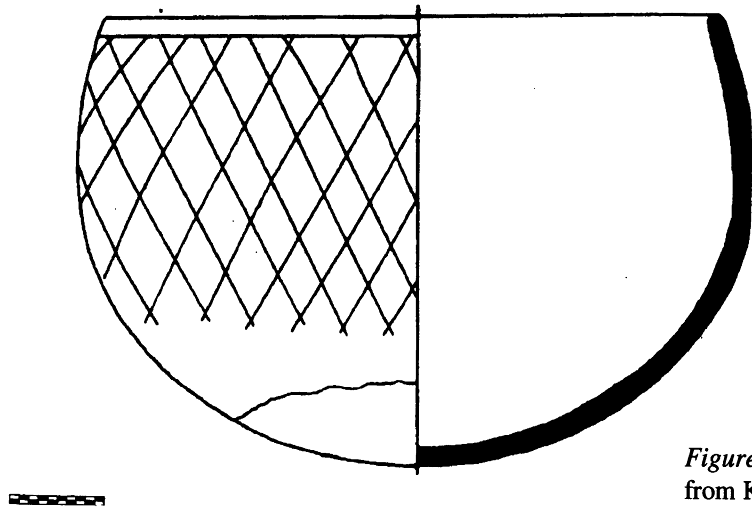
Figure 4.2 a) Incised bowl, wet smoothed exterior. SU 45. b) Incised rough bowl, brown surface. SU 13-14. c) Large, deep bowl with incised rim. SU 1. Scale 4:1. Drawings by Yvonne Markowitz.

b.



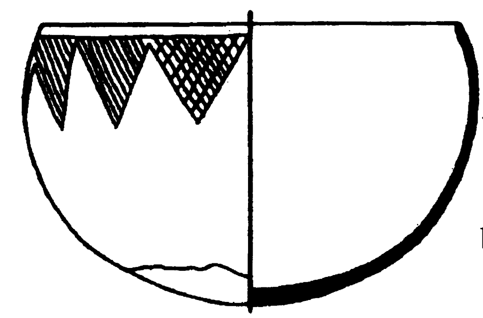
c.



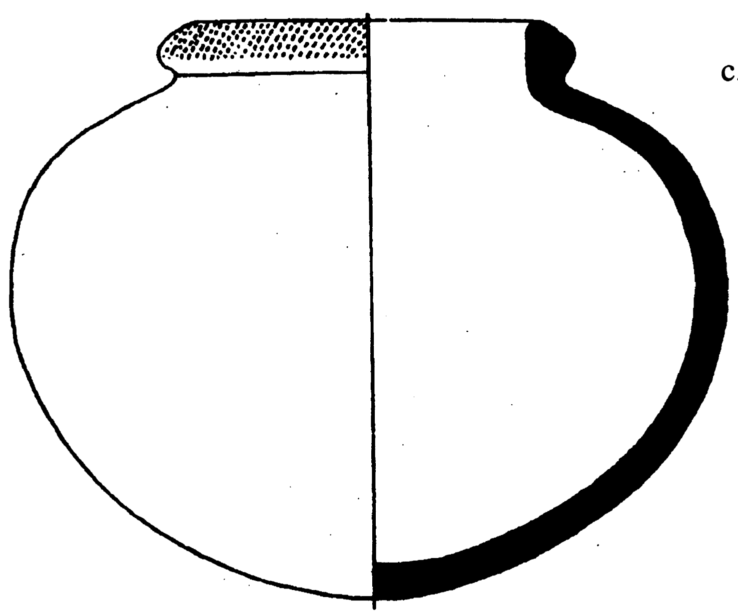


a.

Figure 4.3 a) Incised bowl from KM 15. BMFA 15-2-320. b) Incised rough bowl from KM 48. BMFA 15-3-437. c) Large, deep bowl with incised rim from KN 164. BMFA 16-4-1489. All from Dunham 1991. Scale 4:1. Drawings by Yvonne Markowitz.



b.



c.

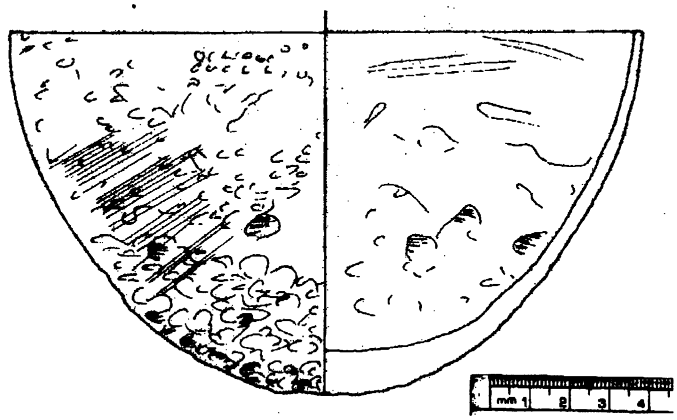
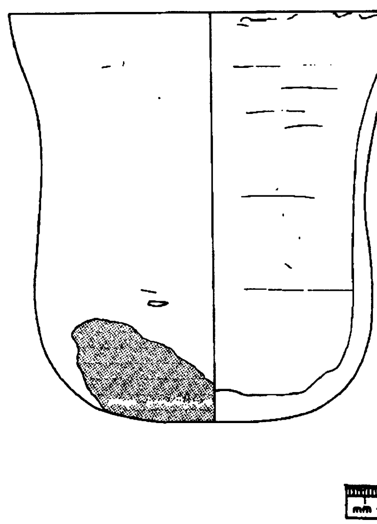


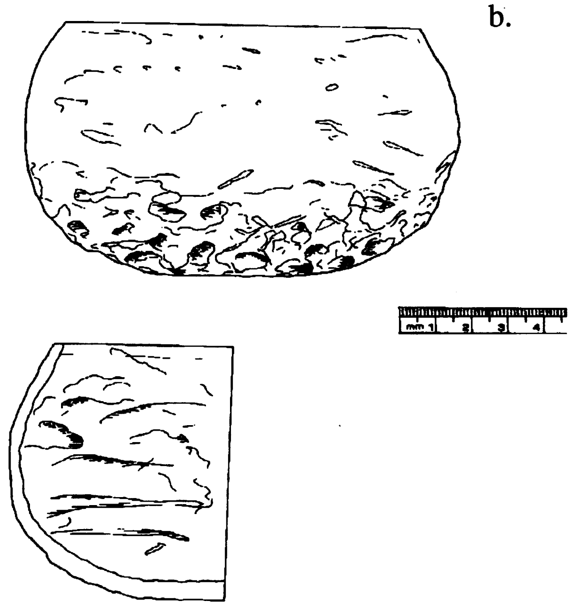
Figure 4.4 Kerma "cooking pot." BMFA 21.3079 (14-1-561). Handmade, low-fired Nile silt with mat-impressed surface and applied clay on bottom. Traces of smoke stains on interior and exterior. scale 1:1. Drawing by Yvonne Markowitz.



a.

Figure 4.5 a) Red polished beaker from Kurru Tomb 702. BMFA 19-4-19. Wheelmade, fine Nile silt with burnished red surface. Fire cloud at bottom. b) "Cooking Pot" from Kurru Tomb 702, BMFA 19-4-17. Handmade, low-fired Nile silt with mat-impressed surface applied clay on bottom. Traces of smoke stains on interior and exterior. Scale 1:1. Drawings by Yvonne Markowitz.

b.



NOTES

[1] Bourriau has suggested that Egyptian sources conflate the Pan-Grave peoples residing in Egypt in the late Middle Kingdom with individuals from the Kerma culture.

REFERENCES

BOURRIAU, JANINE

1986/87 "Cemetery and Settlement Pottery of the Second Intermediate Period to Early New Kingdom." ***Bulletin of the Egyptological Seminar*** 8: 47-59.

1990 "The Pottery." Chap. 15 in ***Deir el-Ballas: Preliminary Report on the Deir el-Ballas Expedition, 1980-1986***, by PETER LACOVARA. American Research Center in Egypt Reports, vol. 12. Winona Lake, IN: Eisenbrauns, 15-22.

1991 "Relations between Egypt and Kerma During the Middle and New Kingdoms." In ***Egypt and Africa: Nubia from Prehistory to Islam***, edited by VIVIAN DAVIES. London: British Museum Press in association with the Egypt Exploration Society, 129-44.

DUNHAM, DOWS

1982 ***Excavations at Kerma, Part VI: Subsidiary Nubian Graves, excavated by the late George A. Reisner in 1915-1916, not included in his Excavations at Kerma, I-III and IV-V, published by him in the Harvard African Studies, V and VI, 1923***. Department of Egyptian and Ancient Near Eastern Art. Boston: The Museum of Fine Arts.

LACOVARA, PETER

1987 "The Internal Chronology of Kerma." ***Beiträge zur Sudanforschung*** 2: 51-74.

1991 "The 'Stone Vase' Deposit at Kerma." In ***Egypt and Africa: Nubia from Prehistory to Islam***, edited by VIVIAN DAVIES London: British Museum Press in association with the Egypt Exploration Society, 118-128.

REISNER, GEORGE A.

1923a ***Excavations at Kerma, Parts I-III***. Harvard African Studies vol. 5. Cambridge, MA: Peabody Museum of Harvard University.

1923b ***Excavations at Kerma, Parts IV-V***. Harvard African Studies vol. 6. Cambridge, MA: Peabody Museum of Harvard University.

WEGNER, J.

1995 "The C-Group Settlement at Arieka." ***Journal of the American Research Center in Egypt*** 32: 127-60.

5

Manufacturing Methods of Pilgrim Flasks and Related Vessels from Cemetery 500 at el-Ahaiwah

Joan Knudsen

The site of el-Ahaiwah is located on the west bank of the Nile, approximately sixty-eight miles north of Luxor. In May of 1900, George Reisner, then excavating at Dêr el Ballâs, was called to the site by an antiquities inspector who reported that a Predynastic cemetery there was in the process of being plundered. Between May 21 and August of that year, Reisner excavated one hundred late New Kingdom/Third Intermediate period graves and tombs (Cemetery 500), in addition to some one thousand graves belonging to a large Predynastic cemetery. A cluster of houses and a structure that was determined to be a fort were also excavated by Albert Lythgoe, Reisner's assistant (Reisner 1904, 123). Among the ceramics recovered from Cemetery 500 were twelve whole or fragmentary pilgrim flasks, or similarly shaped vessels, now housed in the Phoebe Hearst Museum of Anthropology at the University of California, Berkeley.[1] Six of these will be discussed here.[2]

The term "pilgrim flask" originally applied to "Saint Menas flasks" and other two-handled flasks manufactured in great quantities as souvenirs for the large numbers of Christian pilgrims who visited the tomb of Saint Menas and other shrines in Egypt and the Holy Land during the Coptic and Medieval periods. These flasks held sacred oils and holy water (Badawy 1978, 346), which the pilgrims brought back with them when they returned home. As a consequence, the name "pilgrim flask" eventually came to refer to two-handled flasks in general, even those manufactured more than a thousand years before the term was coined (Seif El-Din 1992, 121; Bourriau 1981, 99-100).

The bodies of these vessels are usually lenticular or ovoid in shape, with the spouted neck placed at the top of the angle where the two lenses meet. The upper ends of the handles are fastened to either side of the neck, while the lower ends are usually joined to the shoulder of the vessel. This vessel form is believed to have originated in Syria-Palestine, and first appeared in Egypt during mid-Dynasty 18 (Holthoer 1977, 99). It does not disappear until after the Arab conquest in A.D. 641.

Methods of Manufacture

Like terracotta figurines, the Saint Menas flasks and similar vessels from the Graeco-Roman period were made from two-piece molds. Each mold produced one half of a flask, complete with neck and handles. The two halves were then joined. As a result, a seam running along the sides of the body, neck, and handles was usually visible (Hayes 1976, 37).

It has been popularly assumed that the earlier vessels of this type from both Syria-Palestine and Egypt were made of three basic parts, all wheel thrown. These consisted of two bowl- or plate-like body sections, and the spouted neck. The body sections would have been joined at the rims, the neck attached, and the handles added last (Amiran 1970, 166; Bourriau 1981, 75). Evidence for this method of manufacture would be the characteristic turning-marks on each body section, and a visible joint or other anomalies at the point where the two halves were joined together (Holthoer 1977, 100). Indeed, both Amiran and Holthoer cite examples of pilgrim flasks made by this method from Palestine and Nubia, respectively (Amiran 1970, 166-69, 276-83; Holthoer 1977, 99-101).

Based on a study of pilgrim flasks made in one piece from Transjordan and from the Late Bronze Age Egyptian garrison at Beth Shan, however, Glanzman documents two further methods of manufacture in which the body of a pilgrim flask was made in a single piece (Glanzman and Rufo 1989; Glanzman and Fleming 1993). Glanzman and Fleming describe the two methods as follows: "1) rotation in the upright mode, off a hump of clay, with complete closure of the lenticular body, which was removed from the hump by a pinching movement; or 2) closure of a cone, whose lower portion was cut through, the form inverted, and the orifice then completely closed in the upside-down mode. For either method, the lenticular-shaped body was probably achieved by pressing down on one or both lenses during the formation process."

The visible characteristics of pilgrim flasks made in one piece are: 1) continuous striations proceeding from the center of one lens to the center of the other without interruption; and 2) distinctive marks at the centers of the lenses. These distinctive marks consisted of an interlocking, "navel-like" appearance in the case of lenses closed with a twisting motion, and stretch marks radiating from a central "twisted mass of clay" in the case of those lenses released from the hump by pinching.[3]

The el-Ahaiwah Pilgrim Flasks

A two-part examination was carried out on each of the six vessels from el-Ahaiwah considered here. First, a general macroscopic examination was made, and then each vessel was x-rayed courtesy of the University Health Center at the University of California, Berkeley. The first vessels examined are a group of four flasks from Tomb A502. Numbers 6-18460 and 6-18461 are "true" pilgrim flasks, while 6-18457 and 6-18462 are identical in shape, but without handles. The body of each of these flasks is lenticular in shape. All are of a marl clay fabric, and are self slipped and burnished. Number 6-18460 (fig. 5.1) is the only completely intact vessel in the group. It measures 19 cm in height and 12.5 cm in diameter, with an exterior Munsell reading of 5YR5/4 to 6/4 (reddish brown to light reddish brown). No interior examination was possible, and an exterior examination revealed a smooth surface with no trace of a "twist" at the center of either lens. Number 6-18461 (see color plate 5.1) is fragmen-

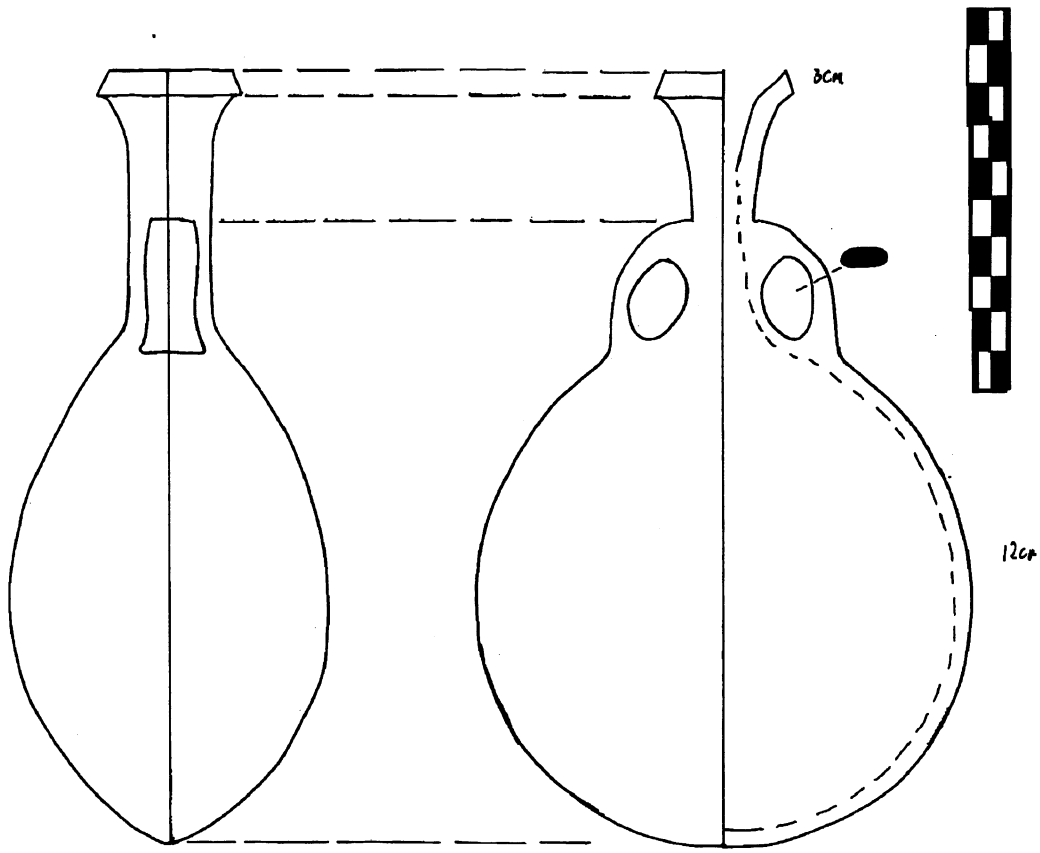


Figure 5.1 Flask, 6-18460 from Tomb A502. Drawing by Sabrina Maras.

tary and has been partially reconstructed. Its reconstructed measurements are 18.5 cm in height and 12.5 cm in diameter, with an exterior Munsell reading of 7.5YR 6/4 (light brown). Like 6-18460, the outer surface was smooth. A visual examination of the interior, however, revealed a lumpy, irregular surface with no trace of wheel marks. A hole had been made at a spot along the sharp angle and the neck had been pushed through. The remains of clay that had been dislodged during this process still adhere to the inside of the vessel at the neck opening. Number 6-18457 (fig. 5.2) is one of the smaller, handleless flasks. It measures 14.6 cm high and is 9.8 cm in diameter, with a Munsell reading of 7.5YR 6/44 (light brown). It has a very faint black and red garland painted around the shoulder, and the interior of the rim appears to have been painted red as well. A small chip is missing from the edge of the spout, but the body is intact; thus no interior inspection was possible. Like the two previous examples, the exterior surface was smooth. Number 6-18462 (fig. 5.3) is the second handleless flask of the group. The spout has been broken off 1.2 cm from the shoulder, and its present height measures 11.5 cm and its diameter is 10.3 cm. Like the previous two vessels, this flask also has a Munsell reading of 7.5YR 6/4 (light brown). The intact body prevented an interior inspection, but as with the other three flasks in this group, the exterior was smooth.

The examination of the interior of flask 6-18461, and of the X rays of all four of these vessels (color plate 5.2), indicates that each body was mold-made in two

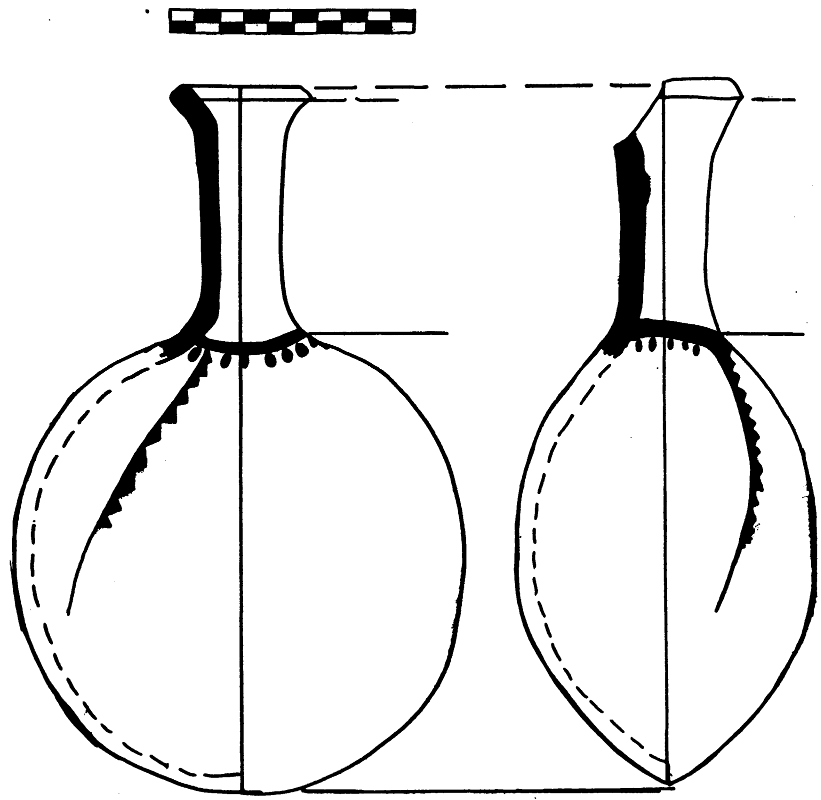


Figure 5.2 Flask, 6-18457 from Tomb A502. Drawing by Sabrina Maras.

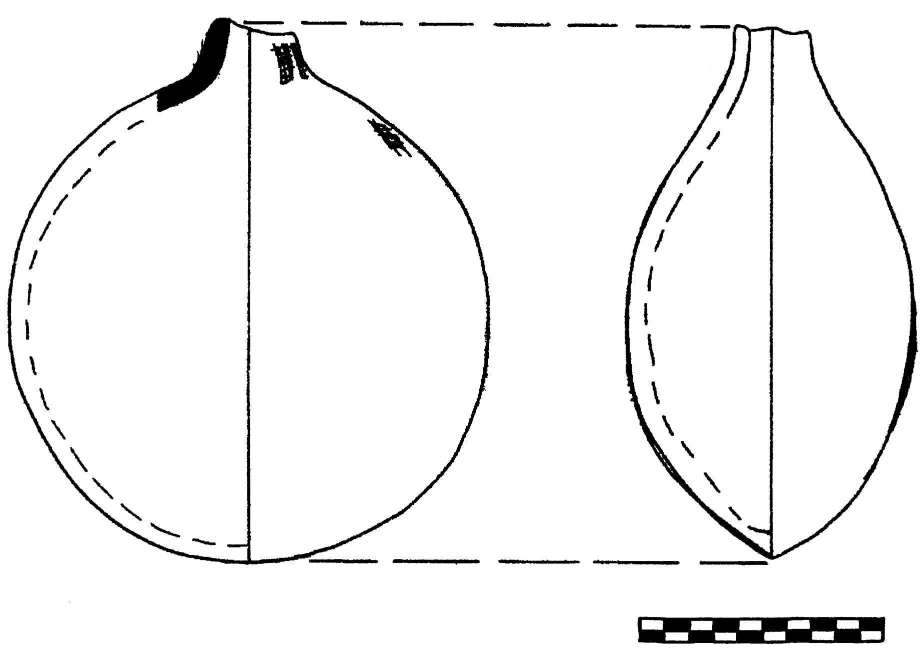


Figure 5.3 Flask, 6-18462 from Tomb

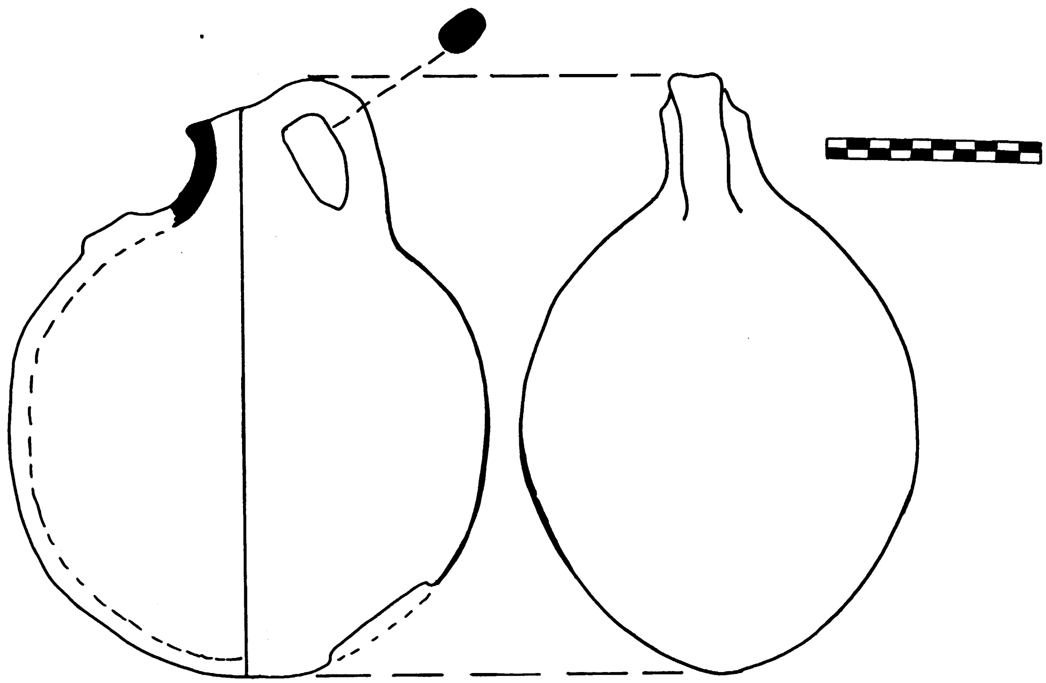


Figure 5.4 Flask, 6-18525 from Tomb A549. Drawing by Sabrina Maras.

pieces, the mold most likely being a shallow dish or saucer. The X rays show that an amorphous mass of clay had been pressed into the mold, and concentric circles of finger-sized indentations indicate where the potter had further worked to even and thin each lens wall (Rye 1981, 70, 81). The two separate sections of each body were then joined at the rims, a hole was made at a point along the angle made by the join, and the handmade spout was affixed. Handles were then added to two of the flasks; the other two were left without them.

The next vessel, 6-18525 (fig. 5.4) is a "true" pilgrim flask. It is incomplete, with a present height of 13.5 cm, a width of 11.5 cm, and a greatest diameter of 9.6 cm. It has an exterior Munsell reading of 5YR 6/4 (light reddish brown). Although the field notes do not mention it, other museum records attribute this vessel to Tomb A549. The body of this flask is more globular in shape than the previous examples, but, like the others, it is of a marl clay fabric and is self slipped and burnished (color plate 5.3). A portion of the neck and one complete handle remain, with an attachment for the second handle clearly visible on the opposite side of the neck. The body had been broken and subsequently repaired, leaving a hole where a section of the body is missing. This allowed for a visual inspection of the vessel interior. The exterior surface is smooth with the exception of the center of each lens, where a raised bump may be felt. An inspection of the interior indicates that the body was wheel made in one piece: the wheel marks flowed continuously from the center of one lens to the other, and the center of each lens was closed with a twist. As with the previous vessels, the end of the spout was pushed through, leaving clay residue from the process clinging to the interior of the vessel.

The last example examined, 6-18519 (fig. 5.5), is from Tomb A542. This vessel is not a pilgrim flask, but a spherical jug having a flared neck with handle ridge

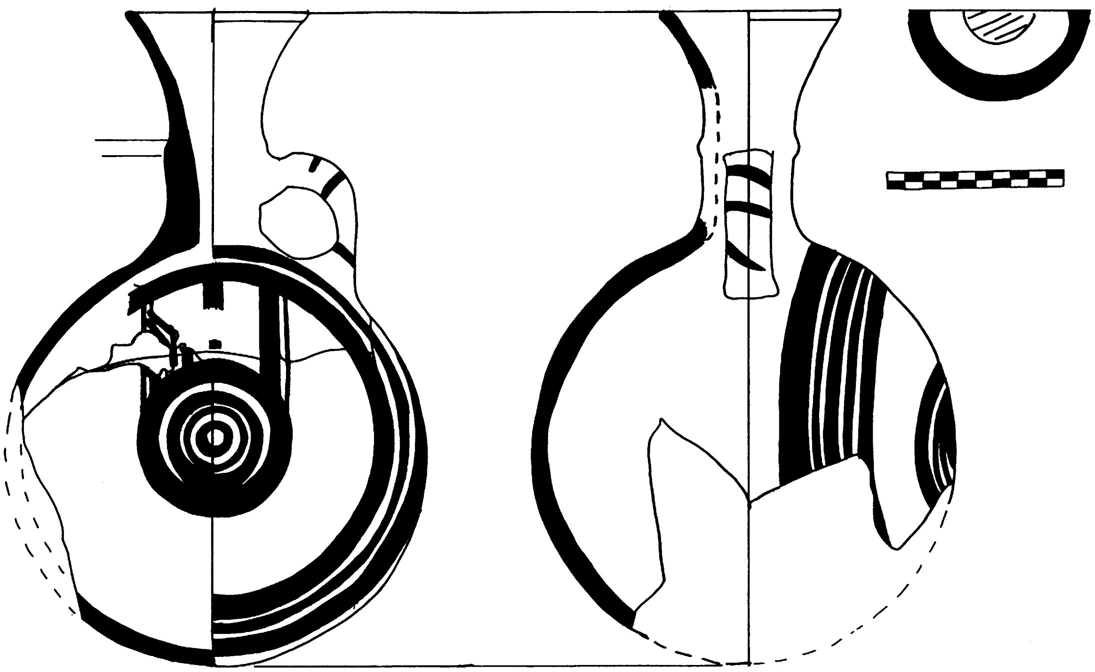


Figure 5.5 Handled Jug, 6-18519 from Tomb A542. Drawing by Sabrina Maras.

and only one handle, which extends from mid-neck to shoulder. It measures 18.7 cm in height and has a greatest diameter of approximately 11 cm. It is of marl clay fabric, Munsell reading 5YR 6/4 (light reddish brown), and has a cream colored slip with a Munsell reading which falls between 7.5YR 8/2 and 7/2 (pinkish white and pinkish gray). The vessel is decorated with brown paint. Two groups of concentric circles, one within the other, are placed on either side of the body. Traces of a vertical lattice panel may still be seen connecting these two groups, and a ladder pattern is visible on the handle (color plate 5.4). Although this vessel shows structural and stylistic similarities to white painted wares of the Cypriot Geometric period (Gjerstad et al. 1934, pl. LXI, nos. 6 and 18; pl. XLVI, niche no. 6), and to Phoenician examples of the Iron I through IIC periods (Amiran 1970, pls. 93, 95), a definitive identification has not been made at this time.

Since this vessel was broken and not repaired, the interior is clearly visible. An inspection of the interior reveals, as with the previous piece, that the vessel body was made in one piece. Again, there is a continuous flow of wheel marks from the twist at the center of one lens to the twist at the center of the other.

Examinations of these six vessels reveal that the bodies of four were produced in two pieces using molds, while the bodies of the remaining two were both wheel thrown in one piece. None of the vessels was constructed of separate wheel thrown lenses joined at the rims.

NOTES

[1] The museum numbers of the twelve flasks are: 6-18457, 6-18460, 6-18461, and 18462 (from Tomb A.502); 6-18519 (from Tomb A.542); 6-18525 and 6-18526 (from Tomb A.549); 6-18554 (from Tomb A.564); and 6-18726, 6-18865, 6-18992, 6-18806.

[2] Museum numbers 6-18457, 6-18460, 6-18461, 6-18462, 6-18519, 6-18525. Illustrations of these vessels, figs. 5.1-5, were kindly provided by Sabrina Maras.

[3] For illustrations and photographs of these characteristic marks, see James and McGovern 1993, pl. 19; Franken 1969, pl. XIII.

REFERENCES

AMIRAN, R.
1970 ***Ancient Pottery of the Holy Land: From its Beginnings in the Neolithic Period to the End of the Iron Age***. New Brunswick, N.J.: Rutgers University Press.

BADAWY, A.
1978 ***Coptic Art and Archaeology: The Art of the Christian Egyptians from the Late Antique to the Middle Ages.*** Cambridge, MA: MIT Press.

BOURRIAU, J.
1981 ***Umm El-Ga'ab: Pottery from the Nile Valley Before the Arab Conquest***. Catalogue of the Exhibition organized by the Fitzwilliam Museum, Cambridge, 6 October to 11 December 1981. Cambridge: Cambridge University Press and the Fitzwilliam Museum.

FRANKEN, H. J.
1969 ***Excavations at Tell Deir 'Allā I: A Stratigraphical and Analytical Study of the Early Iron Age Pottery***. Leiden: E.J. Brill.

GJERSTADT, E., J. LINDROS, E. SJÖQVIST, and A. WESTHOLM
1934 ***The Swedish Cyprus Expedition: Finds and Results of the Excavations in Cyprus 1927-1931, Vol. 1: Text and Plates***. Stockholm: Swedish Cyprus Expedition.

GLANZMAN, W. D., and S. J. FLEMING
1993 "The Pottery: Typology and Technology - Fabrication Methods." In ***The Late Bronze Egyptian Garrison at Beth Shan: A Study of Levels VII and VIII, Vol. 1***, by F. W. JAMES and P. E. MCGOVERN. University Museum Monograph 85. Philadelphia: The University Museum, University of Pennsylvania in cooperation with the University of Mississippi, 94-102.

GLANZMAN, W. D., and A. RUFO
1989 "Palestinian 'Pilgrim Flasks': Technical Assessment of their Fabrication Methods." Handout circulated at the annual meeting of the American Research Center in Egypt, Philadelphia, Pa.

HAYES, J. W.
1976 ***Roman Pottery in the Royal Ontario Museum: A Catalogue.*** Toronto: Royal Ontario Museum.

HOLTHOER, R.
1977 ***New Kingdom Pharaonic Sites: The Pottery***. The Scandinavian Joint Expedition to Sudanese Nubia Publications 5:1. Scandinavian University Books. Lund: The Scandinavian Joint Expedition to Sudanese Nubia.

JAMES, F. W., and P. E. MCGOVERN
1993 ***The Late Bronze Egyptian Garrison at Beth Shan: A Study of Levels VII and VIII***, 2 vols. University Museum Monograph 85. Philadelphia: The University Museum, University of Pennsylvania in cooperation with the University of Mississippi.

REISNER, G. A.
1904 "Work of the Expedition of the University of California at Naga ed Der." ***Annales du Service des Antiquités de l'Égypte*** 5:105-109.

RYE, O. S.
1981 ***Pottery Technology: Principles and Reconstruction***. Manuals on Archaeology 4. Washington, D.C.: Taraxcum.

SEIF El-DIN, M.
1992 "Technical Aspects and Workshop's Centres of the Pilgrim Flasks in the Graeco-Roman Egypt." ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramiques en Égypte):121-27.

6

The Dating of Late Period Bes Vases

D. A. Aston and B. G. Aston

In recent years much attention has been focused on Late period Bes vases, and a number of different typologies and sources of origin have been proposed.[1] No attempt, however, has been made to arrange these enigmatic objects in a chronological order, no doubt due to the difficulties of dating Late period pottery in general. Indeed, as Bourriau (1987, 86-87) has pointed out, a comprehensive study of these Bes vases, taking into account the archaeological context, fabric, ware, vessel shape, and technique of manufacture, is badly needed. It is the aim of this paper to take up this suggestion and attempt to produce a firm chronological typology for Egyptian Bes vases similar to that produced by Blakeley and Horton (1986, 111-19) for vessels found in southern Palestine during the Persian period.

Kuchman Sabbahy (1982, 147-48) was the first to provide a typology for Late period Bes vases found in Egypt when she divided them into two basic types:

1) the juglet or juglet decanter type produced in "fine buff clay" and found only at a few sites in the Memphite area and the Fayum; and

2) a drop-shaped jar type produced in a "rough red ware" and found at sites throughout Egypt.

One year later, Guidotti (1983) published an article in which she divided Late period Bes vases into four types: A; B, which she subdivided into B1 and B2; and C. Type C vessels are clearly Hellenistic or later and lie outside the scope of this article (see ibid., 54-56; Jesi 1963). The other types were classified as follows.

Type A consisted of vessels that were of large dimensions with a mouth with lips, barely differentiated neck, and ovoid body. Into this class Guidotti placed six vessels, three of which were indeed large (our type I) and three of which clearly differed in being much smaller (our type II). Vessels of type B were subdivided into two contemporary groups[2]—those in B2 being much coarser and more schematic than those in B1:

B1) Vases of type B1 are made of a fine clay, have a tall neck, give an indication of the arms, which are proportionally smaller than the face, and, unusually for representations of Bes, do not show the tongue protruding from the mouth. The face becomes progressively more grotesque and representations of the feathered headdress are only found on a few examples.

B2) Vases of type B2 are separated from those of type B1 by being made of a coarser clay and by having a larger mouth, a short neck, and a rounded base without a foot.

The above represents two different ways of looking at these objects. For Kuchman Sabbahy the fabric was clearly the primary factor influencing her typology, whilst for Guidotti the physical appearance of the vessel was more important. In our opinion, which clearly echoes that of Bourriau, a sensible typology of these vessels can only be formulated if both fabric and appearance are considered as equally important. The present corpus of Late period Egyptian Bes vessels amounts to over one hundred pieces, and, we believe, may be divided into the following six types based on fabric, ware, and technique of manufacture: type I, large Nile silt ovoid jars; type II, small Nile silt ovoid jars; type III, bag-shaped Nile silt vessels with detailed facial features; type IV, Nile silt jars with schematic facial features; type V, well-made marl clay vessels with detailed facial features; and type VI, less carefully made jars in both marl and silt clays with more schematic facial features. In addition, there are a small number of Bes vases known to us which do not fall into any of the above categories and are best described as miscellaneous vessels lying outside the main line of development. These latter are probably to be seen as the quirks of individual potters and will not be discussed in this paper.[3]

Type I

Bes vases of type I (fig. 6.1) may be characterized as large Nile silt jars with ovoid bodies, rounded bases, rolled rims, and minimal necks. The Bes face is found on the upper part of the body and is made by the addition of rolls of clay to represent the ears, eyes, nose, mouth, tongue, and arms. Characteristic of these pots is a feathered headdress shown above the eyes. In view of the large size of these vessels, they rarely survive intact. Indeed, only two complete examples are known to us:

1) a vessel found by Petrie (1909a, pl. LIV.845) in the storerooms of the mortuary temple of Seti I at Thebes and dated to Dynasties 23 to 26; and
2) a similar vessel found by Rosellini and now in Florence (inv. no. 3359; Rosellini 1834, 344, n. 125, pl. LVI.125; Guidotti 1983, pl. 1A).

Sherds of two others of this type were found at Ashmunein in level 1 (Spencer 1986, 14-15, fig. 24.112, 114), which was dated to the Third Intermediate period/Saite period. Two more may have been recovered at Mendes, but these "large storage jars" remain unpublished (S. Allen 1982, 20), and fragments of three others may have been discovered at Amarna.[4]

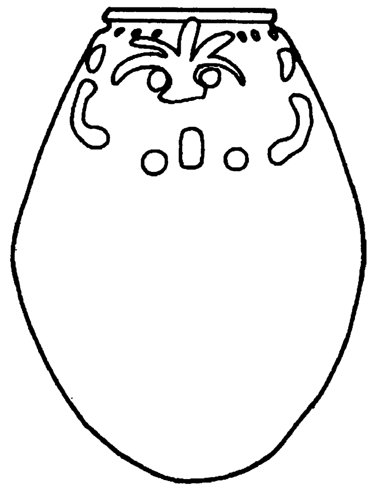


Figure 6.1 Bes vase of type I, with Bes face on upper part of ovoid body and feathered headdress above eyes

While the Florence vessel has lost its original archaeological context, the remaining vessels can be dated through the other pots found with them. The pottery found with that recovered from the Seti I temple at Thebes includes two examples of Attic brush-banded amphorae (Petrie 1909a, pl. LIV.849-50) that are characteristic of the first half of the sixth century B.C., though they may extend as late as ca. 500 B.C. (Sparkes and Talcott 1970, 192-93, nos. 1500-1505, fig. 12 and pl. 64). The bowls (Petrie 1909a, pl. LIV.814-6, 819-20) and bottle (ibid. 834) find ready parallels in Persian period caches at Saqqara (cf. French 1988, 79-89; P. G. French and H. Ghaly 1991, 93-123; D. A. and B. G. Aston, in preparation). On the basis of demotic inscriptions found on a small number of vessels, French consistently dates the Saqqara material to the fourth century B.C., although he readily admits that it need not necessarily be all of the same date. From stratified deposits at Elephantine (unpublished), it would appear that the Saqqara pottery is not all of the same date but falls into two groups, one slightly earlier than the other. The vessels published by French and Ghaly (1991, 97, 123.18a-b) with demotic inscriptions dated to the fourth century B.C. by H. S. Smith are only found in levels provisionally dated to the fourth century at Elephantine, whilst the bowl types found at Qurneh appear stratigraphically one layer lower. From the foregoing discussion it is probable, therefore, that the Qurneh pottery dates to the sixth and fifth centuries B.C. A date in the first half of the sixth century for the Bes vase is perhaps indicated by the sherds recovered at Ashmunein. All of the published material from Spencer's level 1 falls into the period covered by the Twenty-fifth and Twenty-sixth dynasties, as a comparison with the pottery associated with the South Tombs at Amarna (French 1986, 147-88) and in unpublished stratified layers at Elephantine clearly shows.

TYPE II

These vessels, of which only a few are known, consist of small, neckless Nile silt ovoid jars with a rolled rim and rounded or pointed bases. The applied decoration comprises eyes and nose in all examples, usually mouth and ears, and sometimes 'cheeks' (fig. 6.2). The following vessels are known to us:

1) Ashmunein 1985/28 (Spencer and Bailey 1986, 61, fig. 9.1);

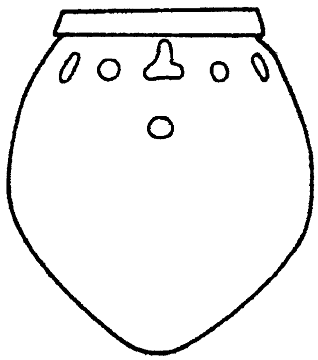


Figure 6.2 Bes vase of type II; small, neckless ovoid jars with applied decorations representing eyes and nose, and often ears and mouth

2) Ashmunein 1985/29 (ibid., fig. 9.2);
3) Thebes (Petrie 1909a, pl. LIV.826);
4) Thebes (ibid., pl. LIV.827);
5) Thebes (Myśliwiec 1987, 57, no. 368).

Petrie dated his vessels to Dynasties 23 to 26, but as they were found with the vessel of type I above, then these too should be dated to the sixth-fifth centuries B.C., with a preference for the first half of the sixth century B.C., owing to the presence of the Attic brush-banded amphorae found in the same place. The vessel published by Myśliwiec was found in a pottery cache with a number of other vessels, which find their closest parallels in an unpublished Saite/Persian context at Buto (P. G. French, personal communication) and in that recovered by Petrie with intrusive burials at Lahun, which he dated to the Twenty-second Dynasty (cf. Myśliwiec 1987, 54-63 with Petrie, Brunton, and Murray 1923, pls. LIX-LX). Despite the generally poor nature of the Lahun graves, enough hints survive to show that these burials date to the seventh century B.C. Bead nets were found with the burials in tombs 603 and 650, which are thus later than ca. 750 B.C. (Aston 1987, 519-23). The published drawings of the finger rings found in tombs 610 and N11 show the bezel raised above the shank (Petrie, Brunton, and Murray 1923, pls. LXIX.22, LXVIII.23), a characteristic that appears to be no earlier than the Twenty-sixth Dynasty, when the shape of finger rings changed to a type in which the bezel is raised above the shank, whilst the underside of the bezel is cut away to leave room for the finger (Wilkinson 1971, 194-95). The foreign pottery found included a small amount of Cypriote Black-on-Red ware recovered from tombs 602, 607, 609, 620, and 851. The jug neck (Oxford Ashmolean 1914.705) from tomb 602 would appear to belong to a Black-on-Red II (IV) jug of Gjerstadt's type 3a (1948, fig. XXXVIII.3a), whilst the base sherd found in Lahun 607 may derive from a bottle of this same Black-on-Red II (IV) ware (cf. ibid., fig. XXXIX.19 with Petrie, Brunton, and Murray 1923, pl. LX.98M). Both vessels would thus date to the Cypro-Archaic period, ca. 750 - 600 B.C. The remaining Cypriote sherds cannot be typed but are likely to be of the same date. Taken together, therefore, the above material points to a date somewhere between 750 and 600 B.C., with the finger rings pointing towards the later part of the period. This is made all the more likely by a comparison with the pottery thrown out of the South Tombs at Amarna, the unpublished stratified Saite material at Buto, and by unpublished stratified deposits at Elephantine. When compared with the Amarna pottery (French 1986), which is dated to or around the Twenty-fifth Dynasty, the Lahun material is clearly different. Since both groups are funerary in nature, the differences between the two groups can presumably be due only to regional or chronological factors. Regional differences, however, can probably be discounted since vessels from both the Amarna and Lahun corpora reappear at Buto in the north and at Thebes and Elephantine in the south. At both Buto and Elephantine, pottery similar to the Amarna group occurs in a lower level than that which is similar to the Lahun group. The pottery at Lahun, therefore, would seem to be later than the Twenty-fifth Dynasty. Yet, since the other grave goods at Lahun indicate a date in the period ca. 750-600 B.C., it is probable that the entire Lahun assemblage should be assigned to the period ca. 650-600 B.C. Moreover, this date is consistent with French's (1992) dating of the Buto group with Lahun parallels to the late seventh or early sixth century B.C.[5]

Since, as already stated, material from the Theban caches in which the Bes vase (no. 5 above) was found is similar to the Lahun group, then it is logical to date the Theban pottery also to the late seventh-early sixth century B.C. The two vessels from Ashmunein were found in sector W, square j10, level 1 in a fill layer with pots that were dated to the Third Intermediate period/Twenty-sixth Dynasty (Spencer and Bailey 1986, 3). All published vessels from level J1, however, find their closest parallels in the material from the Amarna South Tombs and in unpublished deposits at Elephantine provisionally dated to Dynasties 25/26. A date in the late seventh-early sixth century B.C. for the Ashmunein pieces is thus highly probable. The fact that both types I and II come from the same sites and are of the same date indicates a close relationship between the two.

Type III

Bes vases of type III make up a small but related group found in Upper Egypt. They consist of Nile silt ovoid or bag-shaped vessels with rounded or ring bases, distinct necks, and rolled or disc rims. The detailed applied facial features show the ears, eyebrows (though not in all examples), eyes, a well-modelled nose, and a full mouth showing both lips (fig. 6.3). The eyes are sometimes pricked to indicate the pupils. The following examples are known:

1) Asfunul-Mata'nah (Bakry 1968, 37-9, pl. 4, fig. 7b);
2) Asfunul-Mata'nah (ibid., pl. 5, fig. 8b);
3) Asfunul-Mata'nah (ibid., pl. 6, fig. 9b);
4) Asfunul-Mata'nah (ibid.);
5) Asfunul-Mata'nah (ibid.);
6) Asfunul-Mata'nah (ibid.);
7) Asfunul-Mata'nah (ibid., pl. 10, fig. 14b);
8) Asfunul-Mata'nah (ibid., pl. 12, fig. 16b);
9) Asfunul-Mata'nah (ibid.);
10) Asfunul-Mata'nah (ibid., pl. 14, fig. 18b);
11) Asfunul-Mata'nah (ibid.);
12) Asfunul-Mata'nah (ibid., pl. 15, fig. 18c);
13) Asfunul-Mata'nah (ibid.);
14) Esna (Downes 1974, 15 e28, fig. 18, 46 no. 144);
15) Esna (ibid., no. 144A); and
16) El Kasr, Bahria oasis (Fakhry 1938, 428-9, pl. 71a).

With the exception of the Bahria pot, which was dated to the Roman period,

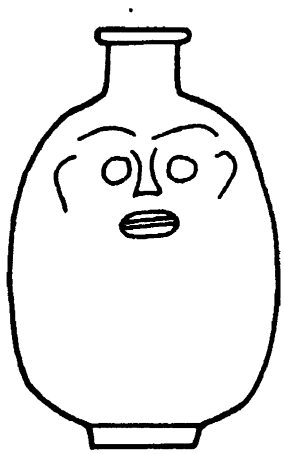


Figure 6.3 Bes vase of type III; detailed applied facial features showing eyes, eyebrows, ears, nose, and mouth with two lips.

none of the above vessels were dated by their publishers. The Asfunul-Mata'nah cemetery can be dated to the late Twenty-sixth or early Twenty-seventh Dynasty through other grave goods that were found in the same cemetery. Some of the mummies found were covered with bead nets to which were attached faience Sons of Horus and a disjointed winged scarab (Bakry 1968, 46, 50, pls. 37-40, 64). They are thus of Silvano's (1980, 84) type A, which are the earliest, having developed sometime after ca. 750 B.C., with most datable examples falling in the seventh century B.C., and possible extensions as late as ca. 525 B.C.(Aston 1996). The ordinary pots found with some of these burials can be dated to about the Twenty-sixth Dynasty (Bakry 1968, pls. VIII, fig. 12b; XXIV, fig. 35) or to the Persian period (ibid., pls. XIX, fig. 27; XXI, fig. 31). A dating in or around the sixth century B.C., therefore, would seem best suited for these type III vessels.

Type IV

Bes vases of type IV consist of small Nile silt bag-shaped jars with rounded or pointed bases and rolled rims (fig. 6.4). Usually they bear representations of eyes, ears, and nose, but no mouth. Less carefully made pots only bear representations of the eyes and nose or the eyes alone. The facial features are formed by indenting applied lumps of clay, or by indentations directly in the vessel wall with or without additional applied lumps for the pupils. Eyebrows are not usually delineated although several examples bear an incised headdress. The following examples are known to us:

1) Tell Defenneh (Petrie 1888, 64-5 pl. XXXV.64);
2) Tell Defenneh (ibid., pl. XXXV.66);
3) Suwa (idem 1906, pl. XXXIX.F.178);
4) Suwa (ibid., pl. XXXIX.F.179);
5) Suwa (ibid., pl. XXXIX.F.180);
6) Suwa (ibid., pl. XXXIX.F.181);
7) Suwa (ibid., pl. XXXIX.F.182);
8) Suwa (ibid., pl. XXXIX.F.183);
9) Suwa (ibid., pl. XXXIX.F.184);
10) Tell el-Yahudieh (ibid., pl. XXIA.34);
11) Tell el-Yahudieh (ibid., pl. XXIA.35);

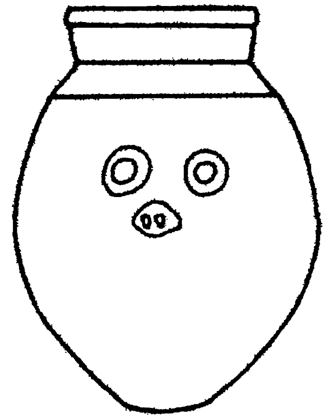


Figure 6.4 Bes vase of type IV; small, bag-shaped jar with eyes and nose but no mouth depicted

12) Heliopolis (Petrie and E. Mackay 1915, pl. XI.48);
13) Heliopolis (Guidotti 1983, 51, fig. 27, 63 pl. IID; Turin 3684);
14) Heliopolis (ibid., fig. 28, 64 pl. IIIA; Turin 3685);
15) Heliopolis (ibid., fig. 29, 64 pl. IIIB; Turin 3644);
16) Heliopolis (ibid., fig. 30, 64 pl. IIIC; Turin 3641);
17) Saqqara (Macramallah 1940, 78 fig. 38);
18) Memphis (Engelbach 1915, pl. XXXIX.109);
19) Memphis (Petrie 1909b, pl. XLVI.39);
20) Mit Rahineh (Anthes 1959, pl. 17e.47);
21) Mit Rahineh (ibid., pl. 17e.48);
22) Mit Rahineh (Anthes 1965, pl. 60.434);
23) Mit Rahineh (ibid., pl. 60.436);
24) Kafr Ammar (Petrie and Mackay 1915, pl. XXXIII.47);
25) Meidum (Petrie, Mackay, Wainwright 1910, pl. XXVIII.138); and
26) Abydos tomb D16B (Bourriau 1981, 83 no. 161).

The original publishers of these pieces have dated these vessels to Dynasties 19 to 26 (no. 12), the Third Intermediate period (no. 26), around the Twenty-third Dynasty (no. 25), Dynasties 23 to 24 (24), the Twenty-sixth Dynasty (no. 18), Dynasties 26 to 30 (nos. 3-9), Late (nos. 17, 22-23) and Ptolemaic (nos. 10-11, 19) periods, or left them undated. Some of the vessels, however, can be dated more accurately if one considers the other objects found with them.

The tombs at Kafr Ammar, in which the Kafr Ammar Bes vase was found, can be divided into two types. The first consisted of a small shaft which descended to a depth of between 2.75 m and 6.00 m. At the bottom were two or three chambers that generally contained a number of painted coffins that were sometimes enclosed in a *qrsw* coffin.[6] The other type of tomb comprised a shaft which ended in a number of chambers with secondary rooms sometimes opening off the shaft on the way down. In these, the mummies were buried without coffins. Commenting on the burials as a whole, Wainwright observed that "the objects discovered all belong to a well known group generally placed between the end of the Twenty-second and the rise of the

Twenty-sixth dynasties," and that most of the adults were buried "with nothing whatsoever but a bead work covering and a Ptah-Sokar-asar figure" (Wainwright 1915, 33). Many of these tomb groups, however, also contained pottery (Petrie and Mackay 1915, pls. XXIII-XXIV), much of which resembled that found at Defenneh and dated to the Twenty-sixth Dynasty (cf. Petrie 1888, pls. XXXIII-XXXVI). Wainwright (1915, 33) divided the pottery into native Egyptian and foreign Greek types, and assumed that the tombs which contained the Greek vases were chronologically the latest "perhaps even dating to the early part of the Twenty-sixth Dynasty." To this foreign class he erroneously attributed a series of handled jugs of a greenish-grey ware (Petrie 1888, pl. XXIV.60-69), rightly pointing out that type 60 was identical with one published by Petrie (1888, pl. XXXV.44), which he then used to date nine of his graves to chronologically the latest period of the cemetery's use. Numerous items among the tomb groups, however, indicate that they date to the late seventh century B.C. at the earliest, and, in all probability, to the sixth century B.C., with some possibly as late as the fifth century B.C. The *qrsw* coffins, unknown before ca. 750 B.C.[7], do not become common until the early seventh century B.C. The Ptah-Sokar-Osiris figures are distinctly Saite types (Raven 1979, 272), and the published bead net is of Silvano's (1980, 83-95) type C, which is chronologically the latest and not known before the Twenty-sixth Dynasty (Aston 1996, 519-23). The offering table of Hori and the coffin of Merneit both show the pennant spelling of Osiris, which seems to have appeared at Thebes around 720 B.C. and sometime later at Memphis where it was still uncommon by 664 B.C.[8] Finally, the close parallels of the pottery found in the 'latest' tombs with that from Defenneh, which must date from the late Twenty-sixth Dynasty or later,[9] strongly indicate a sixth century B.C. date for these pieces at the earliest. A number of other pieces, however, are even later (Petrie and Mackay 1915, pls. XXIII.2-28, 48-50; XXIV.51-59, 71, 73). These find ready parallels in Late period caches at Saqqara which are provisionally dated to the Persian period,[10] and in unpublished stratified deposits at Elephantine. This Persian period phase is well marked in northern sites where it has been dated to the fifth and fourth centuries B.C. (French 1992). Such a date accords well with the pottery from Elephantine, where it occurs immediately above layers provisionally dated to Dynasties 25/26, but below a level which is itself sealed by a house of the early Ptolemaic period (pre-Ptolemy IV).

The Suwa Bes vases were found in graves 3, 36, 101, 121, 179, and 216, of which graves 3, 101, 121, and 179 contained other pots that clearly belong in this same fifth-fourth century B.C. phase (Petrie 1906, pls. XXXIX.F.142, 143, 146, 148, 157, 158, 167, 171, 172, 174, 187, 189, 190, 194, 195, 198A, 199; XXXIX.H.260). The close similarities between the Suwa and the Tell el-Yahudieh vessels would tend to indicate that the latter should also be attributed to this period, the more so since pottery of this date is not unknown at Tell el-Yahudieh, having been found in Petrie's tombs 44, 50, 310, and 410 (ibid., pls. XIX, XXA). The Bes vases from Defenneh are certainly no earlier than the reign of Amasis, and probably somewhat later. Although the remainder cannot be dated by archaeological context, it seems clear from the foregoing discussion that vessels of this type should be dated no earlier than the sixth and, more probably, to the fifth century B.C.

TYPE V

Type V Bes vases (fig. 6.5) are made from a fine marl clay, invariably Marl A2 or

Marl A3, and are generally well fired, thin-walled, and carefully finished. They are usually necked vessels with an ovoid body exhibiting a distinct shoulder, and either a ring or rounded base. The rim is either flanged ('ledge rim') or flaring with a rolled lip. One or more 'collar' ridges may appear on the neck and/or at the base of the neck. A vertical handle running from neck to shoulder is usually present on the opposite side of the vessel from the face. The details of the face are a combination of applied, impressed, and incised elements; occasionally some details are painted in black. The eyes, nose, mouth, eyebrows, ears, and arms are usually modelled from applied lumps of clay; secondarily the eyes are impressed with an annular implement or pricked with a tool. A small circular impression may also appear in the centre of the forehead. Incised mustaches and beards are common, headdresses rare. Painted bands may also be found, usually on the neck, but sometimes above and below the face. At present, vessels of this type are principally known from the Memphite/Fayum region and southern Palestine. As such, they clearly belong in a lower Egyptian pottery tradition. The following examples are known to us:

1) Tell el-Hesi 1981/1620 (Blakely and Horton 1986, 115, fig. 2.1, 116 pl. XXIV);
2) Deve Hüyük (ibid. 115, fig. 2.2, 117 pl. XXV; Ashmolean

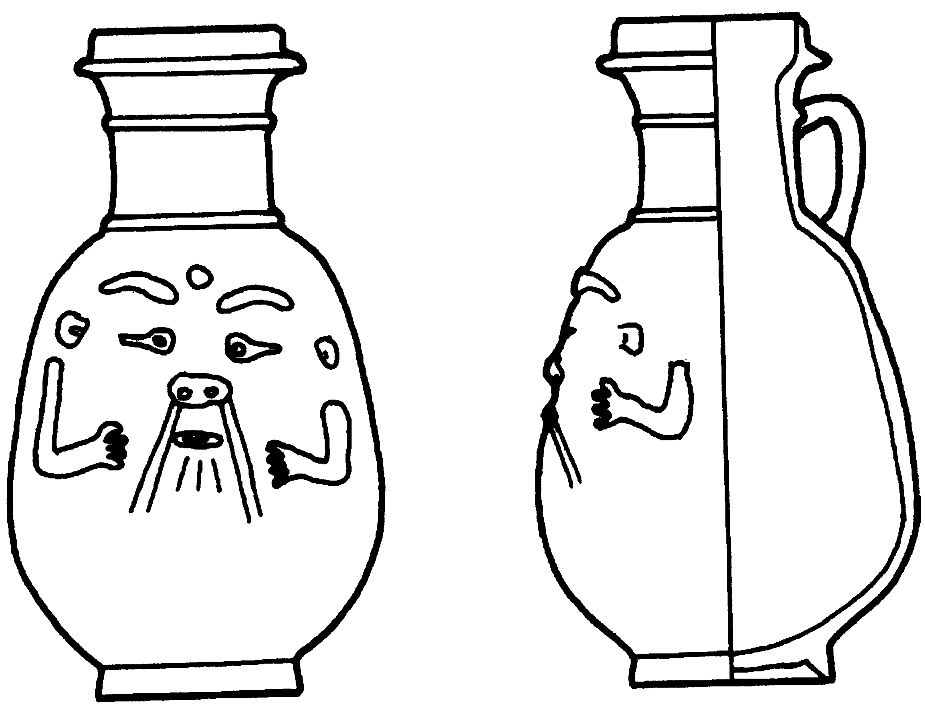


Figure 6.5 Bes vase of type V; ovoid body with neck and ringed bottom, facial details include applied, impressed or incised elements

1913.640);

3) Heliopolis (Guidotti 1983, 48 no. 26, 63 pl. IIC; Turin 3683);
4) Abusir 180 (Charvat 1981, 156-57, pl. 8);
5) Abusir A 738 (ibid.);
6) Abusir E 977 (ibid.);
7) Abusir E 1049 (ibid.);
8) Abusir E II 7 (ibid.);
9) Abusir F.287 (ibid.);
10) Abusir I.438 (ibid., pl. 9);
11) Abusir J.1898 (ibid., pl. 10);
12) Abusir A-18-20-22 (ibid., pl. 66);
13) Abusir A 36/5 (ibid.);
14) Abusir A 38 (ibid.);
15) Saqqara, EAO excavations south of the Unas causeway (French and Ghaly 1991, 107 no. 28);
16) Saqqara, surface debris (EES-Leiden excavations 1975, P699, unpublished);
17) Saqqara, surface debris (EES-Leiden excavations 1975, P240, unpublished);
18) Saqqara, pottery cache (EES-Leiden excavations 1975, P445, unpublished);
19) Saqqara, surface debris (EES-Leiden excavations 1975, P707, unpublished);
20) Saqqara, surface debris 87-218 (EES-Leiden excavations 1987 unpublished);
21) Saqqara, surface debris 87-307 (EES-Leiden excavations 1987 unpublished);
22) Saqqara, surface debris 87-312 (EES-Leiden excavations 1987 unpublished);
23) Saqqara, surface debris 87-337 (EES-Leiden excavations 1987 unpublished);
24) Saqqara, Tomb of Maya, shaft ix 90-220 (EES-Leiden excavations 1990 unpublished);
25) Saqqara, Tomb of Maya, shaft ix 90-313 (EES-Leiden excavations 1990 unpublished);
26) Saqqara, Tomb of Maya, shaft ix 90-280 (EES-Leiden excavations 1990 unpublished);
27) Saqqara, Tomb of Maya, shaft ix 90-237 (EES-Leiden excavations 1990 unpublished);
28) Saqqara, Tomb of Maya, shaft ix 90-301 (EES-Leiden excavations 1990 unpublished);
29) Saqqara, Tomb of Maya, shaft ix 90-311 (EES-Leiden excavations 1990 unpublished);
30) Saqqara, Tomb of Maya, shaft ix 90-312 (EES-Leiden ex cavations 1990 unpublished);
31) Saqqara, Tomb of Maya, shaft ix 90-263 (EES-Leiden excavations 1990 unpublished);
32) Saqqara, Tomb of Maya, shaft ix 90-266 (EES-Leiden ex-

cavations 1990 unpublished);

33) Saqqara, Tomb of Maya, shaft ix 90-310 (EES-Leiden excavations 1990 unpublished);
34) Saqqara, Tomb of Maya, shaft xiii 90-491 (EES-Leiden excavations 1990 unpublished);
35) Saqqara, Tomb of Maya, shaft xiii 90-493 (EES-Leiden excavations 1990 unpublished);
36) South Saqqara, Le Mastabat Faraoun, Cairo (Jequier 1928, 35, fig. 36);
37) Dahshur (De Morgan 1895, 45, fig. 94);
38) Lahun (Petrie 1890, pl. XXIV.27);
39) Provenance unknown (Perrot and Chipiez 1884, 820-1, fig. 14);
40) Provenance unknown (Guidotti 1983, 46, fig. 10, 62 pl. IC; Turin 3555);
41) Provenance unknown (ibid., 47, fig. 20, 63 pl. IIB; Turin 3554);
42) Provenance unknown (ibid., 46, fig. 11, 62 pl. ID; Turin 3553);
43) Provenance unknown (ibid., fig. 12, 63 pl. IIA; Florence 3451);
44) Provenance unknown (Price 1897, 404 no. 3345);
45) Provenance unknown (Guidotti 1983, 47, fig. 15; London, BM 5696).
46) Provenance unknown (*Meisterwerke* 1978, 209-10, no. 356; Munich ÄS 4528);
47) Provenance unknown (*Description de L'Égypte*, tome 5ème 1823, pl. 75 no.7);[11]
48) Provenance unknown (Bourriau 1981, 83 no. 160; Birmingham W1138);
49) Provenance unknown (Hope 1987, 46, fig. 61; London UC 2888); and
50) Provenance unknown (ibid.; London UC 2877).

An unusual vessel from Thebes must also belong to this group since it is made from the same clay and has a face made in a similar manner. The vessel itself, however, is not a closed shape but an open form (Guidotti 1978, 112, fig. 14; idem 1983, 44, no. 7, 46, fig. 7).

These vessels are perhaps the most familiar and most aesthetically pleasing of the Late period Bes vases. Unfortunately, no doubt owing to their inherent charm, they have tended to be published in isolation, devoid of all archaeological context. Indeed, of the fifty vessels listed above, only the Tell el-Hesi, Deve Hüyük, and the unpublished examples from Saqqara, P445, and those from the Tomb of Maya shafts ix and xiii, can be dated archaeologically. The vessels found in southern Palestine, which, from the description of the clay as one that has fired pink with a whitish bloom covering the exterior surfaces, are clearly Egyptian in origin[12] and have been dated, independently of one another, to the fifth century B.C. The vessel from Tell el-Hesi was found in a pit that, on the basis of its stratigraphic location and the local pottery found within it, has been dated to the mid-fifth century B.C. (Toombs 1983, 33-35). The vessel from Deve Hüyük comes from a site that appears to be a military cemetery dating from the early fifth century B.C.[13] Such a dating puts these pots firmly in the

Persian period, a date which corresponds with those found at Saqqara. Other pots found with the Bes vases in shafts ix and xiii at the tomb of Maya and with the vessel P445 belong in the same ceramic phase discussed above when dealing with vessels of type III, and date to the fifth-fourth centuries B.C. Without a doubt, therefore, Bes vases of type V should be dated to the fifth century B.C., with the possibility that they may have extended into the fourth century B.C..

Type VI

Bes vases of type VI (fig. 6.6) are usually made of marl clay, but four examples are also known to us in Nile silt (nos. 7, 11-13 below). In shape, type VI vessels are similar to type V; both are necked and have a generally ovoid body, a distinct shoulder, and either a flanged rim or a flaring rim with rolled lip. Type VI vessels, however, rarely have a ring base; bases are round, or flattened with a pointed centre. Facial features are schematic; the mouth usually lacking. The eyes, nose and ears are simply applied lumps of clay, though a slit is sometimes incised in the eyes. Applied or incised eyebrows may be present; one or both eyebrows are occasionally doubled. Other features that sometimes occur are incised mustaches, headdresses or forehead spots, and simple applied or incised arms without detailed hands. The following vessels belong in this group:

1) Tell Jemmeh (Gerar) EXXXVI 26/8 (Blakely and Horton 1986, 115, fig. 1.2, 112 pl. XIX);
2) Tell Jemmeh (Gerar) EXXXVI 25/13 (Petrie 1928, pl. LIX.78m; Blakely and Horton 1986, 115, fig. 1.3, 113 pl. XX);
3) Tell Jemmeh (Gerar) EXXXVI 25/14 (ibid., fig. 1.4, 113 pl. XXI);
4) Tell Jemmeh (Gerar) EXXXVI 25/15 (Petrie 1928, pl. LIX.78c; Blakely and Horton 1986, 115 fig. 1.5, 114 pl. XXII);
5) Tell Jemmeh (Gerar) (Petrie 1928, pl. LIX.76v);
6) Tell el-Hesi 1981/1687 (Blakely and Horton 1986, 114 pl. XXIII);
7) Mendes (S. Allen 1982, pls. XVI-XVII, no. 10);
8) Saqqara (Lauer 1939, 451 fig. 37);
9) Saqqara (ibid., fig. 38);
10) Saqqara, surface debris, 82-S-252 (EES-Leiden excavations 1982 unpublished);
11) Saqqara, surface debris, P69 (EES-Leiden excavations 1975 unpublished);
12) Saqqara, surface debris, P561 (EES-Leiden excavations 1975 unpublished);
13) Saqqara, Tomb of Maya, shaft ix 90-239 (EES-Leiden excavations 1990 unpublished);
14) Memphis (Anthes 1959, 26 no. 49, pl. 20b);
15) Hawara (Petrie 1912, pl. XXXVI.118);
16) Provenance unknown (Guidotti 1983, 48 no. 31, 52 fig. 31, 64 pl. IIID; Florence 3221); and
17) Provenance unknown (ibid., 48 no. 32, 51 fig. 32).

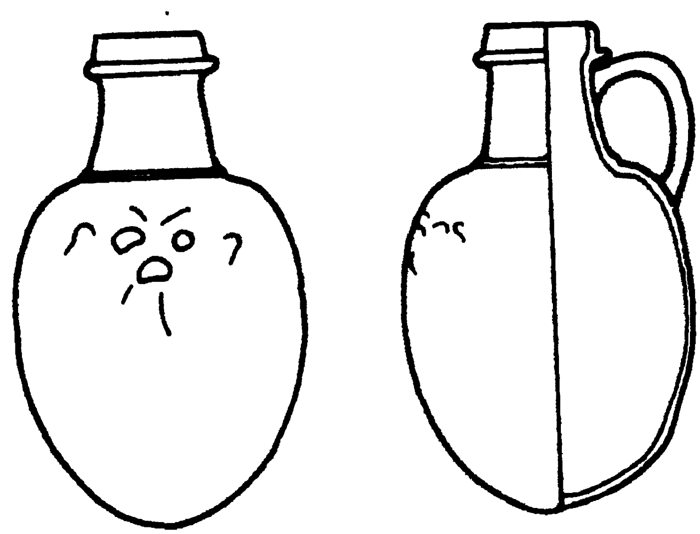


Figure 6.6 Bes vase of type VI; similar in shape to type V but type VI has a round base

The dating of these vessels is dependent on the examples found in southern Palestine, since, with the exception of no. 13, the Egyptian examples are devoid of any archaeological context. Kuchman Sabbahy (1982, 148) has suggested that this type is a Palestinian imitation of the Egyptian type V, but this seems unlikely since so few Bes vases of type V have been found in Palestine, and the above list shows that at least eight examples of type VI have been found in Egypt.[14] The Tell el-Hesi piece was found in the same pit as the Tell el-Hesi vase of type V and can thus be dated to the middle of the fifth century B.C. The vessels from Tell Jemmeh cannot be dated with precision but are apparently earlier, and possibly much earlier, than the granary phase at Jemmeh which began sometime after 350 B.C. (Petrie 1928, 7-9; Van Beek 1983, 18-19; Blakely and Horton 1986, 117). The Saqqara vessel, 90-239, was found with other vessels of type V together with pottery datable to the fifth-fourth centuries B.C. Once again a date in the fifth, possibly extending into the fourth, century B.C. is thus indicated for this type.

In conclusion, it seems that, of the forms discussed here, types I and II are the earliest, dating from the late seventh and early sixth centuries B.C. These would appear to be followed by Bes vases of type III sometime during the sixth century B.C. Bes vases of type IV first appear in the late sixth century B.C. and continue into the fifth whence they are joined by types V and VI. As such, they form just one part of the changing pottery repertoire recognizable in Persian period contexts.[15] It is perhaps something of a conundrum that the three earlier types are restricted to sites south of Ashmunein, whilst the three later ones are concentrated in an area extending northwards from the Fayum to Southern Palestine. It is, of course, possible that this is simply due to a gap in the archaeological record with the corresponding early sites in the north and late sites in the south still waiting to be excavated.[16] The contemporaneity of types IV-VI has led Kuchman Sabbahy (1982, 149) to suggest that the differences were economic, with the Nile silt vessels being a less expensive and more easily produced version of the marl clay types. This, however, seems unlikely.[17] From the distribution pattern of the provenanced examples it would appear that the marl clay vessels form part of a ceramic industry centered on the Memphis-Fayum region, from where they were traded elsewhere, whereas the Nile silt vessels belong in a Lower Egyptian (Delta) pottery tradition.[18] Most of the vessels listed above come from funerary contexts, but not all. Indeed, a significant number have been found on town sites (Tell el-Hesi, Tell Defenneh, Mendes, Mit Rahineh, Ashmunein) or in pottery caches (Qurneh), suggesting that these vessels also played some part in the daily lives of the living. Nevertheless the fact that most with known provenance derive from cemetery sites tends to support the idea that they were primarily manufactured for burial with the deceased.[19] This is in marked contrast to the New Kingdom, when almost all Bes vases with known provenance come from town sites. Clearly a change in emphasis in the nature of the god Bes had taken place over time, but a discussion of such religious changes lies outside the scope of this article.[20]

Notes

[1] The term "Late period" as used in this paper refers to the period initiated by Psammetichus I's accession in 664 B.C. and ended by Alexander's conquest in 332 B.C. In company with previous writers we have tacitly assumed that the faces found on these vessels represent the god Bes; any discussion on the validity of this identification lies outside the scope of this article. For earlier studies see Stern 1976a, 183-87; idem 1976b, 34-35, 69-71; Charvat 1980, 46-52; Kuchman Sabbahy 1982, 147-49; Guidotti 1983, 33-64; Blakeley and Horton 1986, 111-19

[2] Since Guidotti does not attempt to date any of her vessels, her observation that her types B1 and B2 are contemporary is not proved. As this article will show, however, that observation was indeed correct.

[3] The most famous of these unusual vessels is probably that excavated by Petrie at Tell Defenneh (1888, pl. XXXV.65).

[4] Since writing this article, P.G. French has informed us that the three pieces he published in *Amarna Reports III* (French 1986, 160 and fig. 9.22.3) may derive from vessels of this type. If so, then the illustrated "breast" may be an eye (or a cheek?) and the drawing should be reoriented.

[5] However, French is since inclined, on the basis of further work on the Buto material, to prefer a date at least a century later (personal communication).

[6] For this term see Niwinski (1983).

[7] The earliest coffins of this type are those of Tabekhtenaskhet ii (Tamit) and Irbastwedjanefu A (Louvre E.3872), dated to ca. 750 and ca. 730 B.C., respectively. Compare Taylor 1985, 86-93, 468-70.

[8] Cf. Leahy 1979, 141-53. The start date of ca. 740 B.C. has been revised to ca. 720 B.C. by Aston and Taylor 1990, 149.

[9] We do not agree with Petrie that the Saite fort at Defenneh was founded in ca. 664 B.C. since the pottery types found do not suggest so early a date. This conclusion was also reached by

P.G. French (personal communication), who believes the pottery to be no earlier than the reign of Amasis, at the very earliest, and who would date most of it to the late fifth or even the early fourth centuries B.C.

[10] Mostly unpublished, but cf. Lauer and Iskander 1956, 167-95; Bourriau and Aston 1985, 54-5; French 1988, 79-89; French and Ghaly 1991, 93-124.

[11] Not seen. Cited by Guidotti 1983, 45 no. 17, 47 fig. 17.

[12] An Egyptian origin for the vessel from Deve Hüyük has already been postulated by Kuchman Sabbahy (1982, 148).

[13] P. R. S. Moorey 1975, 108-117; the fifth century date is based on imported Greek pottery and bronzes.

[14] Moreover the unpublished vessel 82-S-252 is clearly made in an Egyptian marl clay, which can be equated with Saqqara fabric K5 (for which see Bourriau and Aston 1985, 52).

[15] This is especially noticeable in marl clay vessels which bear little resemblance to the shapes that went before. In this respect it may be more than mere coincidence that the kick wheel was apparently introduced during the reign of Darius I (521-486 B.C.).

[16] It is also possible that during the Third Intermediate period, when Egypt split into a Libyan north and an Egyptian south, that the religious connotations of Bes vases were alien to Libyan culture and gradually lost. In the south the ideas were perhaps retained and only spread back to the north after the effective reunification of Egypt during the reign of Psammetichus I.

[17] Kuchman-Sabbahy's hypothesis has also been doubted by Guidotti, (1983, 60, n.45).

[18] A distinct Memphis-Fayum tradition is already noticeable in the New Kingdom, with a ceramic industry based on marl D clays (cf. Nordström and Bourriau 1993).

[19] Why this should be is not known with certainty. Kuchman Sabbahy (1982, 149) has suggested, following Hornblower (1930, 16), that they were used to contain milk, which at this time was thought of as a purifying substance for the dead (Bonnet 1971, 460).

[20] The changing nature of Bes is touched on by Charvat (1981, 48-50).

References

ALLEN, S. J.

1982 "The Pottery." Chap. 3 in ***Cities of the Delta, Part II. Mendes: Preliminary Report on the 1979 and 1980 Seasons*** by K. L. WILSON. American Research Center in Egypt Reports 5. Malibu: Undena, 13-26.

ANTHES, R.

1959 ***Mit-Rahineh 1955***. Museum Monographs. Philadelphia: The University Museum, University of Pennsylvania.

1965 ***Mit-Rahineh 1956***. Museum Monographs. Philadelphia: The University Museum, University of Pennsylvania.

ASTON, DAVID A.

1987 ***Tomb Groups from the End of the New Kingdom to the Beginning of the Saite Period.*** Ph.D. dissertation, University of Birmingham.

1996 ***Egyptian Pottery of the Late New Kingdom and Third Intermediate Period (Twelfth - Seventh Centuries BC): Tentative Footsteps in a Forbidding Terrain.*** Heidelberg: Heidelberger Orientverlag, 1996. Studien zur Archäologie und Geschichte Altägyptens 13.

ASTON, D. A., and J. H. TAYLOR

1990 "The Family of Takeloth III and the 'Theban' Twenty-third Dynasty." In ***Libya and Egypt c.1300-750 B.C.***, edited by A. LEAHY. School of Oriental and African Studies Centre of Near and Middle Eastern Studies and Society for Libyan Studies. London: Centre of Near and Middle Eastern Studies, School of Oriental and African Studies, University of London, 131-54.

BAKRY, H. S. K.

1968 "Asfûnul-Mata'neh Sondages." ***Annales du Service des Antiquités de l'Égypte*** 60: 37-53.

BLAKELEY, J. A., and F. L. HORTON, JR.

1986 "South Palestinian Bes Vessels of the Persian Period." ***Levant*** 18: 111-19.

BOURRIAU, J.

1981 ***Umm El-Ga'ab: Pottery from the Nile Valley Before the Arab Conquest***. Catalogue of the Exhibition organized by the Fitzwilliam Museum, Cambridge, 6 October to 11 December 1981. Cambridge: Cambridge University Press and the Fitzwilliam Museum.

1987 "Pottery Figure Vases of the New Kingdom." ***Cahiers de la Céramique Égyptienne*** 1: 81-96.

BOURRIAU, J., and D. A. ASTON

1985 "Pottery." Sect. 5 in ***The Tomb Chapels of Paser and Ra'ia at Saqqâra*** by G. T. MARTIN. Egypt Exploration Society Excavation Memoir 52. Egypt Exploration Society in collaboration with the National Museum of Antiquities, Leiden. London: Egypt Exploration Society, 32-55.

CHARVÁT, P.

1980 "The Bes Jug. Its Origin and Development in Egypt." ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 107: 46-52.

1981 ***The Pottery: The Mastaba of Ptahshepses***. Czechoslovak Excavations at Abusir. Prague: Univerzita Karlova.

DE MORGAN, J.

1895 ***Fouilles à Dahchour, Mars-Juin 1894.*** Vienna: Adolphe Holzhausen

Description de l'Égypte

1823 ***Description de l'Égypte, ou, Recueil des Observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'Armée française. Vol. 5: Antiquités***. 2nd ed., Paris: Panckoucke.

DOWNES, D.

1974 ***The Excavations at Esna, 1905-6***. Warminster: Aris and Phillips.

ENGELBACH, R. E.

1915 ***Riqqeh and Memphis VI***. British School of Archaeology in Egypt and Egyptian Research Account Publication 25. London: British School of Archaeology in Egypt and Bernard Quaritch.

FAKHRY, A.

1938 "Bahria and Farafra Oases: A Preliminary Note on the New Discoveries." ***Annales du Service des Antiquités de l'Égypte*** 38: 396-434.

FRENCH, P. G.

1986 "Late Dynastic Pottery from the South Tombs." Chap. 9 in ***Amarna Reports III***, by B. J. KEMP. Occasional Publications 4. London: Egypt

Exploration Society, 147-88.

1988 "Late Dynastic Pottery from the Berlin/Hannover Excavations at Saqqara, 1986." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 44: 79-89.

1992 "A Preliminary Study of Pottery in Lower Egypt in the Late Dynastic and Ptolemaic Periods." ***Cahiers de la Céramique Égyptienne 3*** (Ateliers de Potiers et Productions Céramiques en Égypte): 83-94.

FRENCH, P. G., and H. GHALY

1991 "Pottery Chiefly of the Late Dynastic Period, From Excavations by the Egyptian Antiquities Organization at Saqqara, 1987." In ***Cahiers de la Céramique Égyptienne*** 2: 93-124.

GJERSTADT, E.

1948 ***The Swedish Cyprus Expedition, Vol. 4.2: The Cypro-Geometric, Cypro-Archaic and Cypro-Classical Periods***. Stockholm: Swedish Cyprus Expedition.

GUIDOTTI, M. C.

1978 "À proposito dei vasi con decorazione hathorica." ***Egitto e Vicino Oriente*** 1: 105-18.

1983 "I potesi di significato e tipologia dei vasi egizi di Epoca Tarda raffiguranti il dio Bes." ***Egitto e Vicino Oriente*** 6: 33-65.

HORNBLOWER, G. D.

1930 "Funerary Designs on Predynastic Jars." ***Journal of Egyptian Archaeology*** 16: 10-18.

HOPE, C. A.

1987 ***Egyptian Pottery***. Shire Egyptology 5. Aylesbury, U.K.: Shire Publications.

JÉQUIER, G.

1928 ***Le Mastabat Faraoun***. Fouilles à Saqqarah. Service des Antiquités de l'Égypte. Cairo: Institut Français d'Archéologie Orientale.

JESI, F.

1963 "Bes bifronte e Bes ermafrodito." ***Aegyptus Anno*** 43: 237-55.

KUCHMAN SABBAHY, L.

1982 Observations on Bes-pots of the Late Period. ***Zeitschrift für ägyptisch Sprache und Altertumskunde*** 109: 147-49.

LAUER, J.-P.

1939 "Fouilles du Service des Antiquités à Saqqarah, Secteur de la Pyramide à Degrés (Novembre 1938-Mai 1939). I La Grande Cour Située au Sud de la Pyramide." ***Annales du Service des Antiquités de l'Égypte*** 39: 448-52

LAUER, J.-P., and Z. ISKANDER

1956 "Données nouvelles sur la momification dans l'Égypte ancienne." ***Annales du Service des Antiquités de l'Égypte*** 53: 167-95

LEAHY, A.

1979 "The Name of Osiris Written." ***Studien zur Altägyptischen Kultur*** 7: 141-53.

MACRAMALLAH, R. N.

1940 ***Un cimetière archaïque de la classe moyenne du peuple à Saqqarah***. Fouilles à Saqqarah. Service des Antiquités de l'Égypte. Cairo: Imprimerie nationale, Boulaq.

Meisterwerke altägyptischer Keramik

1978 ***Meisterwerke alt ägyptischer Keramik: 5000 Jahre Kunst und Kunsthandwerk aus Ton und Fayence.*** Höhr-Grenzhausen, Rastal-Haus, 16 September bis 30 November 1978. Montabaur: Förderkreis Westerwald für Kunst und Keramik.

MOOREY, P. R. S.

1975 "Iranian Troops at Deve Hüyük in Syria in the Earlier Fifth Century B.C." ***Levant*** 7: 108-17.

MYŚLIWIEC, K.

1987 ***Keramik und Kleinfunde aus der Grabung im Tempel Sethos' I in Gurna***. Archäologische Veröffentlichungen 57. Deutsches Archäologisches Institut Abteilung Kairo. Mainz am Rhein: Philipp von Zabern.

NORDSTRÖM, H.-Å., and J. BOURRIAU

1993 "Ceramic Technology: Clays and Fabrics." Fasc. 2 in ***An Introduction to Ancient Egyptian Pottery***, edited by Do. ARNOLD and J. BOURRIAU. Mainz am Rhein: Philipp von Zabern, 144-90.

NIWINSKI, A.

1983 "Sarg NR-SpZt." ***Lexikon der Ägyptologie*** 5: 434-68.

PERROT, G., and C. CHIPIEZ

1884 ***Histoire de l'Art dans l'Antiquité***. Vol. 1: l'Égypte. Paris: Hachette

PETRIE, W. M. F.

1888 ***Tanis: Part II, Nebesheh (Am) and Defenneh (Tahpanhes)***. Fourth Memoir of the Egypt Exploration Fund. London: Trübner.

1890 ***Kahun, Gurob and Hawara***. London: K. Paul, Trench, Trubner.

1906 ***Hyksos and Israelite Cities***. British School of Archaeology in Egypt and Egyptian Research Account Publication 12. London: Office of the School of Archaeology and Bernard Quaritch.

1909a ***Memphis I***. British School of Archaeology in Egypt and Egyptian Research Account Publication 15. London: School of Archaeology in Egypt and Bernard Quaritch.

1909b ***Qurneh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 16. London: School of Archaeology in Egypt and Bernard Quaritch.

1928 ***Gerar***. British School of Archaeology in Egypt and Egyptian Research Account Publication 43. London: British School of Archaeology in Egypt and Bernard Quaritch.

PETRIE, W. M. F., and E. MACKAY

1915 ***Heliopolis, Kafr Ammar and Shurafa***. British School of Archaeology in Egypt and Egyptian Research Account Publication 24. London: School of Archaeology in Egypt and Bernard Quaritch.

PETRIE, W. M. F., G. BRUNTON, and M. A. MURRAY

1923 ***Lahun II***. British School of Archaeology in Egypt and Egyptian Research Account Publication 33. London: British School of Archaeology in Egypt and Bernard Quaritch.

PETRIE, W. M. F., E. MACKAY, G. WAINWRIGHT

1910 ***Meydum and Memphis (III)***. British School of Archaeology in Egypt and Egyptian Research Account Publication 18. London: School of Archaeology in Egypt and Bernard Quaritch.

PETRIE, W. M. F., G. A. WAINWRIGHT, and E. MACKAY

1912 ***The Labyrinth, Gerzeh and Maghuneh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 21. London: School of Archaeology and Bernard Quaritch.

PRICE, F. G. HILTON

1897 ***A Catalogue of the Egyptian Antiquities in the Possession of F. G. Hilton Price***. London: B. Quaritch.

RAVEN, M. J.

1979 "Papyrus-sheaths and Ptah-Sokar-Osiris Statues." ***Oudheidkundige Mededelingen uit het Rijksmusem van Oudheden te Leiden***: 259-96.

ROSELLINI, I.

1834 ***I Monumenti dell'Egitto e della Nubia: Disegnati dalla Spedizione Scientifico-Letteraria Toscana in Egitto: Distributi in Ordine di Materie, Interpretati ed Illustrati***, Parte Seconda. Monumenti Civili, Vol. 2. Pisa: Niccolò Capurro.

SILVANO, F.

1980 "Le reticelle funerarie nell'Antio Egitto: proposted di interpretazione." ***Egitto e Vicino Oriente*** 3: 83-97.

SPARKES, B. A., and L. TALCOTT

1970 ***Black and Plain Pottery of the Sixth, Fifth, and Fourth Centuries B.C.*** Athenian Agora 12. Princeton: American School of Classical Studies at Athens.

SPENCER, A. J.

1986 "Excavation in the Western Part of the Town." Chap. 1 in ***Ashmunein (1985)*** by A. J. SPENCER and D. M. BAILEY. British Museum Expedition to Middle Egypt. British Museum Occasional Paper No. 67. London: British Museum, 1-16.

SPENCER, A. J., and D. M. BAILEY

1986 ***Ashmunein (1985)***. British Museum Expedition to Middle Egypt. British Museum Occasional Paper No. 67. London: British Museum.

STERN, E.

1976a "Bes Vases from Palestine and Syria." ***Israel Exploration Journal*** 26: 183-87.

1976b Phoenician Bes Vases from Eretz Israel. ***Qadmoniot*** 9: 34-35, 69-71.

TAYLOR, J. H.

1985 ***The Stylistic Development of Theban Coffins during the Third Intermediate Period***. Ph.D. dissertation, University of Birmingham.

TOOMBS, L. E.

1983 "Tell el-Hesi, 1981." ***Palestine Exploration Quarterly*** 115: 25-46.

VAN BEEK, G. W.

1983 "Digging Up Tell Jemmeh."***Archaeology*** 36: 12-19.

WAINWRIGHT, G. A.

1915 "Burials and Temple of 25th Dynasty." Chap. 13 in ***Heliopolis, Kafr Ammar and Shurafa***, by W. M. F. PETRIE and E. MACKAY. British School of Archaeology in Egypt and Egyptian Research Account Publication 24. London: British School of Archaeology and Bernard Quaritch.

WILKINSON, A.

1971 ***Ancient Egyptian Jewellery***. Methuen's Handbooks of Archaeology. London: Methuen.

7

Remarques sur les Vases Décorés avec la Figure du Bes

Hedvig Györy

A la 18ème Dynastie, une nouvelle divinité apparaît dans le panthéon égyptien, mais qui n'est pas sans précédent. Sur le relief représentant la scène de la naissance d'Hatchepsout à Deir el-Bahari, près de la déesse hippopotame Ipet, sous le lit de l'enfant venant au monde, est debout Bès, l'aimé d'Hathor.

La première apparition du dieu nain ne se trouve pas peut-être par chance dans le temple d'une femme-pharaon qui est tellement fière de son expedition au Pount, quoïque la figure de Bès ne présente pas encore des traits négroides. Dès ce temps-là, Bès se trouve de plus en plus fréquemment sur les représentations, sa figure se canonise graduellement, son rôle se consolide. Il gagne du terraine dans la petite statuaire, et dès le temps d'Amenhotep III sa figure se trouve fréquemment sur les objets quotidiens.

C'est aussi la date de la première jarre avec la figure de Bès (Rowe 1940, 57 n.2, pl. XLVI.A.3,4). En connection avec cette jarre, Charvát (1980) suggère que les premiers exemplaires pouvaient être préparés en signe de la soumission syrienne en tant que dédicaces au Temple. C'est que les masques de Bès portant des traits syriens passent sur les formes du dieu Bès, qu'elle soit d'origine syrienne ou nubienne (Guidotti 1978), s'attache au peuple du Midi pendant la 20ème Dynastie: dans la tombe d'Iymiseba (Ramses IX), parmi des tributs des Noirs, se trouvent des vases au couvercle décoré avec le masque de Bès (Wreszinski 1923-35, 224, TT 65).

Au Nouvel Empire, la majorité des jarres encore en grande dimension, décorées avec la figure de Bès en relief, provient des centres (Gurob, Deir el-Médineh, Thèbes), mais elles se trouvent aussi au lieux moins grands (Leeds 1922, pl. 2 II, en haut; idem 1931, 46). Elles ne viennent plus des domaines des temples.[1] La majeure partie se trouvait dans les maisons. Vu sa présence à Deir el-Médineh (Bruyère 1939, 93-108), il est probable, qu'elles étaient employées avec des vases à tête d'Hathor pour libation surtout ablution dans la maison des couches moyennes et inférieures pendant les services à domicile. Comme la figure des deux divinités se trouvent ensemble dans les groupes, il est vraisemblable qu'elles se rattachent au nouveau culte de la vache Hathor, élargi de celui de Bès.

Dans les textes, Bès se présente près d'Hathor au cours de son voyage au Sud, et il l'amuse et l'apaise avec la musique de tambourine et avec sa dance (cf. Junker 1911). En dehors de l'amusement, des plaisirs, de la gaité, leur trait commun est encore leur présence à la naissance.[2] Aussi la peau feline les rattache-t-elle puisque Hathor était en furie au Sud dans sa forme de lionesse, comme Tefnout, et sa tête se trouve sur ses vases aussi entre deux panthères.[3] Probablement leur rapport avec le mythe d'Horus se développait déjà au Nouvel Empire. C'est l'explication probable de la représentation du marais aux papyrus auprès de la tête d'Hathor sur les vases qui ont été découverts avec des amphores, des cuvettes, des jattes, des écuelles et des coupes ornées de tête d'Hathor peintes ou traitées en relief (Bruyère 1939, 103).

Jusqu'à la fin du Nouvel Empire, les jarres à tête d'Hathor disparaissent graduellement et, entre temps surtout après ce changement, la quantité et le cercle d'expansion des vases decorés de la figure de Bès agrandit. La dimension des jarres diminue, la forme change. La majorité provient de la Basse Egypte.

Guidotti (1983: 33-65) a divisé les vases decorés avec le masque de Bès de Basse Epoque en deux types, qui étaient employés parallèllement. Parmi les jarres du type A se trouvent d'abord des grandes, puis des petites jarres, qui ont à peine des cols, et leur ouverture se termine par rebord. Sur la partie supérieure du corps et sur le col se voit une decoration fort stylisée en relief, qui représente en dehors de la tête de Bès, plusieurs fois même les bras de celui-ci. Le diadème de plume ne se présente plus.

Le premier groupe du type B est préparé de l'argile fine et blanchâtre avec des murs minces, de relativement petites dimensions. La décoration en relief, appliquées ou gravée, se trouve sur le corps, et est achevée assez détaillée, avec les bras qui sont anormalement petits. La matière du deuxième groupe, préparé parallèllement, est un peu grossière, mais aussi blanchâtre, la décoration est définitivement stylisée, les bras sont disparus. Tous les deux groupes datent en majorité de l'époque saïte.

La division faite par Charvát (1980, 46-52, en particulier 50) est différente. Son premier groupe est décoré avec des touffes d'argile, gravées ou estampillées. Le deuxième, en dehors des touffes oblongues d'argile, contient encore un peu de gravures. Sur le troisième se trouvent seulement les petits yeux ronds stylisés et le nez. Il mentionne encore des exemplaires de transition parmi les pièces du Nouvel Empire et de la Basse Epoque. Il parle des compositions complétées par une branches de palme, couteau et sistre. Il connaît tous ces trois groupes de l'époque saïte, mais la majorité appartient aux premier et troisème groupes. Quelquefois, on ne peut voir qu'une touffe d'argile. Il mentionne quelques exemplaires uniques de la fin d'époque, qui sont plus détaillées.

Kuchman Sabbahy (1982, 147-49) fait de nouveau deux groupes. Le premier contient des cruches lavées finement, d'argile chamoise, qui montrent les détails du visage à l'aide de petits cercles et arcs. La forme des cruches a des parallèlles en Syrie du nord, et elles ont aussi des imitations à cet endroit. Elles se présentent à l'entour de Memphis et du Fayoum. Le second groupe a des vases préparés d'argile rouge à gros grains, et ils ont quelquefois aussi des anses et un socle. L'ouverture est exclinée, occasionnellement carinée au double. Le visage de Bès est grossier. Ils se trouvent à differentes endroits en Egypte. Les variations de diverses qualités qui peuvent s'expliquer par des raisons économiques, étaient utilisées jusqu'à l'époque gréco-romaine. Elles ne changeaient pas essentiellement.

Selon moi il y a deux types de fond, les cruches faites en générale d'argile de marne, et les jarres préparées généralement du limon nilotique. Les jarres du Nouvel Empire étaient remplacées lentement par des jarres plus petites à ventre grand, sans col à vanne, ou bien celui-ci change de forme: il s'étrangle. D'abord il pouvait signaler les plumes.[4] La représentation des bras et des sourcils est devenue occasionnelle. Ces première variations[5] se trouvent dès le commencement de la troiséme période intermédiaire jusqu'à l'époque saïte, mais elles se modifient déjà pendant cette période.

La phase prochaine du développement du type est représentée par les jarres trapues à corps formant une goutte, avec une ouverture large. Elles sont décorées d'habitude seulement avec quelques bosses. Le fond est encore rond. Comme un exemplaire de Meydum montre, elles étaient portées par une corde ficelée au dessous du col (Petrie, Mackay and Wainwright 1910, pl. XXVIII, 138). Quelques exemplaires, surtout leurs imitations, sont connus de la région de Syrie-Palestine.[6]

Il y a plusieures places où le développement des jarres est différent: elles ont le socle horizontal, le col resserré, le corp allongé. Sur le ventre se voit un visage stylisé, mais dessiné régulièrement. Il y en a des pièces à panse (Adam 1958, pl. IV au milieu de l'image, en haut; Fakhry 1938, 428-29, pl. LXXIA; Bakry 1968, 37-39, pl. V-VI, X, XII, XIV-XV, 8b, 9b, 14b, 16b, 18b-c).

L'autre ligne principal du développement réflète l'influence palestinienne.[7] Ici un corps de forme d'oeuf se formait de la jarre originale, qui se complétait avec un col à vanne, et souvent avec le socle plat. Elles ont en général les murs fins, d'argile de marne, bien lavée. Quelques pièces ont le col cariné du double, ce qui peut s'expliquer vraisemblablement par l'influence perse (cf. Stern 1976, 184). Les exemplaires à cou simple sont connus de la région de Saqqarah et du Fayoum, les derniers aussi du Gerar palestinien.[8]

Les deux exemplaires du Musée des Beaux-Arts à Budapest appartiennent à ces cruches-là. Elles sont préparées comme d'habitude: sur la partie intérieure on peut voir des anneaux d'argile produits pendant le tournage; sur la partie extérieure, on peut reconnaître les traces de la rotation. La surface extérieure est lissée, la formation du socle était faite par l'addition d'argile. Une partie du corps des cruches était déprimée à l'état dur comme peau (cf. Yon 1981), et l'application surtout la gravure ou estampillement était posée près de celui-ci. Des empreintes digitales témoignes du travail. La combustion est homogène. L'une d'entre elles est une cruche allongé à corps ovoïde, avec un petit socle bas. Le diamètre maximum se trouve au tiers bas. A demi haut de corps se trouve l'application habituelle, autour de la déprimation (fig. 7.1A, B; pl. 7.1). L'autre est aussi une cruche allongée à corps ovoïde, à l'overture exclinée, au fond rond (fig. 7.2A, B; pl. 7.2). Le diamètre maximum se trouve à peut près au milieu. Près de la déprimation se voient des touffes d'argile posées négligemment.

Au course de la Basse Epoque, même la fonction des vases est changée. Parallèllement au renforcement des cultes funèraires, elles sont devenues des objets rituels d'enterrement (Spiegelberg 1902, 175; Hornblower 1930, 16; cf. les morts ont reçu de l'eau, Fakhry 1942, 165-66) et, probablement, elles contenaient les offrandes de lait pour le mort. Elles n'ont pas perdue même leur rôle cultuelle non plus, puisqu'il

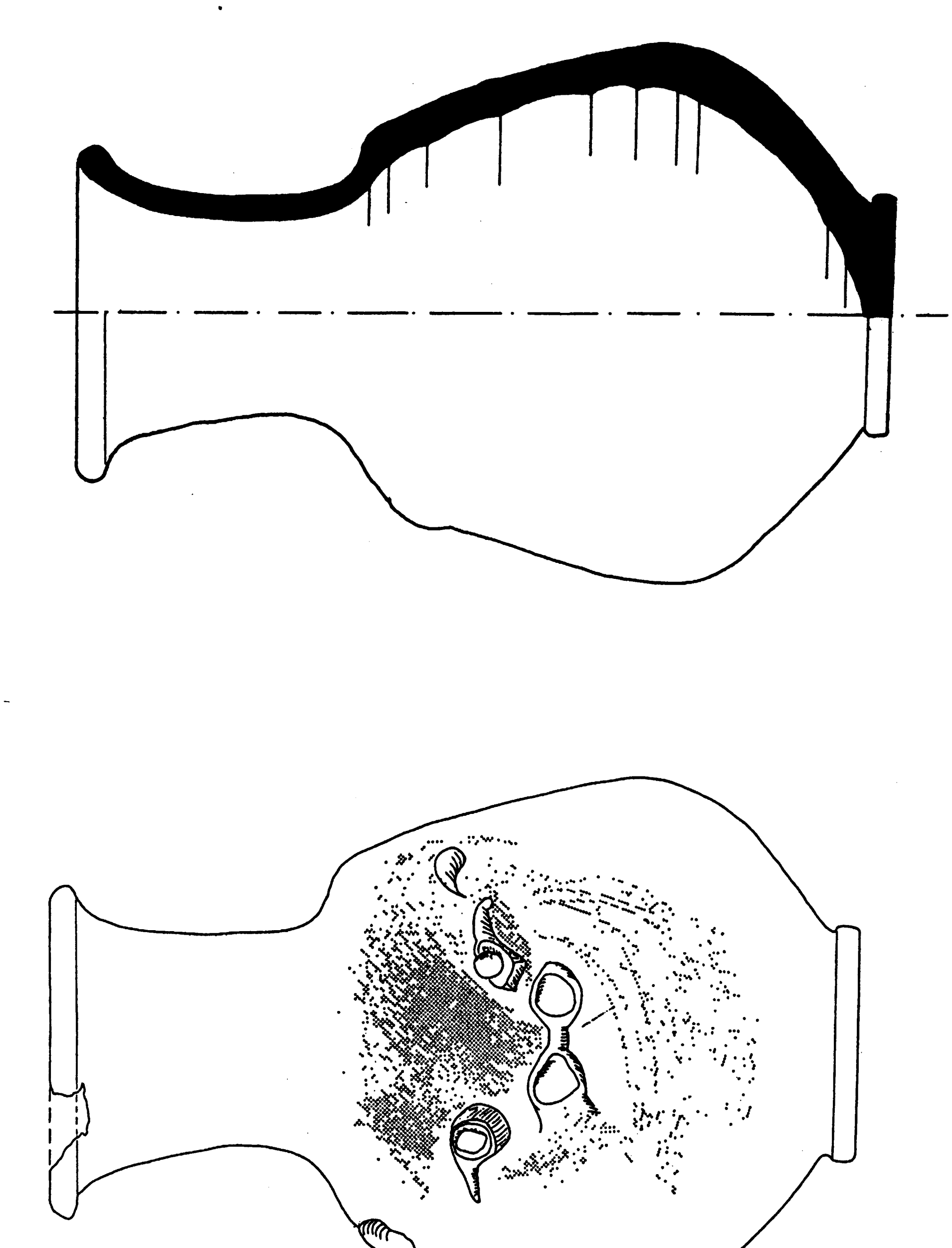


Figure 7.1A, B Vase décoré avec la figure du dieu Bès. 51-2077. h.: 14.2 cm; h. corps: 9.1 cm; diam. rebord: 5.7 cm; diam. max.: 8.6 cm; diam. socle: 4 cm. Buff Marl A, Var. 2; mohs 4, 5. Provenance inconnue. A part les brèches sur le rebord et sur le socle, elle est d'une conservation parfaite.

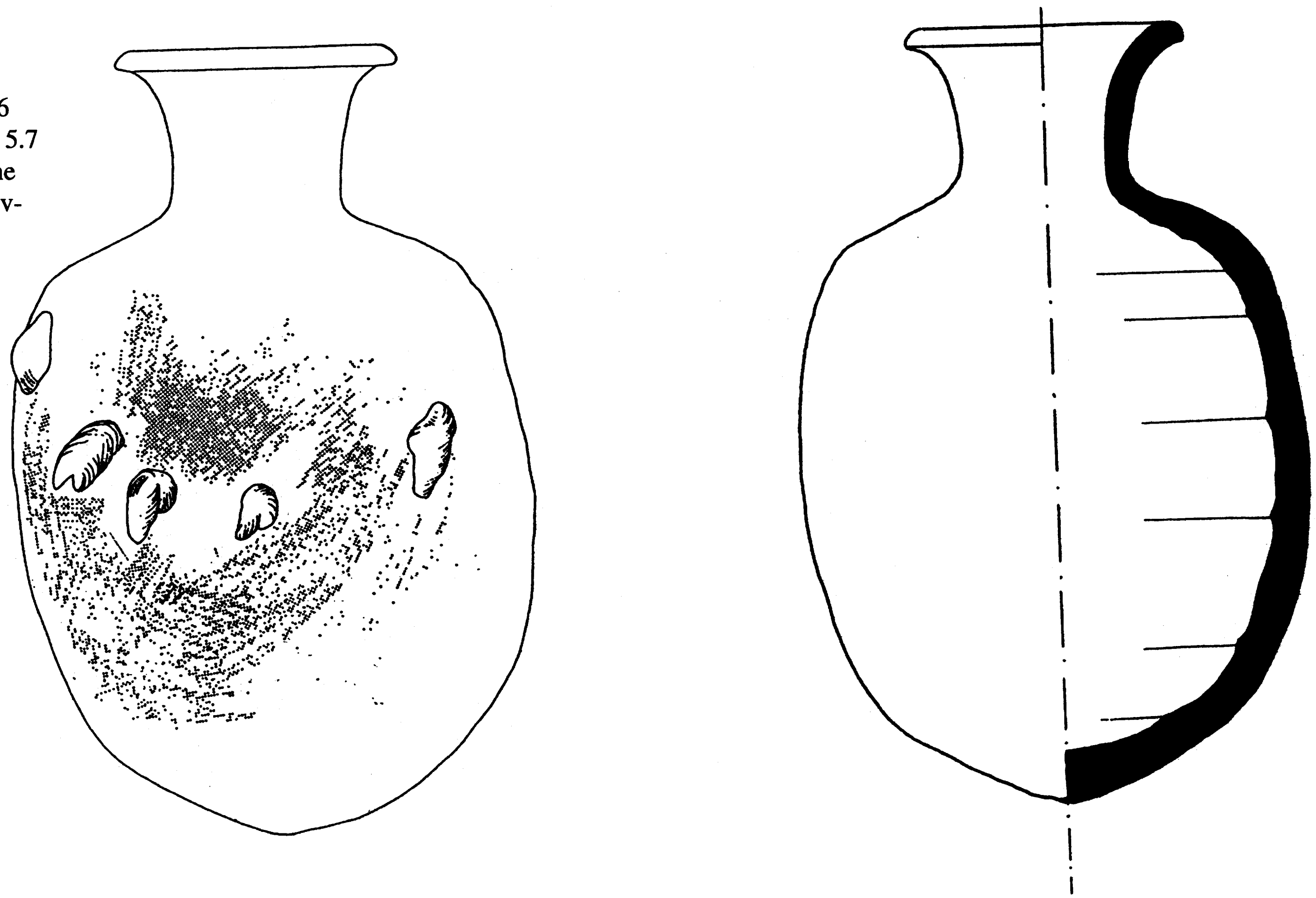


Figure 7.2A, B Vase décoré avec la figure du dieu Bès. 51-1522. h.: 14.6 cm; h. corps: 11.4 cm; diam. rebord: 5.7 cm; diam. corps: 9.7 cm. Argile brune claire de Marl A, Var. A; mohs 3. Provenance inconnue. Rebord ébréché, surface patinée.

Plate 7.1 Vase décoré avec la figure du dieu Bès. 51-2077. h.: 14.2 cm; h. corps: 9.1 cm; diam. rebord: 5.7 cm; diam. max.: 8.6 cm; diam. socle: 4 cm. Buff Marl A, Var. 2; mohs 4, 5. Provenance inconnue. A part les brèches sur le rebord et sur le socle, elle est d'une conservation parfaite.

Plate 7.2 Vase décoré avec la figure du dieu Bès. 51-1522. h.: 14.6 cm; h. corps: 11.4 cm; diam. rebord: 5.7 cm; diam. corps: 9.7 cm. Argile brune claire de Marl A, Var. A; mohs 3. Provenance inconnue. Rebord ébréché, surface patinée.

y a des jarres qui proviennent d'une maison. Elles pouvaient fonctionner aussi au cours de l'époque gréco-romaine comme objets cultuels (Sauneron 1963, no. 120; Adam 1958, 301-3, pl. IV, image en haut, au milieu, d'une maison ptolemaïque à Mit Ya'ish). Mais l'identification de la personne représentée devait être déjà incertaine. La confusion fréquente des touffes plastiques sur les vases fait allusion à l'obscurité concernant le sens originel. Cependant, au cours de l'époque gréco-romaine, un nouveau type des vases à tête de Bès apparaîssait (p. ex., Kaufmann 1913, 134, fig. 122), dont la forme et l'exécution diffèrent complètement de celles des vases de la Basse Epoque.

Notes

[1] Par exemple, dans le temple de Thutmosis IV à Gourna, "Casa dei Sacerdoti," ils se trouvent avec des jarres à tête d'Hathor (Giodotti 1978, 110).

[2] Cf. les 7 Hathors du Prince prédestiné et Bès, guardien de l'enfant Horus; Plutarch, *De Iside*, 18.

[3] Par exemple, Bruyère 1939, 104, fig. 37; entre deux chats, ses pendants doux; Vandier 1964, 55-146, fig. 12a, auprès de la vache d'Hathor, fig. 12b; Hayes 1959, 359.

[4] Cf. Petrie 1888, 65, pl. XXXV.65, du tombeau 9 à Defenneh. La cruche de Torino no. 695 pouvait être préparée sous l'influence de celle-ci (sur le bras gauche une situle; les deux lignes verticales sont les traces des jambes).

[5] Petrie 1909a, pl. LIV, 844-45, 826-28; idem 1888, 65, pl XXXV. 64-65; Rosellini, *1834,* no. 125, pl. LVI; Dunham and Janssen 1960, 55, no.28-1-169, fig. 26; Downes 1974, 15, 28, 46, fig. 144, 144A, 144B.

[6] Macramallah 1940, pl. 38, au milieu de la ligne dernière, 77; Petrie 1906, pl.XXIA, 34-35, 19, pl. XXXIXF, 177-84, 49; Petrie and Mackay 1915, no. 48, pl. XI, 7, pl. XXXIII, 47; idem 1888, 65, no. 66, pl. XXXV; Petrie, Mackay and Wainwright 1910, III, 22, 37, pl. XXVIII.138; Engelbach 1915, 21, pl. XXXIX, 109-10; Anthes 1959, 25-26, pl. 17e/47, 48, fig. 5; Anthes 1965, 145, pl. 60/434, 436; Guidotti 1983, fig. 27-30; Petrie 1928, 22, pl. LIX/76V, 78c, f=Duncan 1930, 78c, f. Pour l'adaptation syro-palestinienne, cf. Woolley 1914-16, 115-29, pl. XXVII; Stern 1976a, pl. 32B.E; idem 1976b, 70.

[7] Rawson 1954, 164ff; Oates 1959, 130-146. Ces formes se rappellent beaucoup aux formes des beakers assyriennes du 8-7ème siècles av. J.C., où le mur du vase était aussi déprimé volontairement.

[8] Petrie, Wainwright and MacKay 1912, pl. XXXVI, 118; idem 1889, pl. XIV, 3; Petrie 1890, pl. XXIV, 27; Lauer 1939, 451, fig. 37-38; Perrot and Chipiez 1884, 820-21, fig. 548; *Description de l'Égypte* 1823, pl. 75, 7; *Pharaonendämmerung* 1990, 56, le premier vase dans la ligne supérieure; Fabretti, Rossi, and Lanzone 1882, 474, no. 3554-55; Guidotti 1983, figs. 9, 26, 59.

Avec le col cariné au double: De Morgan 1895, 43, 45, fig. 94; Jéquier 1928, 35, fig. 36; Petrie 1928, 22, pl. LIX, 78M; W. Golenischeff 1891, 330, no. 2277; Birch 1873, 29, no. 13; British Museum 1922, 261, no. 10; Fabretti, Rossi and Lanzone 1882, 474, no. 3553, pl. III. 207; *Meisterwerke altägyptischer Keramik* 1978, 209, no. 356; Price 1897, 404, no. 3345; Guidotti 1983, fig. 31-32.

References

ADAM, SHEHATA

1958 "Recent Discoveries in the Eastern Delta (Dec. 1950 - May 1955)." ***Annales du Service des Antiquités de l'Égypte*** 55: 301-324.

ANTHES, RUDOLPH

1959 ***Mit-Rahineh 1955***. Museum Monographs. Philadelphia: The University Museum, University of Pennsylvania.

1965 ***Mit-Rahineh 1956***. Museum Monographs. Philadelphia: The University Museum, University of Pennsylvania.

BAKRY, H. S. K.

1968 "Asfûnul-Mata'neh Sondages." ***Annales du Service des Antiquités de l'Égypte*** 60: 37-53.

BRUYÈRE, BERNARD

1939 ***Rapport sur les fouilles de Deir el-Médineh (1934-35). Troisième partie: Le village, les décharges publiques, la station de repos du col de la vallée des rois***. Fouilles de l'Institut Français du Caire sous la direction de M. Pierre Jouguet, vol. 16. Cairo: Institut Français d'Archéologie Orientale.

CHARVÁT, PETR

1980 "The Bes Jug. Its Origin and Development in Egypt." ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 107: 46-52.

Description de l'Égypte

1823 ***Description de l'Égypte, ou, Recueil des Observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'Armée française.*** *Vol. 5:* ***Antiquités***. 2nd ed., Paris: Panckoucke.

DOWNES, DOROTHY

1974 ***The Excavations at Esna, 1905-6.*** Warminster: Aris and Phillips.

DUNCAN, JOHN GARROW

1930 ***Corpus of Dated Palestinian Pottery***. Egyptian Research Account and British School of Archaeology in Egypt Publication 49. London: British School of Archaeology in Egypt.

DUNHAM, DOWS, and JOZEF M. A. JANSSEN

1960 ***Second Cataract Forts. Vol. I: Semna, Kumma. Excavated by George Andrew Reisner*** Boston: Museum of Fine Arts.

ENGELBACH, R. E.

1915 ***Riqqeh and Memphis VI***. British School of Archaeology in Egypt and Egyptian Research Account Publication 25. London: School of Archaeology in Egypt and Bernard Quaritch.

FABRETTI, ARIODANTE, F. ROSSI, and RIDOLFO V. LANZONE

1882 ***Regio Museo di Torino: Antiquitá Egizie***. Turin: Museo di Antichità.

FAKHRY, A.

1938 "Bahria and Farafra Oases: A Preliminary Note on the New Discoveries." ***Annales du Service des Antiquités de l'Égypte*** 38: 396-434.

1942 ***Bahria Oasis, vol. 1. The Egyptian Deserts***. Service des Antiquités de l'Égypte. Cairo: Government Press, Bulâq.

GUIDOTTI, M. CRISTINA

1978 "À proposito dei vasi con decorazione hathorica." ***Egitto e Vicino Oriente*** 1: 105-18.

HAYES, WILLIAM C.

1959 ***The Scepter of Egypt: A Background for the Study of the Egyptian Antiquities in the Metropolitan Museum of Art. Part II: The Hyksos Period and the New Kingdom (1675-1080 B.C.)***. Cambridge: Harvard University Press for the Metropolitan Museum of Art.

HORNBLOWER, G. D.
1930 "Funerary Designs on Predynastic Jars." ***Journal of Egyptian Archaeology*** 16: 10-18.
KAUFMANN, CARL M.
1913 ***Ägyptische terrakotten der griechisch-romischen und koptischen epoche vorzugsweise aus der oase El Faijum (Frankfurter sammlung)***. Cairo: F. Diemer, Finck and Baylaender.
KUCHMAN SABBAHY, L.
1982 Observations on Bes-pots of the Late Period. ***Zeitschrift für ägyptische Sprache und Altertumskunde*** 109: 147-49.
LAUER, JEAN-PHILIPPE
1939 "Fouilles du Service des Antiquités à Saqqarah. Secteur de la Pyramide à Degrés (Novembre 1938-Mai 1939). I. La Grande Cour Située au Sud de la Pyramide." ***Annales du Service des Antiquités de l'Égypte*** 39: 448-52.
LEEDS, E. THURLOW
1922 "Alabaster Vases of the New Kingdom from Sinai." ***Journal of Egyptian Archaeology*** 8: 1-4.
1931 ***Summary Guide***. Ashmolean Museum, Department of Antiquities. Oxford: Oxford University Press.
MACRAMALLAH, RIZQALLAH N.
1940 ***Un cimetière archaïque de la classe moyenne du peuple à Saqqarah***. Fouilles à Saqqarah. Service des Antiquités de l'Égypte. Cairo: Imprimerie nationale, Boulaq.
Meisterwerke altägyptischer Keramik: 5000 Jahre Kunst und Kunsthandwerk aus Ton und Fayence.
1978 Höhr-Grenzhausen, Rastal-Haus, 16 September bis 30 November 1978. Montabaur: Förderkreis Westerwald für Kunst und Keramik.
OATES, JOAN
1959 "Late Assyrian Pottery from Fort Shalmenser." ***Iraq*** 21: 130-46.
PERROT, GEORGES and CHARLES CHIPIEZ
1882 ***Histoire de l'Art dans l'Antiquité. Vol. 1: l'Égypte***. Paris: Hachette.
PETRIE, W. M. FLINDERS
1888 ***Tanis. Part II, Nebesheh (Am) and Defenneh (Tahpanhes)***. Fourth Memoir of the Egypt Exploration Fund. London: Trübner.
1889 ***Hawara, Biahmu and Arsinoe***. London: Field and Tuer, The Leadenhall Press.
1890 ***Kahun, Gurob and Hawara***. London: K. Paul, Trench, Trübner.
1906 ***Hyksos and Israelite Cities***. British School of Archaeology in Egypt and Egyptian Research Account Publication 12. London: Office of the School of Archaeology and Bernard Quaritch.
1909 ***Qurneh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 16. London: School of Archaeology in Egypt and Bernard Quaritch.
1928 ***Gerar***. British School of Archaeology in Egypt and Egyptian Research Account Publication 43. London: British School of Archaeology in Egypt and Bernard Quaritch.
PETRIE, W. M. FLINDERS, and ERNEST MACKAY
1915 ***Heliopolis, Kafr Ammar and Shurafa***. British School of Archaeology in Egypt and Egyptian Research Account Publication 24. London: School of Archaeology in Egypt and Bernard Quaritch.
PETRIE, W. M. FLINDERS, E. MACKAY, and GERALD WAINWRIGHT
1910 ***Meydum and Memphis (III)***. British School of Archaeology in Egypt and Egyptian Research Account Publication 18. London: School of Archaeology in

· Egypt and Bernard Quaritch.

PETRIE, W.M. FLINDERS, GERALD WAINWRIGHT, and B.A. and E. MACKAY

1912 ***The Labyrinth, Gerzeh and Mazghuneh***. British School of Archaeology in Egypt and Egyptian Research Account Publication 20. London: School of Archaeology in Egypt, University College.

Pharaonendämmerung: Wiedergeburt des alten Ägypten.

1990 Strasbourg: Edition DNA.

PRICE, F. G. HILTON

1897 ***A Catalogue of the Egyptian Antiquities in the Possession of F.G. Hilton Price***. London: B. Quaritch.

RAWSON, P. S.

1954 "Palace Wares from Nimrud: Technical Observations on Selected Examples." ***Iraq*** 16: 168-72.

ROSELLINI, I.

1834 ***I Monumenti dell'Egitto e della Nubia: Disegnati dalla Spedizione Scientifico-Letteraria Toscana in Egitto: Distributi in Ordine di Materie, Interpretati ed Illustrati***, Parte Seconda. Monumenti Civili, vol. 2. Pisa: Niccolò Capurro.

ROWE, ALAN

1940 ***The Four Canaanite Temples of Beth-Shan. Part I: The Temples and Cult Objects***. Publications of the Palestine Section of the University Museum, University of Pennsylvania. Philadelphia: Published for the University Museum by the University of Pennsylvania Press.

SAUNERON, SERGE

1963 ***Le temple d'Esna***. Esna II. Publications de l'Institut Français d'Archéologie Orientale du Caire. Cairo: Institut Français d'Archéologie Orientale du Caire.

SPIEGELBERG, WILHELM

1902 ***Recueil de Travaux relatifs a la Philologie et a l'Archéologie Égyptiennes et Assyriennes*** 24.

STERN, E.

1976a "Bes Vases from Palestine and Syria." ***Israel Exploration Journal*** 26: 183-87.

1976b Phoenician Bes Vases from Eretz Israel. ***Qadmoniot*** 9: 34-35, 69-71.

WOOLLEY, C. L.

1914-16 "A North Syrian Cemetery of the Persian Period." ***Liverpool Annals of Archaeology and Anthropology*** 7: 115-29.

WRESZINSKI, W.

1923-25 ***Atlas zur ägyptischen Kulturgeschichte***. Leipzig: J.C. Hinrichs.

YON, MARGUERITE

1981 "Vase à fossette." In ***Dictionnaire illustré multilingue de la céramique du proche Orient ancien***. Collection de la Maison de l'Orient méditerranéen série archéologique 7. Collection de la Maison de l'Orient méditerranéen 10. Lyon: Maison de l'Orient, p. 101.

8

INAA* of the Postpharaonic Pottery in the Collection of the Museum of Fine Arts in Budapest

Hedvig Györy

The pottery collection of the Department of Egyptian Antiquities of the Museum of Fine Arts in Budapest contains a considerable number of postpharaonic vessels, unfortunately unprovenienced except for one cup from Alexandria, bought in 1907. We also know that at least five pieces are from the collection of Philippe Back, who financed the excavations at Sharuna and Gamhud. I could only identify four of these, however. About the other pieces we know practically nothing.

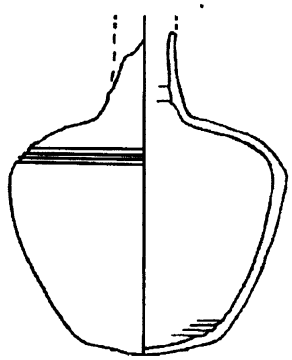
With a few exceptions, the material of these vessels is Nile Silt C, in general medium-hard (Mohs 3)—a hastily made ware for poor households. The vessels sometimes have a red slip or lime wash. Shapes are mostly complete, but the surfaces are in poor condition—worn, patinated, or corroded. They were restored a few decades ago and completed with plaster. Most of the common shapes of late antiquity are represented, along with some earlier types (figures. 8.1-30).

To learn more about the relationships of the vessels to each other, their origins, and their dates of production, we have taken samples for Instrumental Neutron Activation Analysis (INAA). Samples were taken only from the ordinary vessels; i.e., no miniature plates or huge jars were included. We also tested some later period samples of pottery which could have been used in later times. Results are shown in figure 8.31 and in table 8.1. Preliminary analysis indicates the following.

- The marl clay and the Nile silt wares are clearly separated. Only figure 8. 21 is problematic, for it is Marl Clay C with many limestone particles.
- The Nile silt wares are divided into two main groups on the first level, and two others, both represented by only one piece, on higher levels.
- The differences between the two main groups are not significant as samples taken from the same vessel (figure 8.22) are found in both groups.

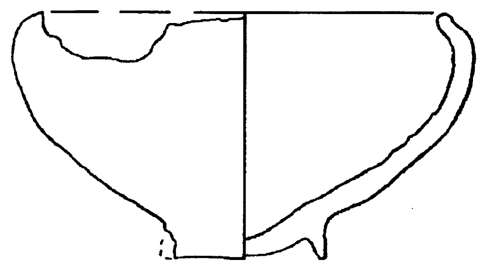
---

* INAA stands for Instrumental Neutron Activation Analysis.



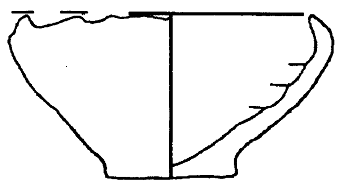
1

51.2072; Ht.: 26 cm;
Max. Diam.: 21 cm
From Gamhoud?



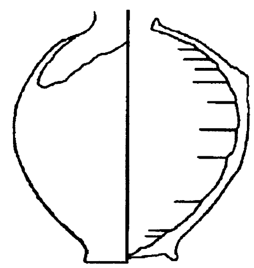
2

51.1534; Ht.: 9 cm;
Max. Diam.: 17.6 cm;
Provenience unknown



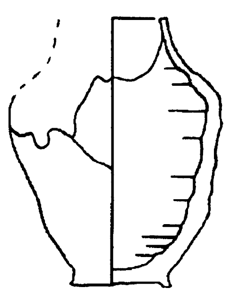
3

51.1546; Ht.: 6.1 cm;
Max. diam.: 12 cm;
Provenience unknown



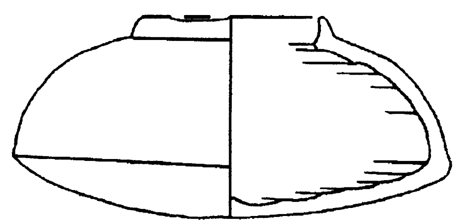
4

51.1547; Ht.: 12.6 cm;
Max. Diam.: 13.15 cm;
Provenience unknown



5

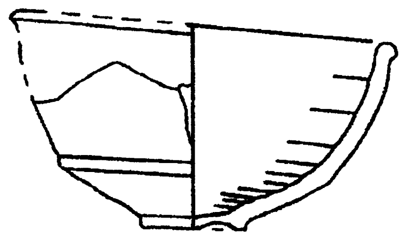
56.44-E; Ht. 16 cm;
Max.Diam.: 14 cm;
Provenience unknown



6

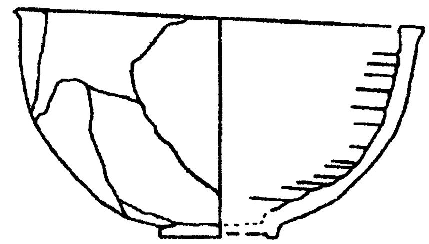
56.137-E; Ht. 7.3 cm;
Max. Diam.: 15 cm;
Provenience unknown

Figures 8.1 through 8.6



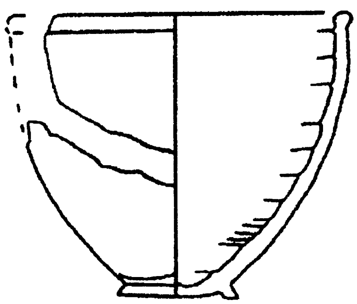
7

51.2009; Ht.: 13 cm;
Max. Diam.: 19.3 cm;
Provenience unknown



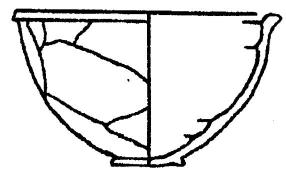
8

56.45-E; Ht.: 12.8 cm;
Max. Diam.: 21 cm;
Provenience unknown



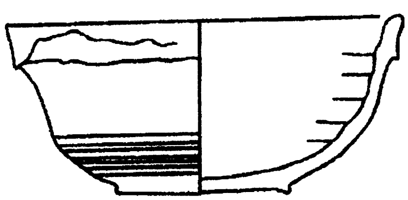
9

56.42-E; Ht.: 8.6 cm;
Max. Diam.: 9 cm;
Provenience unknown



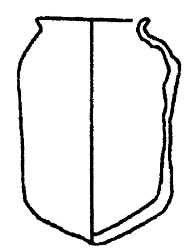
10

56.49-E; Ht.: 12.8 cm;
Max. Diam. 12.25 cm;
Provenience unknown



11

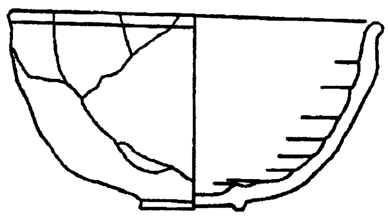
51.2071; Ht.: 14 cm;
Max. Diam.: 28 cm;
Provenience unknown



12

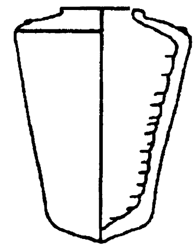
51.1543; Ht.: 18 cm;
Max. diam.: 11 cm;
Provenience unknown

Figures 8.7 through 8.12



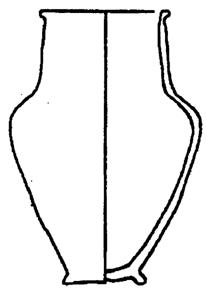
13

51.1535; Ht.: 9 cm;
Max. Diam.: 22 cm;
Provenience unknown



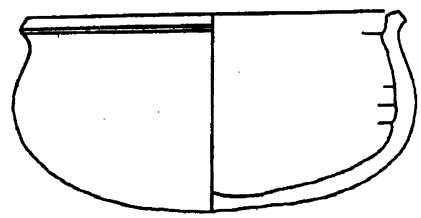
14

56.138-E; Ht.: 20 cm;
Max. Diam.: 13.5 cm;
Provenience unknown



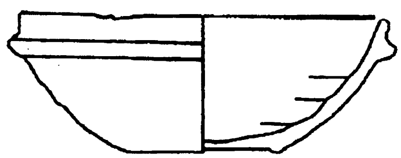
15

51.2069; Ht.: 31 cm;
Max. diam.: 24 cm;
Provenience unknown



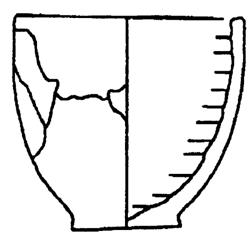
16

51.1521; Ht. 7.4 cm;
Max. Diam.: 16 cm;
Provenience unknown



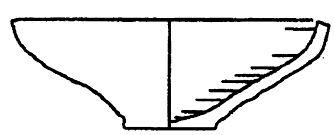
17

51.1545; Ht.: 5.7 cm;
Max. Diam.: 15.5 cm;
From Gamhoud?



18

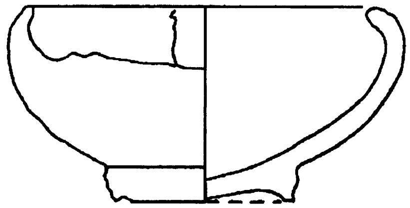
56.45-E; ht.: 15.6 cm;
Max. Diam.: 15 cm;
Provenience unknown



19

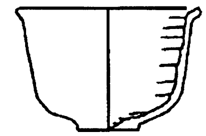
51.2074; Ht.: 4 cm;
Max. diam.: 12.7 cm;
Provenience unknown

Figures 8.13 through 8.19



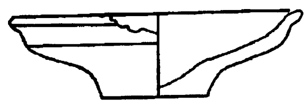
20

56.43-E; Ht.: 7.6 cm;
Max. Diam.: 15 cm;
Provenience unknown



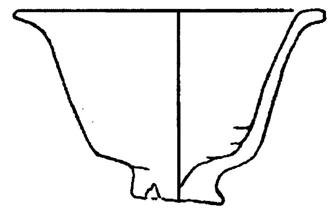
21

51.2073; Ht.: 7.5 cm;
Max. Diam.: 10.5 cm;
Provenience unknown



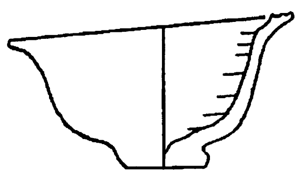
22

56.47-E; Ht.: 3.2 cm;
Max. Diam.: 10.9 cm;
Provenience unknown



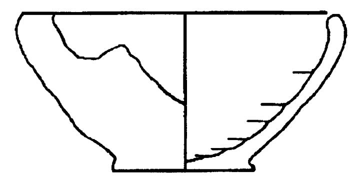
23

51.1544; Ht.: 7.2 cm;
Max. Diam.: 12.7 cm;
Provenience unknown



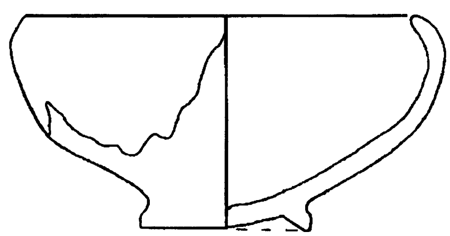
24

51.2078; Ht.: 6 cm;
Max. Diam.: 10.5 cm;
Provenience unknown



25

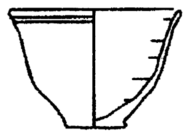
Ht.: 6 cm;
Max. Diam.: 12.8 cm;
Provenience unknown



26

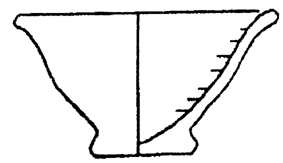
56.41; Ht.: 8.1 cm;
Max. Diam.: 17 cm;
Provenience unknown

Figures 8.20 through 8.26



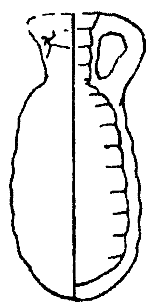
27

51.1537; Ht.:10.5cm;
Max. Diam.: 14.8 cm;
Provenience unknown



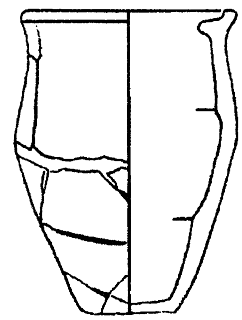
28

75.2-E; Ht.: 10.5 cm;
Max. Diam.: 14.8 cm;
Provenience unknown



29

54.331; Ht.: 15 cm;
Max. Diam.: 6.8 cm;
Provenience unknown



30

56.51-E; Ht.: 77 cm;
Max. Diam.: 57 cm;
Provenience unknown

Figures 8.27 through 8.30

- The differences within and between the two main groups are therefore so small that their material can theoretically belong to the same lump of clay.
- The Late period types' samples match exactly the other pottery, which shows unchanged clay sources.

From these statements we can conclude that the vessels analyzed fall into five or six different fabrics, one or two of marl clay and four of alluvial Nile silt. The marl clay group(s) corresponds to Marl A, while the Nile silt groups are A (fig. 8.14) and C (the other three groups). For the next step I would like to get analyzed material with known provenience to see if these fabrics could be located. If anyone has any questions or suggestions, please contact me by mail or fax.

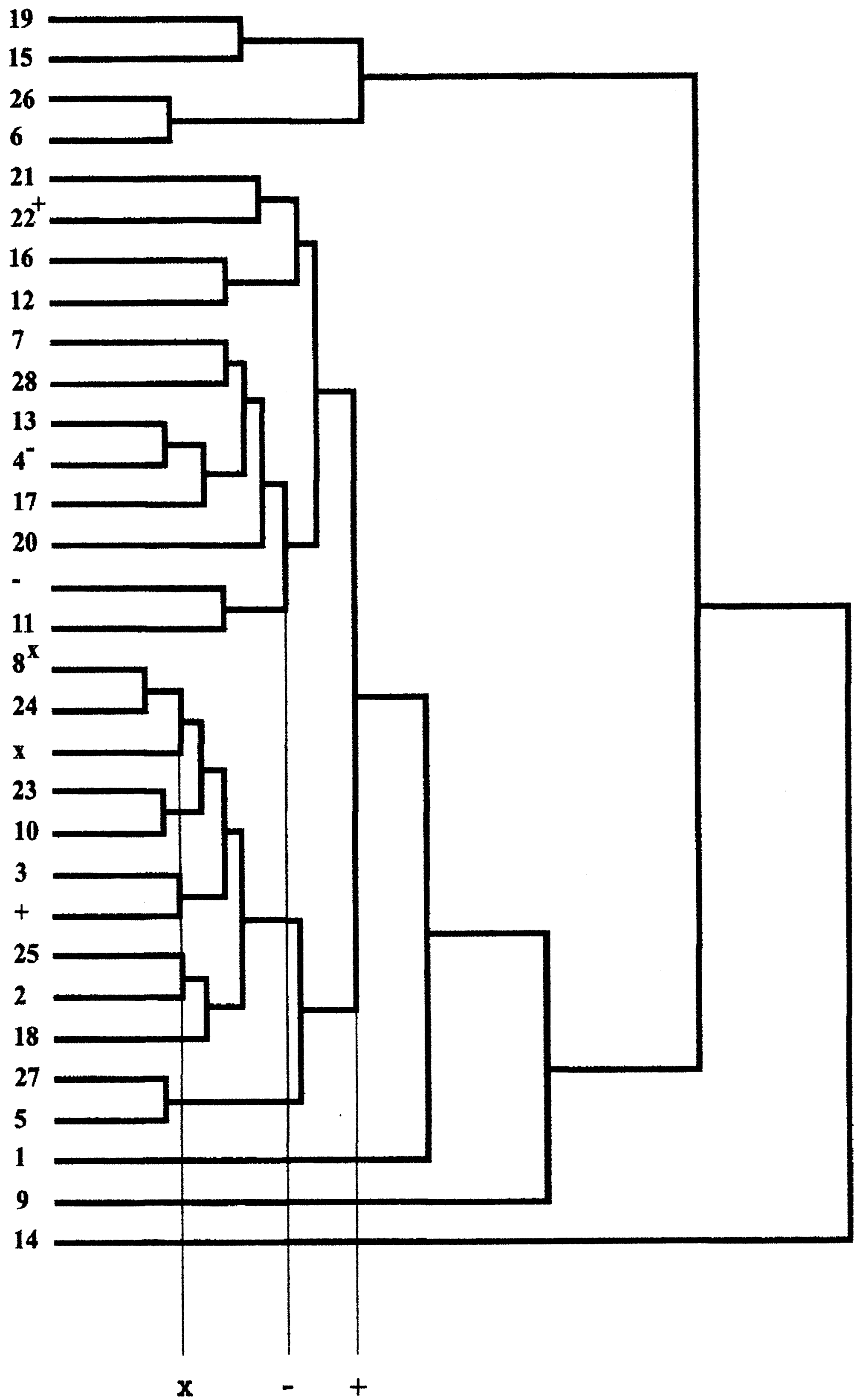


Figure 8.31 - Dendrogram

Table 8.1 Measrements of Elements in Pottery Samples

	Sc (ppm)	Cr (ppm)	Fe %	Co (ppm)	La (ppm)	Ce (ppm)	Eu	Yb	Lu	Hf	Ta	Th
1.	22.70	174.00	7.19	41.90	31.80	62.60	2.09	2.90	0.40	8.20	1.50	7.40
2.	21.10	172.00	6.77	35.90	28.30	53.70	1.91	2.80	0.38	7.70	1.20	5.40
3.	21.60	169.00	7.15	46.80	31.30	62.70	1.69	2.90	0.40	7.30	1.30	5.50
4.	20.60	168.00	6.66	42.30	30.90	62.50	1.65	2.70	0.40	8.40	1.20	5.90
5.	21.30	172.00	7.00	35.60	31.60	61.30	1.67	2.50	0.38	6.80	1.30	6.30
6.	23.80	199.00	7.68	40.00	30.10	63.20	1.91	3.10	0.41	8.40	1.60	5.80
7.	22.70	180.00	7.83	39.50	33.90	73.90	1.83	3.20	0.46	7.00	1.30	6.60
8.	23.10	163.00	7.65	35.50	33.10	70.30	2.04	3.10	0.40	6.80	1.60	6.60
9.	24.10	174.00	7.98	45.30	34.30	75.40	2.06	3.20	0.49	5.90	2.02	6.40
10.	22.00	165.00	7.43	43.10	31.60	67.30	2.19	2.90	0.47	7.30	1.20	6.30
11.	18.70	154.00	6.10	29.70	26.50	54.70	1.47	2.80	0.46	7.90	0.89	6.00
12.	19.10	170.00	6.46	30.90	27.00	56.30	1.49	3.10	0.39	7.60	0.97	5.50
13.	27.00	190.00	9.54	62.30	35.80	74.30	2.46	3.70	0.46	8.10	1.91	7.40
14.	23.50	165.00	8.02	39.80	33.80	70.00	1.97	3.00	0.43	6.50	1.94	6.90
15.	23.60	154.00	7.77	41.10	34.70	67.90	1.90	3.10	0.47	6.50	1.30	7.00
16.	20.00	212.00	6.57	34.20	25.60	51.90	1.54	2.90	0.42	7.90	1.30	5.10
17.	29.80	181.00	5.10	23.50	60.30	121.00	2.40	4.40	0.61	8.80	2.00	16.10
18.	21.30	144.00	6.99	37.80	31.80	65.60	1.93	2.89	0.42	6.00	1.31	5.40
19.	24.10	192.00	8.06	40.60	34.20	72.40	2.11	4.30	0.44	7.10	1.44	6.10
20.	23.80	196.00	7.88	45.20	41.00	70.20	1.59	3.70	0.49	9.30	1.60	19.40
21.	17.20	220.00	5.77	28.10	23.40	46.60	1.31	2.80	0.39	9.40	1.40	4.30
22.	24.00	181.00	7.86	38.00	34.90	73.80	1.92	3.10	0.41	6.60	0.96	6.10
23.	24.10	215.00	7.74	43.90	33.20	53.40	1.80	3.20	0.44	7.10	1.20	6.20
24.	26.60	181.00	8.51	43.50	33.60	72.30	2.46	3.40	0.47	9.05	1.39	7.00
25.	25.00	214.00	8.36	44.50	35.20	76.10	1.99	3.00	0.47	6.80	1.40	6.20
26.	22.50	192.00	7.51	35.30	29.80	60.70	1.90	2.30	0.40	7.80	1.38	6.10
27.	22.10	195.00	7.55	34.90	32.90	65.80	1.89	3.40	0.48	6.80	1.24	5.30
28.	26.10	207.00	8.32	40.50	30.50	63.70	2.23	4.30	0.61	8.30	1.42	6.30
29.	14.50	176.00	4.55	19.00	37.80	74.10	1.43	4.00	0.54	13.60	1.26	9.90
30.	27.90	195.00	8.98	45.80	33.10	67.50	2.34	3.20	0.50	7.90	1.51	6.60

APPENDIX

BALLA MÁRTA

Instrumental neutron activation analysis was used for provenience studies of ceramics. Eleven trace elements and Fe were determined by the multi-isotope comparator.

The measurements were carried out according to the following steps:

1) Sample preparation:
   The surface of the ceramics was cleaned by a diamond grinder at the place of sampling. We drew 50-100 mg of powder samples by the help of a conical diamond drill. The samples were heated in a furnace at 900°C for one hour to turn up the absorbed moisture. After cooling, the samples were placed in small polyethylene capsules followed by accurate mass weighing.
2) Irradiation:
   The samples were irradiated in the nuclear reactor of the Technical University of Budapest at a thermal neutron flux of 10^{16} n $m^{-2}s^{-1}$ for 8-12 hours time. Together with the samples, ruthenium compound was irradiated as a flux-monitor and universal standard.
3) Measurements:
   Each sample was measured twice, 4-6 days and 25-30 days after the irradiation to ensure optimal conditions to determine the greatest amount of isotopes as possible. For gamma-ray spectrometry measurements a HpGe semiconductor detector was used, produced by ORTEC (energy resolution was 2 KeV for the 1333KeV peak of Co-60; relative efficiency was 12.6%), connected to a CANBERRA-80 type multichannel analyser. Evaluation of the gamma spectra was carried out by a PDP 11/23 computer using the program system "spectran F."

The accuracy and reproducibility of our measurements were controlled by a standard reference material called standard pottery prepared by Perlman and Asaro (1969). For grouping the samples according to the similarity of their trace element distributions, cluster analyses were used. As a similarity index we used the Euclidean distances.

In order to calculate what deviation can be considered significant among the samples, an investigation of homogeneity must be carried out. After this, it can be decided whether or not the deviation of the sherds calculated from the analytical data is significant. In this case we had no opportunity to take more samples than two each from three sherds.

REFERENCES

PERLMAN, I., and F. ASARO
1969 Pottery Analysis by Neutron Activation. ***Archaeometry*** 11: 21-52.

9

A Center of Ceramic Production in Ptolemaic Athribis

Karol Myśliwiec and Anna Południkiewicz

The area surrounding the hill Kôm Sidi Youssuf at Tell Atrib, an eastern suburb of Benha (50 kms north of Cairo), upon which modern buildings are supposed to be erected in the immediate future, was the object of geophysical examinations and archaeological soundings carried out by the Polish Center of Mediterranean Archaeology of the Warsaw University in Cairo in 1985.[1] These rescue works, answering an appeal of the Egyptian Antiquities Organization, revealed the existence of archaeological remains which preserve parts of the Ptolemaic, Roman, and Byzantine town of Athribis.[2] Considering the necessity of systematic excavations at this site, a joint Polish-Egyptian archaeological mission has been pursuing work from 1986 until now.[3]

In the eastern part of the excavated area there are predominantly Roman constructions, including a villa, store rooms, workshops, and a canal system (Leclant and Clerc 1988, 314, pls. VIII-X; idem 1991, 168; Myśliwiec and Rageb 1992, 407-413; Myśliwiec 1990b, 7-8; idem 1991, 25-26, 30). Rich numismatic material belonging to this archaeological context betrays a particularly vivid building activity in the time of the Antonines, i.e., in the first half of the second century A.D. Early Byzantine mudbrick constructions have been unearthed in the area's northeastern part (Leclant and Clerc 1990, 345; idem 1991, 168, pl. XXXV, fig. 12; Myśliwiec and Rageb 1992, 410-13; Myśliwiec 1990b, 7-8; idem 1991, 25-26); whereas its western sector, adjoining the Kôm Sidi Youssuf on the latter's southwest side, preserves Ptolemaic strata in an almost undisturbed state, i.e., without later intrusions (Leclant and Clerc 1989, 346, pls. XXI-XXIII; idem 1990, 344-45, pls. XIX-XX; idem 1991, 167-68, pl. XXXIV, XXXV, fig. 11; Myśliwiec and Rageb 1992, 394-405; Myśliwiec 1990b, 7-8; idem 1991, 26-30; cf. above n. 2). Our discoveries made in this sector appear to be particularly important for the study of Egyptian pottery.

A clear stratigraphy of the Ptolemaic quarter comprises the following layers, which could be dated on the basis of numismatic materials:

a) early Ptolemaic constructions (third century, possibly even the end of the fourth century, to the beginning of the second century B.C.);

b) a layer of ashes bearing witness to a general destruction, which must have taken place close to the reign of Ptolemy V and may coincide with the date of the sixth Syrian war (170-68 B.C.);

c) a stratum of mud- and red-brick constructions containing almost exclusively coins of Ptolemy VI among its rich numismatic material, and thus corresponding to a period of intense architectural activity during his reign and later in the second half of the second century B.C.;

d) a thick layer of late Ptolemaic constructions, comprising the period from the late second half of the second century B.C. to the beginning of the first century A.D. The upper part of this stratum, lying immediately under the present surface of this area, contains mixed materials including Ptolemaic, Roman, Byzantine, and Early Arabic artifacts.

Our strata b and c divided the archaeological context of the Ptolemaic period into two general groups corresponding to the first and second halves of this period. The strata a, b, and c reveal no or almost no intrusions of later materials, whereas in stratum d objects dating from earlier periods are found as well, and the chronological homogeneity of this material progressively diminishes towards the top of the stratum.

From the very beginning of the Ptolemaic period, perhaps even as early as the end of the Dynastic period (Thirtieth Dynasty), to the beginning of the first century A.D., this district was a center of ceramic production. The occurrence of some molds used for producing the characteristic late Roman-early Byzantine "frog lamps" may indicate that there were workshops continuing this tradition until the fourth-fifth centuries A.D. Our hypothesis remains an open question, however, since the archaeological strata corresponding to this late period were not actually preserved in this area.

Almost all Ptolemaic constructions unearthed in this part of Athribis are built of mudbrick, and this is the reason why only the lower parts of their walls are preserved. Remains of numerous small kilns in every stratum are a characteristic feature of this quarter. They are most frequently of circular shape, and their state of preservation varies but is generally quite poor. Sometimes, particularly in the lowest strata, large circular areas filled with ashes, red gravel, and petrified lime are the only visible traces of their existence. In other cases, especially in the upper strata (plates 9.1-3), the lower parts of their walls, including a horizontal vent, are preserved. Some of the kilns are fortified with mud-brick walls adjoining the kiln on its three sides, leaving the front open. The kilns' archaeological context identifies their use for firing various ceramic products modeled in local workshops—mainly pottery, but also terra-cotta figurines and oil lamps.

In the lowest Ptolemaic stratum, the remains of kilns are accompanied by wasters in the forms of handle, rim, and body fragments, which are distorted, burst, or discolored (overfired), and which most frequently belong to large cylindrical amphorae made of yellowish, pinkish, or greenish marl clay (cf. Myśliwiec 1987, 60-62, pl. XII, fig. 3-5). Another ware found with these fragments is represented by thick sherds of storage vessels made of Nile silt containing many inclusions, fired to a red-brownish color, and having a layer of compact, well-burnished red slip on the outer face.

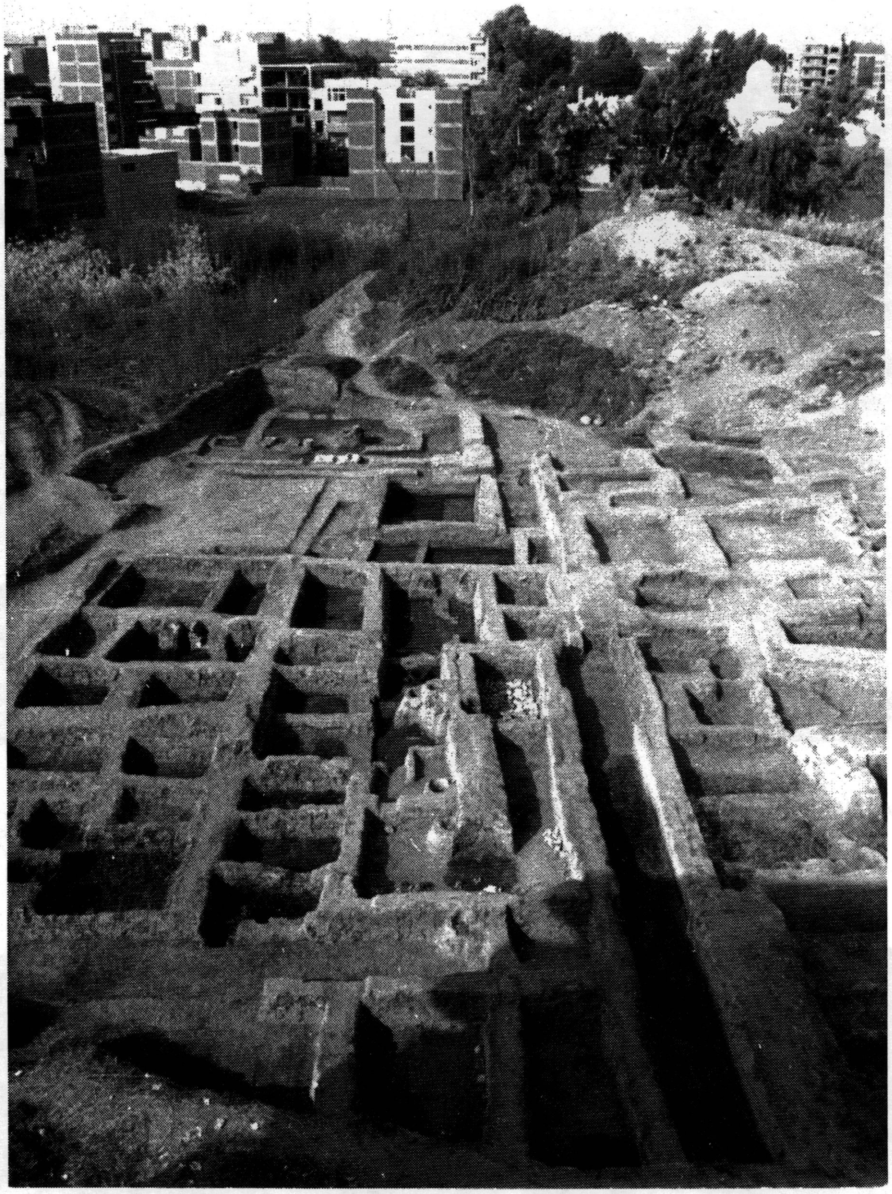


Plate 9.1 Ptolemaic constructions in Tell Atrib (after excavations in 1989). View from the south.

The lowest strata to the south of the Ptolemaic quarter, underlying mid-Ptolemaic mud-brick walls, contained large deposits of unfired pottery (fig. 9.1, plate 9.4) in the vicinity of some relatively well-preserved kilns. For the sake of exploring the kilns, the later walls have been dismantled. Coins of Ptolemy II and Ptolemy III were found among the unfired pots. These deposits contained a large number of bowls with ring bases and incurved rims, as well as some vessels of closed forms, such as globular pots and large amphorae or jugs, a handle of which was found in this material. The bowls (plates 9.4-6) are imitations of a type widely distributed throughout the Hellenistic world and are among the most frequently occurring shapes in our ceramic materials of Ptolemaic date. The inner surface of the unfired specimens is often covered with a thin layer of pale yellow slip, which sometimes also

Plate 9.2 Ptolemaic constructions: workshops on the south side and a bath complex from the time of Ptolemy VI on the north side (after excavations in 1989).

Plate 9.3 Bath complex from the time of Ptolemy VI (after excavations in 1990).

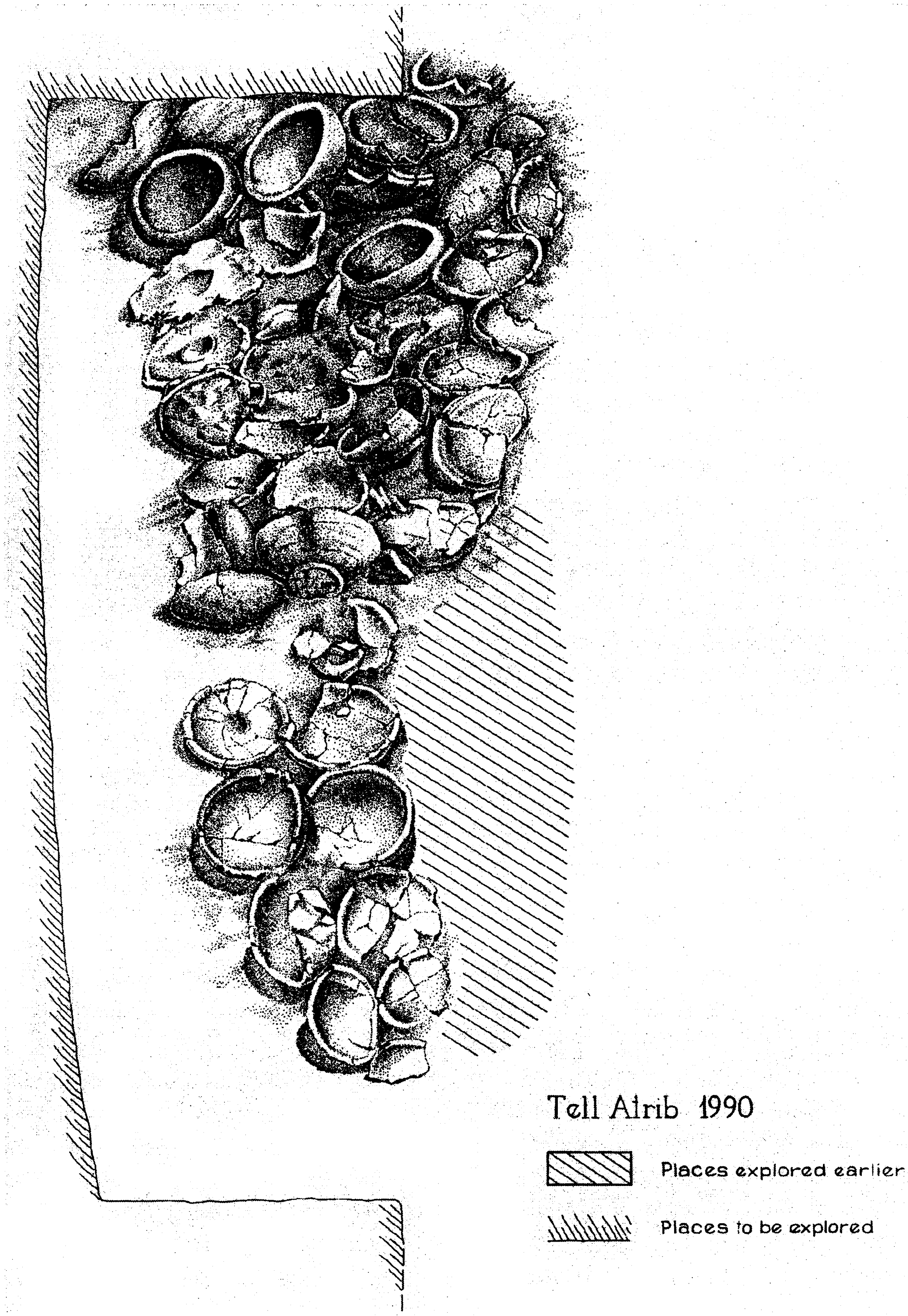


Figure 9.1 Deposit of clay bowls prepared for firing, unearthed near Early Ptolemaic kilns, third century B.C.

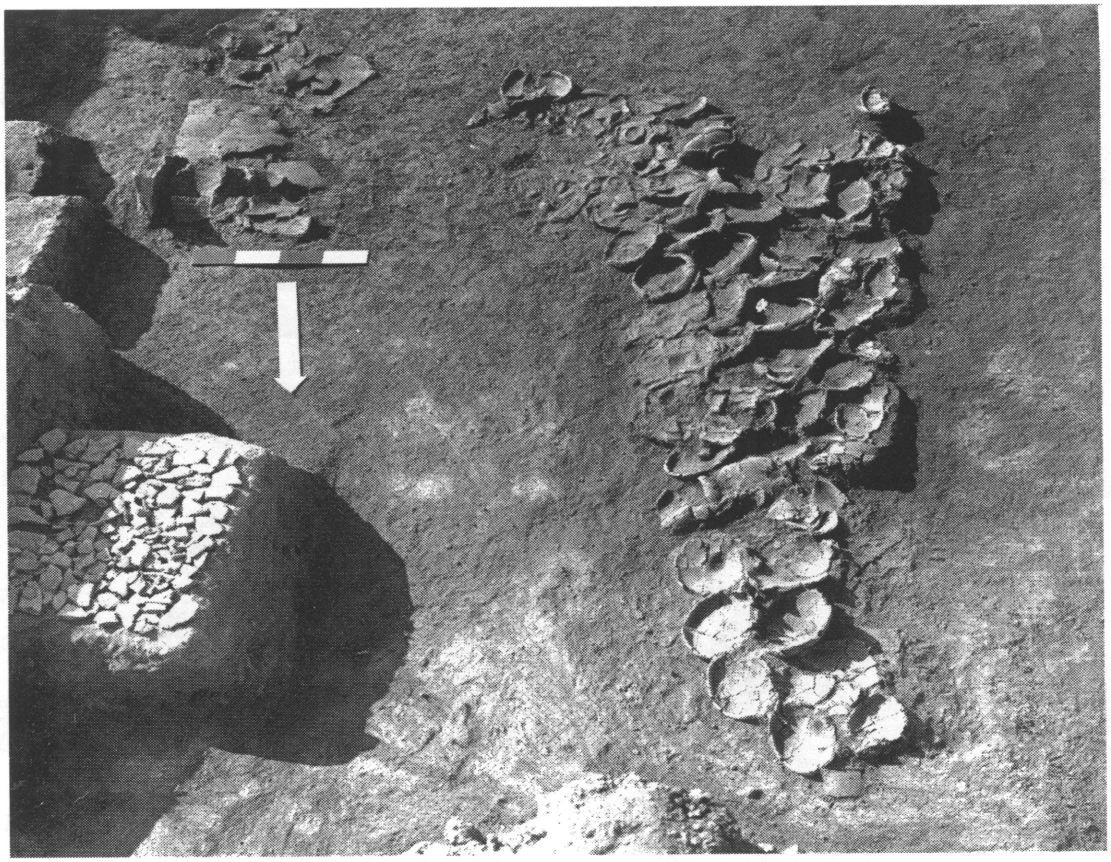


Plate 9.4 Deposit of clay bowls prepared for firing. Third century B.C.

Plate 9.5 Unfired bowl from the deposit.

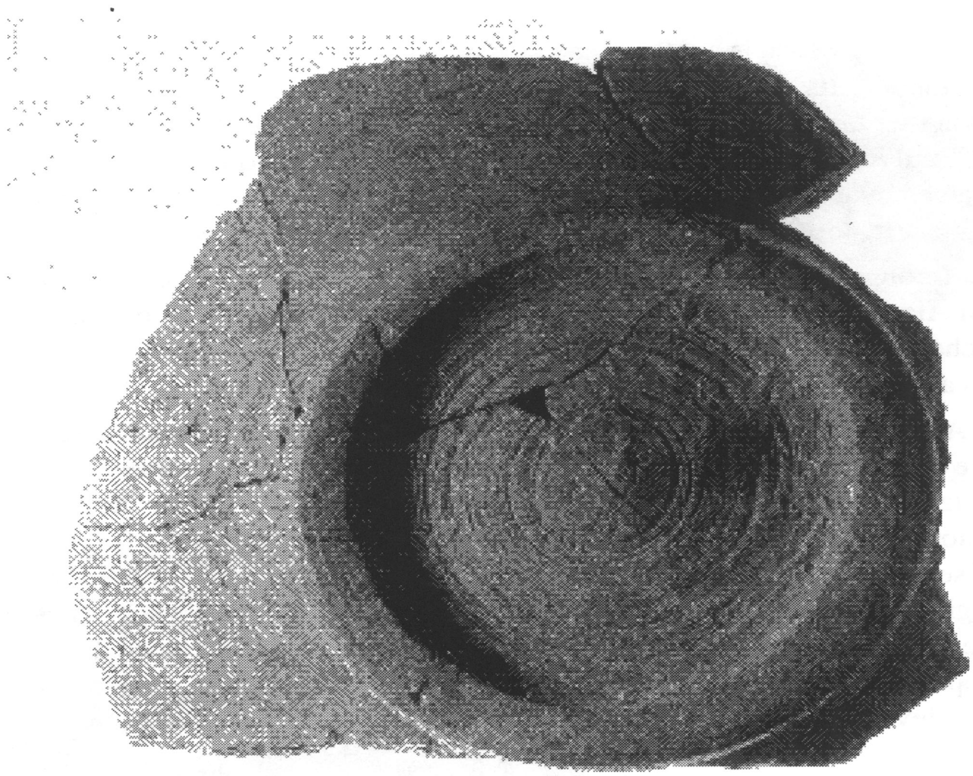


Plate 9.6 Base of unfired bowl from the deposit.

extends over the upper part of the exterior surface. In the process of firing, this substance visibly changed its color to red, since many final products of the same kind have a burnished red slip on their surface. These bowls are usually made of rough Nile silt containing many inclusions. Some of them, fired in a reduced atmosphere, have a black or black-grayish body and the same slip color. Bowls of this form were produced in Athribis throughout the Ptolemaic period. The finest examples of this kind bear a stamped decoration, composed of palmate and roulette patterns, on their bottom.

In the context of such deposits, as well as in higher strata of the Ptolemaic quarter, other objects belonging to pottery workshops have been found. Among them were pigments in various stages of prefabrication (from mineral clods to a plaster elaborated in small bowls), as well as weights made of various materials, such as stone, metal, and clay. Particularly popular were terra-cotta weights of oval shape with a hole in their middle part (plates 9.7-8). They are concave on one side and convex on the other; some are covered with red slip. Several thick circular weights with two small holes in their body (plate 9.9) were found beside one of the earliest Ptolemaic kilns, in the northern part of this district.

Close to the latter kiln was a deposit of clay, in which the head of a modeled, but not yet fired, terra-cotta figurine came to light (plates 9.10-11; Leclant and Clerc 1991, 167, pl. XXXV, fig. 11; Myśliwiec 1991, 28; Myśliwiec and Szymańska 1992, 115-17, figs. 1-2). It depicts an old woman whose face, rendered naturalistically, is endowed with dramatic expression. Its artistic maturity, observable also in the shape of the cranium, denotes the activity of an outstanding coroplast in Athribis in the third century B.C. Local production of terracottas is confirmed by some fragments of wasted figurines, among which is another head of a female, fired with a stone sticking in her distorted mouth. Its size (height 3.8 cm) conforms to the dimensions of the previous head. Another terra-cotta piece with stylistic affinities to the same early Ptolemaic "school," and found in the same deep stratum, is a miniature portrait of an old woman accompanied by a figurine of Anubis (plate 9.12). All three pieces are hand modeled, while a great majority of later Ptolemaic terra-cotta pieces are cast in molds.

Among the other remarkable works of Early Ptolemaic coroplasts that are found in Athribis is an oil lamp in the form of the seated naked god Silen, whose outstretched phallus constitutes the lamp's burner (fig. 9.2). Its stratigraphic context suggests a dating within the late third-early second centuries B.C.

A similar date must be attributed to several fragments of marble sculptures that have been found together in one of the rooms adjoining the pottery workshops (Myśliwiec 1988a, 188-90, pls. 35-38 a, b; idem 1990c, 295-96, fig. 4; for further publications, see the bibliography in idem 1990a, 458). Most of the fragments are parts of several statues representing the goddess Aphrodite; some of them preserve their original polychromy (blue on the garment, and reddish on the hair). These fragments seem to bear witness to the activity of an experienced sculptor in the artisanal workshops of Athribis toward the end of the third century B.C. His production was at an artistic level comparable to that of the coroplast whose work has been described above.

By far the largest, the most diversified, and at the same time the most homogeneous ceramic material derives, however, from the stratum corresponding to the period that includes the reign of Ptolemy VI and extends to later in the second half of the second century B.C. The constructions dating from this period form two separate units:

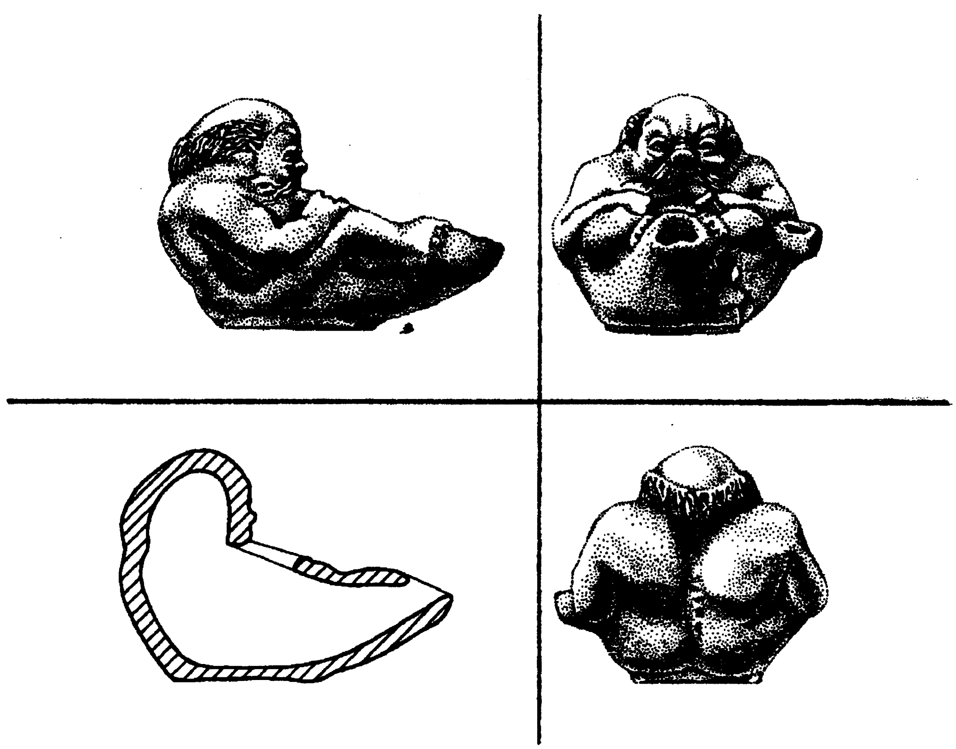


Figure 9.2 Terra-cotta lamp in the shape of the god Silen, late third-early second centuries B.C. Drawing by K. Baturo.

Plate 9.7 Ceramic weight from Early Ptolemaic strata.

Plate 9.8 Ceramic weight from Early Ptolemaic strata.

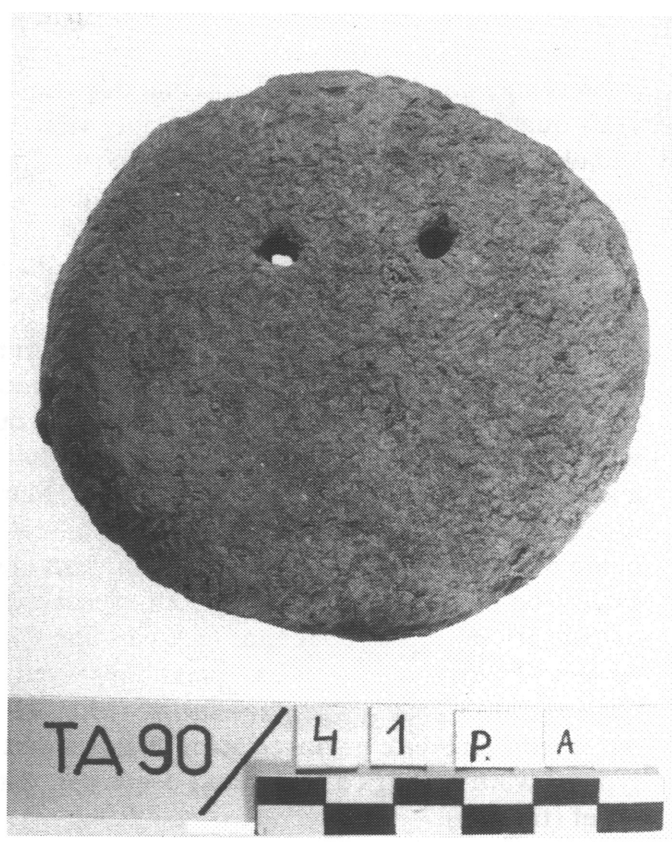


Plate 9.9 Ceramic weight from Early Ptolemaic strata.

1) The workshops continuing the ceramic tradition of the earlier period, which comprise a square complex of mud-brick walls delimiting small rooms and courts and which occupy the quarter's southern part (plates 9.1-2); and
2) A recreation center to the north of this area, embracing a construction with small baths and basins of various shapes, built of red bricks covered with a thick layer of waterproof plaster, and a relatively large room having thick mud-brick walls overlaid on both sides with polychrome plaster panels (plate 9.3).

It is inside and in the vicinity of the latter construction that the most beautiful and the best preserved specimens of our Ptolemaic pottery have been found. The occurrence of many erotic votive objects in this context implies a rather frivolous function for this architectural complex. Many of the terracottas represent either Aphrodite-Isis "anasyrménè" (uncovering her womb) or phallic gods of fertility (fig. 9.3), as well as figurines made of various materials (stone, clay, faience) showing naked males or females in various positions (Myśliwiec 1994a, 385-89; idem 1994b, 154-58, Taf. I-III). Among the most original terra-cotta pieces is a figurine showing an elephant with scenes in relief on the animal's long sides (figs. 9.4-5): one depicts the god Bes dancing between two huge cocks; the other, two dancing naked men with unnaturally long phalli. These statuettes are often accompanied by small limestone stelae upon which a standing naked woman is usually represented in relief (Myśliwiec 1994a, 387, fig. 1). The relief on a small shard—the only remaining fragment of a fine, thin-walled vessel—completes the series of erotic items (color plate 9.1; see Myśliwiec 1994b); it shows a couple in a love scene on an elaborate bed.

Among the beautiful pottery found in great quantity inside the room with polychrome plaster panels (room no. 159 in our numeration), there were also ceramic goblets and small plates of a type that does not occur in other buildings of the Ptolemaic quarter. Small amphorae, possibly vessels for wine, of particularly fine shape and elegant painted decoration, which most frequently reproduces various versions of the garland pattern (color plate 9.2), abound in the ceramic material from this room (Południkiewicz 1992, 100-101, figs. 9-10). These objects confirm a special function of the architectural complex with baths and basins—a function which is connected with pleasure and joy.

Other fine vessels have been found immediately beside and in the close vicinity of this establishment. They include, among others, small globular cups with stamped relief decoration covering their whole outer surface—a type of pottery that is well known from Ptolemaic Egypt, and that has recently been dated to the late third and second centuries B.C. on stylistic bases (Mandel-Elzing 1988). Our stratigraphic data independently confirm this chronological attribution. These cups are usually made of fine-grained, homogeneous, pinkish clay with matte yellow slip on the surface. The most beautiful and the best-preserved specimen illustrates a scene of leading sacrificial cattle to an altar (Leclant and Clerc 1989, pl XXIII, fig. 12); another appears to be a parallel to fragments preserved in the Benaki Museum, showing the transportation of a barge with shrine (Mandel-Elzing 1988, 258, n. 63, figs. 5-6); while a third reveals a winged solar disk as a part of its relief decoration.[4] To the same type of ware belongs a high bowl decorated with representations of Harpocrates in relief (fig. 9.6).

Plate 9.10 Head of female (height 3.8 cm). Early third century B.C.

Plate 9.11 Fragment of an unfired clay figurine. Early third century B.C.

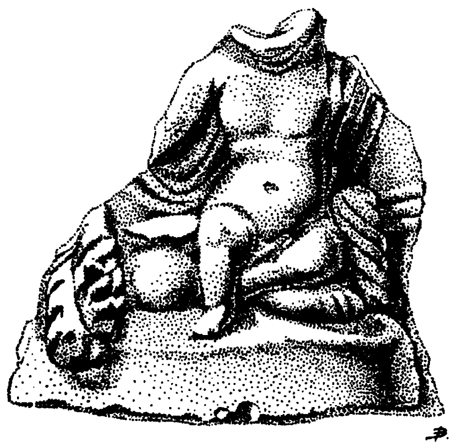
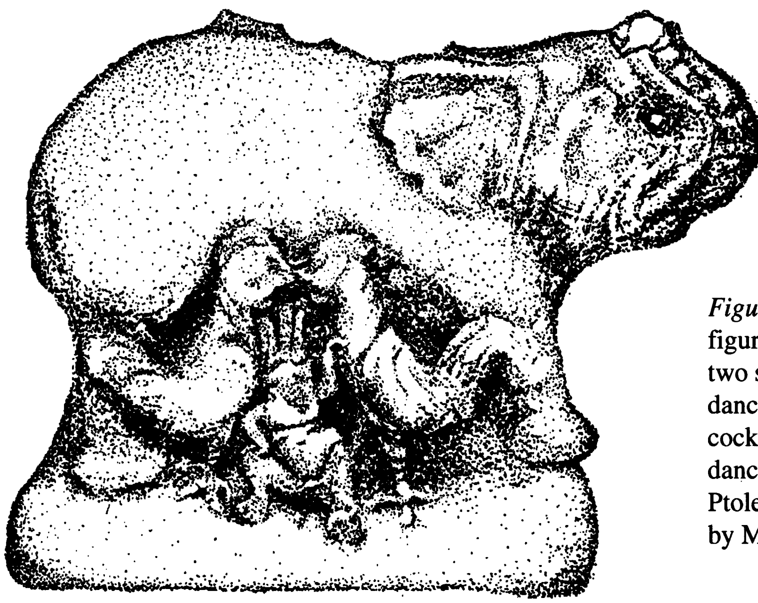
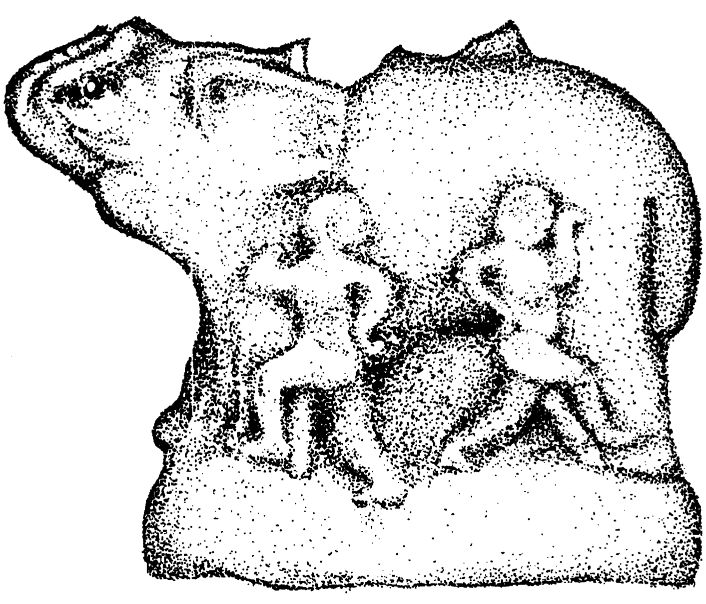


Figure 9.3 Terra-cotta figurine of a seated phallic god, second century B.C. Drawing by Kamila Baturo.



Figures 9.4-5 Terra-cotta figurine of an elephant with two scenes in relief: 4) dancing Bes between two cocks; 5) naked phallic dancers. Second half of the Ptolemaic period. Drawings by Miroslaw Czarnocki.



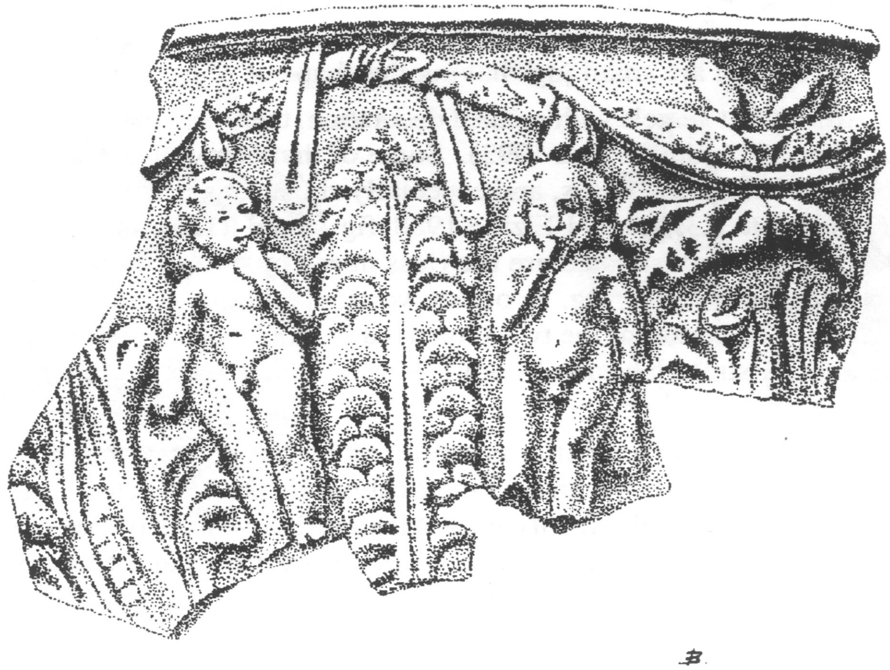


Figure 9.6 Fragment of a bowl with relief decoration showing Harpocrates, mid-second century B.C. Drawing by Kamila Baturo.

Plate 9.12 Old woman with statuette of Anubis. Fragment of a terra-cotta figurine. Early third century B.C.

A representation of the same god also occurs on a fragmentarily preserved circular flask, whereas other vessels of similar shape, particularly the smaller examples, are decorated with stamped geometrical and floral patterns (figure 9.7). Particularly interesting are small jugs having the shape of grapes.

Among the vessels with painted decoration, there are many imitations of Greek ceramic forms (Południkiewicz 1992). Some of them are rather clumsy, with irregularly shaped bodies, ring bases, and especially rims. Cases in point are a krater-like vessel (color plate 9.3; Mandel-Elzing 1988, fig.1) and a large one-handled jug (color plate 9.4). More sophisticated are the (less numerous) jugs with either one vertical and two horizontal (ibid., fig. 8) or one vertical and one horizontal handle (color plates 9.5-6). The earlier of the two illustrated examples (color plate 9.5; ibid., fig. 7), found in a lower stratum beside Room 159, is remarkable for its fine shape and decoration.

In the repertory of patterns preferred by the pottery-makers of Ptolemaic Athribis, garlands with floral and geometrical motifs predominate. In this respect our local pottery shows much affinity with Alexandrian vessels of the same period, although some combinations of friezes chosen by Athribian artists surprise with their originality and freshness, with regard to both their composition and the sophisticatedly sober colors (color plates 9.7-8; Myśliwiec 1988a, 192, fig. 6, pl. 41b). Figural representations occur only exceptionally among the patterns painted on Ptolemaic pottery from Athribis (color plate 9.9; Południkiewicz 1992, fig. 12).

The most popular type of painted decoration found on pots produced in our workshops in the second century B.C. is also the simplest (color plate 9.10). It consists of irregular splashes which extend down a stripe of white wash, surrounding the pot's body underneath the rim. In many cases there are additionally some horizontal red or brown stripes painted on the white zone. This type of decoration usually occurs on medium-sized globular pots with ring foot and vertical rim, but is also found on vessels of other shapes.

Also worthy of attention are some undecorated vessels. Local imitations of Greek pottery shapes, such as *lagynoi* (fig. 9.8) made of Nile silt and overlaid with a thin layer of matte yellowish or pinkish slip, or a large jar with three handles at the rim, probably a far echo of Mycenaean pottery, fall into this category (Myśliwiec 1989, 245-47, pl. 28).

Ceramic imports from the Mediterranean world occur frequently in our Ptolemaic strata. They comprise first of all large amphorae that, while only occasionally well preserved, contribute to a precise dating of our archaeological contexts through the survival of many handles bearing stamps with Greek or Latin inscriptions.[5] Less numerous are sherds belonging to decorated vessels of foreign origin. Among the various wares and shapes, plates and cups or bowls of the "Gnathis" (or "West slope ware"; color plate 9.11) and the oriental "terra sigillata" occur more frequently than other types such as bowls with stamped decoration (color plate 9.12). There are also some imported terra-cotta lamps, especially in our early Ptolemaic materials. Their simple and elegant shapes recur in local products of the same kind, made of Nile silt.

A special group of ceramic products found in various strata of our Ptolemaic quarter, and particularly within the workshop complex, is a series of clay molds. Most of them look like a disk with a circular handle on one flat side and a decorative pattern in sunk relief on the other (fig. 9.9). A large circular mold belonging to the earliest Ptolemaic context (third century B.C.) is, however, made of limestone, and its decora-

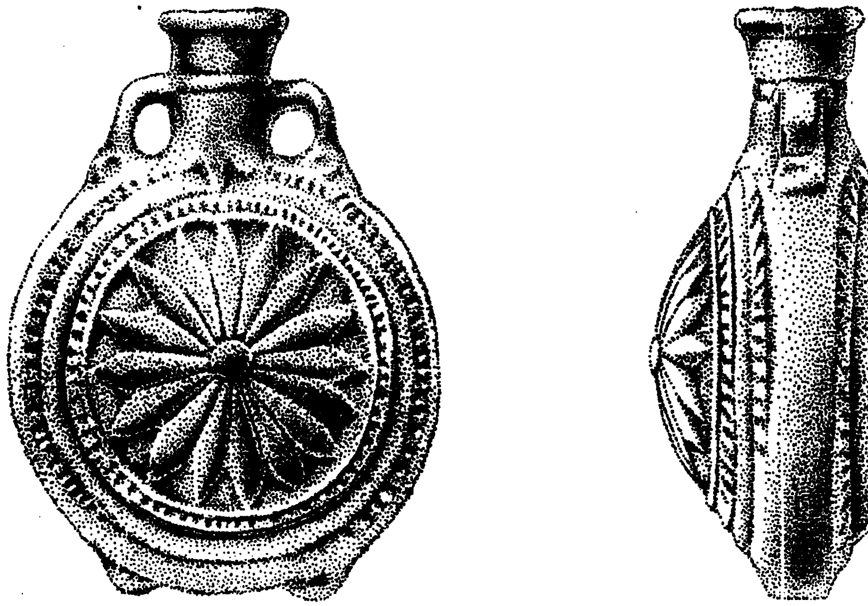
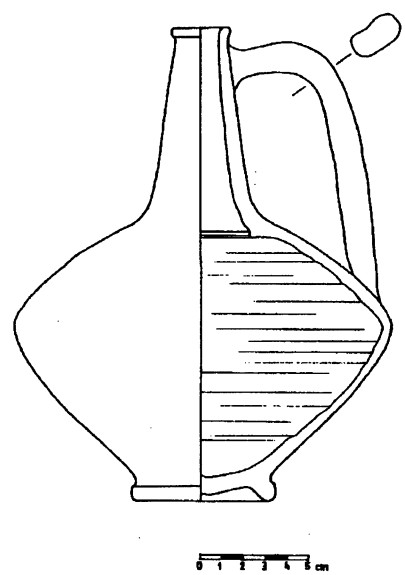


Figure 9.7 Small flask with stamped decoration, late third-early second centuries B.C. Drawing by Kamila Baturo.

Figure 9.8 Lagynos. Local imitation of a Greek vessel type, late third-early second centuries B.C. Drawing by Anna Południkiewicz.



tive frieze, composed of alternating lotus buds and flowers, possesses a visible affinity with ancient Egyptian patterns (e.g., *Meisterwerke altägyptischer Keramkik* 1978; 66 Kat. Nr. 12, 158 Kat. Nr. 243; Museum of Fine Arts, Boston 1982, 92, nr.72; Hayes 1978, 368, fig. 232; 421, fig. 267, upper edge). The stamps of the ceramic molds, which are mainly found in the mid-Ptolemaic stratum (second century B.C.), usually depict variations of the rosette pattern (e.g., fig. 9.9). Nevertheless, one of them bears a more sophisticated motif, that of Cupid riding a dolphin (fig. 9.10).[6] Although it remains an open question whether the molds were used for stamping ceramic dishes

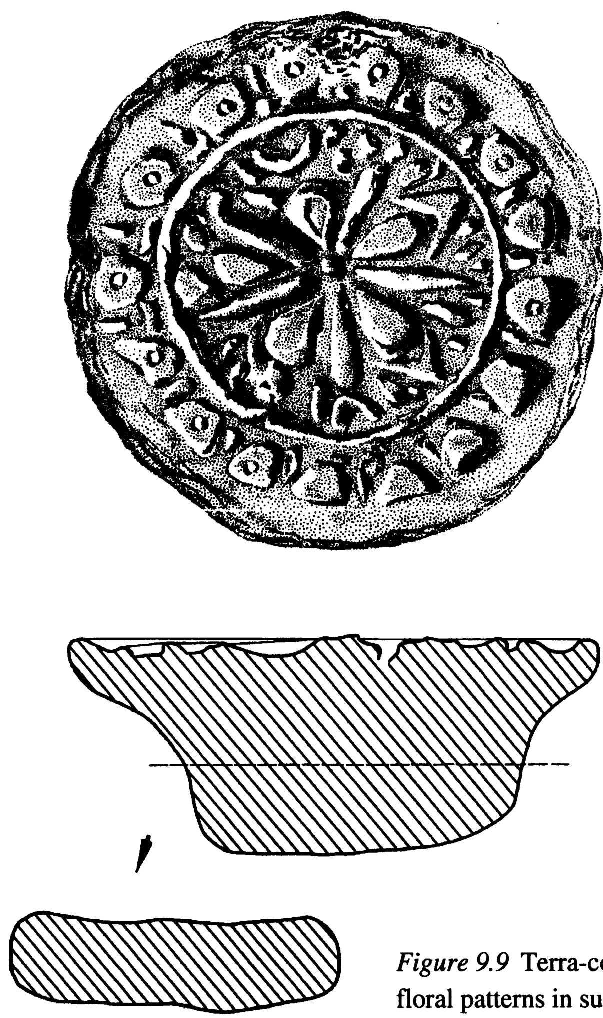


Figure 9.9 Terra-cotta mold with geometrical and floral patterns in sunk relief. Second century B.C.

(of a type which is known from elsewhere in Egypt but totally missing thus far among our materials from Tell Atrib) or bread that could be baked in local ovens, the latter mold may possess some functional connection with the erotic votive objects found in the same stratum but closer to the bath construction located in the workshops' neighborhood.

To the same chronological context belong also some original terra-cotta ware, one of which seems to be unique. It seems to represent the goddess Isis with two small sons—one of them at her breast, and the other one at her side (Myśliwiec and Szymanska 1992, 122-23, fig. 6). Since the archaeological evidence, and particularly the numerous coins, allow us to attribute this statuette to the time of Ptolemy VI or later, the goddess may possibly be identified with Cleopatra I, mother of two rulers (Ptolemy VI and Ptolemy VIII).

The discovery of ceramic workshops which produced both pottery and objects of art in Ptolemaic Athribis, combining in this process ancient Egyptian and Greek traditions, may not only help in dating and interpreting various artifacts of that period, but also assist in shedding some new light on the development of the Hellenistic *koine* in its topographic and diachronic aspects.

Figure 9.10 Terra-cotta mold with a figural scene in sunk relief, Second century B.C. Drawing by Kamila Baturo.

NOTES

[1] For earlier Polish excavations at Tell Atrib, see: Vernus 1978, XXI; idem [LÄ I] 1973, 521-22, nn. 37, 47, 56, 65; Ruszczyc 1975, 335-40; idem 1990a, 379-80; idem 1986, 29-34; idem 1990b, 317-19; idem 1989-1990, 673-76; Sztetyłło 1963, 335-36, 339; Zdrojewska 1971, 523-29; Młynarczyk 1974, 145-85; Krzyżanowska 1990, 209-210; Michałowski 1961, 219-29; Ruszczyc 1976, 118-27; idem 1966, 167-69; Górecki 1981, 7-8; idem 1990, 34-48.

[2] Myśliwiec and Herbich 1988a; Myśliwiec with contributions by Sztetyłło, and Kryżanowska 1988b; Myśliwiec with contributions by Herbich, Krzyżanowska, Sztetyłło and Łukaszewicz 1988c; Leclant and Clerc 1987, 300-301, pls. XI-XII; Myśliwiec 1986, 16-18; idem 1990, 458; idem 1992.

[3] Myśliwiec and Rageb 1992, 393-416; Myśliwiec 1990, 5-9; idem 1991, 25-30; idem 1992, 24-28; Leclant and Clerc 1988, 314, pls. VIII-X; idem 1989, 346-47, pls. XXI-XXIII; idem 1990, 344-45, pls. XIX-XX; idem 1991, 167-68, pls. XXXIV-XXXV; Myśliwiec and Abou Senna 1993; Meyza 1986, 18-19; Południkiewicz 1991, 13-15.

[4] An article on Ptolemaic pottery with relief decoration from Tell Atrib is in preparation by the authors of this text.

[5] Z. Sztetyłło is preparing an overall publication of this material (cf. Myśliwiec1988a, 183, 194, 196, pl. 40 a,b).

[6] Myśliwiec 1991:29, fig. 2; Myśliwiec and Rageb 1992, 406, fig. 8a.; Szczepkowska 1993. The publication of the molds from Tell Atrib is being prepared by J. Szczepkowska.

REFERENCES

GÓRECKI, T.

1981 "Tell Atrib." ***Bulletin de Liaison du Groupe International d'Étude de la Céramique Égyptienne*** 6: 7-8.

1990 "Coptic Painted Amphorae from Tell Atrib: Introductory Remarks on Decoration." In ***Coptic and Nubian Pottery, Part I: International Workshop, Nieborow, August 29-31, 1988, Vol. 1***, edited by W. GODLEWSKI. Occasional Paper National Museum in Warsaw 1. Warsaw: National Museum in Warsaw, 34-48.

HAYES, W. C.

[1959] 1978 ***The Scepter of Egypt: A Background for the Study of the Egyptian Antiquities in the Metropolitan Museum of Art. Part II: The Hyksos Period and the New Kingdom (1675-1080 B.C.).*** Cambridge: Harvard University Press for the Metropolitan Museum of Art. Revised reprint edition, distributed by Harry N. Abrams. New York: Metropolitan Museum of Art.

KRZYŻANOWSKA, A.

1990 "Remarques sur la circulation monetaire en Égypte du IVe au VIIe siècles fouilles archéologiques copto-polonaises à Tell Atrib." In ***Coptic Studies, Acts of the Third International Congress of Coptic Studies***, 20-25 August 1984, edited by W. GODLEWSKI. Varsovie: Państwowe Wydawnictwo Naukowe—Éditions Scientifiques de Pologne, 209-10.

LECLANT, J., and G. CLERC

1987 "Fouilles et travaux en Égypte et au Soudan, 1985-1986: 12. Tell Atrib." ***Orientalia*** 56: 300-301.

1988 "Fouilles et travaux en Égypte et au Soudan, 1986-1987: 10. Tell Atrib." ***Orientalia*** 57: 314

1989 "Fouilles et travaux en Égypte et au Soudan, 1987-1988: 14. Tell Atrib." ***Orientalia*** 58: 346-47.

1990 "Fouilles et travaux en Égypte et au Soudan, 1988-1989: 16. Tell Atrib." ***Orientalia*** 59: 344-45.

1991 "Fouilles et travaux en Égypte et au Soudan, 1989-1990: 10. Tell Atrib." ***Orientalia*** 60: 167-68.

1992 "Fouilles et travaux en Égypte et au Soudan, 1990-1991: 15. Tell Atrib." ***Orientalia*** 61: 225.

MANDEL-ELZINGA, U.

1988 "Ptolemäsche Reliefkeramik." ***Jahrbuch des Deutschen Archäologischen Instituts*** 103: 247-307.

Meisterwerke altägyptischer Keramik

1978 ***Meisterwerke altägyptischer Keramik: 5000 Jahre Kunst und Kunsthandwerk aus Ton und Fayence.*** Höhr-Grenzhausen, Rastal-Haus, 16 September bis 30 November 1978. Montabaur: Förderkreis Westerwald für Kunst und Keramik.

MEYZA, H.

1986 "Tell Atrib (1986)." ***Bulletin de Liaison du Groupe International d'Étude de la Céramique Égyptienne*** 11: 18-19

MICHAŁOWSKI, K.

1961 "Les constructions ptolémaïques et romaines à Tell Atrib." ***L'Erma, III.*** Roma, pp. 219-29.

MŁYNARCZYK, J.

1973 "Types of Terracotta Lamps from Tell Atrib." ***Études et Travaux*** 7: 81-113.

MUSEUM OF FINE ARTS, BOSTON
1982 ***Egypt's Golden Age: The Art of Living in the New Kingdom 1558-1085 B.C.***
Catalogue of the Exhibition. Boston: Museum of Fine Arts.
MYŚLIWIEC, K.
1986 "Tell Atrib, 1985." ***Bulletin de Liaison du Groupe International d'Étude de la Céramique Égyptienne*** 11: 16-18.
1987 ***Keramik und Kleinfunde aus der Grabung im Tempel Sethos' I in Gurna.*** Archäologische Veröffentlichungen 57. Deutsches Archäologisches Institut Abteilung Kairo. Mainz am Rhein: Philipp von Zabern.
1988a "Remains of a Ptolemaic Villa at Athribis." (With contributions by Z. Sztetyłło and A. Krzyżanowska.) ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 44: 183-97.
1988b "Polish Excavations at Tell Atrib in 1985." (With contributions by T. Herbich, A. Krzyżanowska, Z. Sztetyłło and A. Łukaszewicz) ***Annales du Service des Antiquités de l'Égypte*** 72: 53-77.
1989 "Dreihenklige Gefâsse in Égypten." ***Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo*** 45: 239-47.
1990a "Hellenistic Sculptures Found at Tell Atrib (Egypt) in 1985." In ***Akten des XIII. Internationalen Kongresses für Klassische Archäologie, Berlin 1988.*** Mainz am Rhein: von Zabern, 457-58.
1990b "Polish-Egyptian Excavations at Tell Atrib in 1989." ***Polish Archaeology in the Mediterranean*** 1: 5-9.
1990c "Isis à Athribis." ***Études et Travaux*** 15: 285-96.
1991 "Polish-Egyptian Excavations at Tell Atrib in 1990." ***Polish Archaeology in the Mediterranean*** 2: 25-30.
1992a "Excavations at Tell Atrib in 1985." ***Études et Travaux*** 16: 383-91.
1992b "Polish Egyptian Excavations at Tell Atrib in 1991." ***Polish Archaeology in the Mediterranean*** 3: 24.
1994a "Isis Aphrodite "anasyrménè" et le culte de la déesse nue à Athribis ptolémaïques." In ***Hommages à Jean Leclant. Vol. 3: Études Isiaques,*** edited by C. BERGER, G. CLERC, and N. GRIMAL. Bibliothèque d'Étude 106/3. Cairo: Institut Français d'Archéologie Orientale, 385-89.
1994b "Un passage des Textes des Pyramides et la rencontre d'une tradition Égyptienne avec une tradition grecque à l'époque ptolémaïques." In ***Zwischen den beiden Ewigkeiten: Festschrift Gertrud Thausing,*** edited by M. BIETAK, J. HOLAUBEK, H. MUKAROVKSY, and H. SATZINGER. Vienna: Institut für Ägyptologie der Universität Wien, 154-58.
MYŚLIWIEC, K., and S. ABOU SENNA
1993 "Polish Egyptian Excavations at Tell Atrib in 1991-1992." ***Études et Travaux*** 17: 210-44.
MYŚLIWIEC, K., and T. HERBICH
1988 "Polish Archaeological Activities at Tell Atrib in 1985." In ***The Archaeology of the Nile Delta: Problems and Priorities,*** edited by E. M. C. VAN DEN BRINK. Proceedings of the Seminar held in Cairo, 19-22 October 1986, on the occasion of the fifteenth anniversary of the Netherlands Institute of Archaeology and Arabic Studies in Cario. Amsterdam: Netherlands Foundation for Archaeological Research in Egypt, 177-203.
MYŚLIWIEC, K. L., and M. A. H. RAGEB
1992 "Fouilles polono-égyptiennes à Tell Atrib en 1986-1990." ***Études et Travaux*** 16: 393-416.
MYŚLIWIEC, K., and H. SZYMAŃSKA
1992 "Les terres cuites de Tell Atrib. Rapport préliminaire." ***Chronique d'Égypte*** 67: 112-32.

POŁUDNIKIEWICZ, A.
1991 "Tell Atrib/Benha, 1989." **Bulletin de Liaison du Groupe International *d'Étude de la Céramique Égyptienne*** 15: 13-15.
1992 "Local Imitations of Greek Pottery Found in Tell Atrib." In ***Cahiers de la Céramique Égyptienne 3*** (Ateliers de Potiers et Productions Céramiques en Égypte): 95-102.
RUSZCZYC, B.
1966 "Zur Problematik der aegyptisch semitischen Beziehungen." **Mélanges offerts à Kazimierz Michałowski**. Warsaw: Pańistwowe Wydawnictwo Naukowe, 167-69.
1975 "Tell Atrib Kôm Sidi Youssef 1969." ***Études et Travaux*** 8: 335-40.
1976 "Le temple d'Amosis à Tell Atrib." ***Études et Travaux*** 9: 117-27.
1986 "Tell Atrib." In ***50 lat polskich wykopalisk w Egipcie i na Bliskim Wschodzie: Uniwersytet Warszawski Stacja Archeologii Sródziemnomorskiej im. prof. Kazimierza Michałowskiego***. Warsaw, 29-34.
1989-90 "Wykopaliska w Tell Atrib w roku 1984." ***Rocznik Muzeum Narodowego w Warszawie*** 33-34: 673-76.
1990a "Die Ausgrabungen in Tell Atrib (Kôm Sidi Youssuf)." In ***Coptic Studies, Acts of the Third International Congress of Coptic Studies***, 20-25 August 1984, edited by W. GODLEWSKI. Varsovie: Pańistwowe Wydawnictwo Naukowe—Éditions Scientifiques de Pologne, (Varsovie), 379.
1990b "Tell Atrib Kôm Sidi Youssef 1979." ***Études et Travaux*** 14: 317-19.
SZCZEPKOWSKA, J.
1993 "A Stamp with a Representation of Eros Riding a Dolphin from Tell Atrib." ***Études et Travaux*** 17: 316-24.
SZTETYŁŁO, Z.
1963 "Stamped Amphorae Handles from Polish Excavations in Tell Atrib (1957 1961)." ***Eos*** 53(2): 335-40.
VERNUS, P.
1973 "Athribis." ***Lexikon der Ägyptologie*** I: 519-23.
1978 ***Athribis: Textes et documents relatifs à la géographie, aux cultes, et à l'histoire d'une ville du Delta Égyptien à l'Époque pharaonique***. Bibliothèque d'Étude 74. Cairo: Institut Français d'Archéologie Orientale.
ZDROJEWSKA, W.
1971 "Alexandrinische Bronzestatuetten eines Eroten aus den polnischen Ausgrabungen." In ***Acta Conventus XI "Eirene," diebus XXI-XXV mensis Octobris anni MCMLXVIII habiti***. Eirene Komitee zur Förderung der Klassischen Studien in den Sozialistischen Ländern Collegium Studiis Classicis Promovendis Academiae Scientiarum Polonae. Warsaw: Ossolineum, 523-29.

10

The Egyptian Modern Pottery Project: Pilot Phase Findings

Carol A. Redmount

1. Introduction and Research Design

Egypt boasts a long tradition of pottery production that extends from present times far back into the ancient past. For approximately seven thousand years, Egyptian potters have produced a wide variety of ceramic vessels using raw materials, methods, and technologies that have remained comparatively constant, although not unchanged, over the millennia. This unbroken line of ceramic tradition can be matched in few other modern societies. The richness and variety of the ancient Egyptian ceramic traditions are amply reflected in the archaeological record, and pottery has long served archaeologists as a basic tool for understanding and interpreting many aspects of the past. Today, traditional Egyptian craftsmen continue to create copious amounts of domestic pottery, using techniques and materials current for centuries or longer. Such pottery remains an important part of modern Egyptian life, particularly in rural households.

Ancient Egyptian ceramic traditions can be studied and interpreted directly only by examining remains of ancient vessels (potsherds, or, more rarely, whole pots) or by reviewing those few written and pictorial accounts of pots and potting preserved by the vagaries of time and chance (see, inter alia, Arnold 1993; Paice 1989; Rose 1993). These, along with occasional archaeological finds of potters' workshops or associated materials (e.g., Ballet and Vichy 1992; Ghaly 1992; Hope 1993; Nicholson 1992; Werner 1992), provide our only sources of primary knowledge for ancient manufacturing processes. Modern pottery production, however, takes place within a living society, where the entire ceramic cycle can be observed and recorded. Potters can be visited and asked questions about their raw materials and manufacturing choices; workshops can be mapped; the distribution networks of end products can be traced; and usage patterns of the completed vessels can be investigated. It was this potential for extant pottery industries to serve as interpretive guides to those long dead that led to the development of ceramic ethnoarchaeology.

Ceramic ethnoarchaeology combines a study of pottery with both ethnography and archaeology; all are concerned with understanding potters and pottery in their many aspects. Ethnoarchaeology uses the study of living societies as a means of understanding the physical traces of past cultures through analogy. The method is far from ideal, since analogy is an imperfect tool. A modern society, no matter how traditional, differs from those of the past, and modern materials and methods, although often similar, are rarely if ever exactly the same as those used in antiquity. Nevertheless, the study of pottery production within a living matrix provides a salutary reminder that the dead potsherds of archaeology once sprang from and functioned within a comparably vital and diverse societal context.

> Once an ethnoarchaeologist gets into the thick of a culture through participant-observation and begins examining the cognitive and behavioral variation of potters . . . the complexities of ceramic production are mind-boggling . . . Ethnoarchaeologists are thus discovering a great truth that those of us who have been doing ethnography all our professional lives have known all along: Seeing material culture as a participant observer is nowhere near as simple as it seems to archaeologists who have spent their lives looking at the results of that behavior. Seeing people rather than pots offers an entirely new perspective on ceramic production (Arnold 1991, 324).

Ceramic ethnoarchaeology thus encourages the development of new insights into and fresh perspectives on ancient pottery. It aids in the reconstruction of ancient manufacturing practices. It promotes an understanding of the "archaeological correlates" associated with pottery manufacture, "the by-products or traces of a given action or series of actions of the sort which the archaeologist might later come upon" (Nicholson and Patterson 1985b, 54). It allows testing of archaeological assumptions regarding associations between vessel form and function or vessel fabric and function. It permits an investigation into how various ceramic forms and fabrics are perceived by those who use them. It enables an exploration of the parameters and potential causes of regional ceramic diversity, as well as of variations in distribution patterns for various vessels or groups of vessels. And it provides a further means of assessing and refining various elements of archaeologically derived form and fabric typologies.

To address some of these issues, the Egyptian Modern Pottery Project (EMPP) was initiated in 1989 as a part of continuing archaeological field research on Egyptian ceramics.[1] The EMPP is an on-going, open-ended endeavor concerned with documenting Egypt's modern pottery resource for use as an ethnoarchaeological research tool.[2] The EMPP focuses specifically on modern traditional pottery, defined as pottery manufactured since the time of the French Expedition according to traditional methods, i.e., using traditional tools and equipment that, at least in principle, would or could have been available to ancient potters. Excluded from consideration are ceramics produced using modern technology (i.e., technology not potentially available to the ancient Egyptians) or created solely or dominantly as an art form.[3] Long-term objectives of the EMPP include documenting existing traditional ceramic forms and fabrics in Egypt; promoting a better understanding of archaeological ceramics by comparing modern forms, fabrics and technical characteristics with their ancient counterparts; and establishing a database and analytical framework according to which ancient and modern ceramics can be compared and contrasted. As a result of work to date, two further areas of exploration have been added to the EMPP's scope of research: the study and documentation of regional ceramic differences; and the characterization of distribution mechanisms and sales networks for finished ceramic products.

The research reported here comprised the pilot phase of the EMPP, which explored different approaches to modern Egyptian ceramics. One approach was to examine modern pottery from an archaeological perspective—i.e., to collect, study, and analyze the material as if it were an archaeological find. To this end, pottery was gathered from a variety of refuse contexts. Bits of broken pottery or abandoned vessels were collected from a railroad track, from the edges of roads or streets, and from balconies or roofs. Such an approach proved somewhat problematic as there was no secure way to pinpoint the place of origin or date of manufacture of the finds. On the other hand, such refuse contexts did provide evidence of fabrics (and potentially of forms) apparently no longer produced. A second approach was to purchase pottery at retail outlets and to question the seller regarding pertinent characteristics of the pots, such as their places of origin, functions, and nomenclature. Purchasing pottery from such retail outlets also provided an overview of forms and fabrics currently on the market in particular areas. A third approach was to go directly to the potters and collect information regarding raw materials and manufacturing processes as well as finished products.[4]

The usefulness of various analytical approaches and techniques was also investigated in this phase of the project. Hand lenses and a binocular microscope of varying powers, differing fracture locations and treatments of the fracture zones, and various methods of recording were all tested in the field. More sophisticated scientific approaches were explored in the United States when funds and additional expertise became available.

The remainder of this report is divided into four separate but interrelated sections that describe the outcome of the EMPP's pilot phase research. These findings should be considered suggestive rather than conclusive; the EMPP is very much a work in progress. The first section of the paper deals with ceramic sample collection, gives details of visits to potters and pottery retailers, and provides a general, preliminary discussion of pottery production in Egypt today. The next section reviews the sample corpus, placing particular emphasis on the forms and functions of the collected vessels. The third part of the account discusses the ceramic fabrics represented in the sample collection and considers the results of visual, petrographic, and chemical analyses of those fabrics. Finally, the report concludes with an assessment of the project to date and suggestions for future research.

2. Sample Collection

The initial EMPP group of modern traditional pottery samples was acquired mainly in Sinai, the Delta, the greater Cairo region, the Fayum, and Middle Egypt[5] (fig. 10.1). As noted above, samples were collected or purchased from three primary sources: 1) potters; 2) pottery retailers; and 3) rubbish contexts. Wherever possible, the place of origin, method of manufacture, Arabic name,[6] and function of the sample vessels, whether whole or broken, were determined. Within each of the three primary source groups, sample collection locations are discussed in geographical order from north to south.

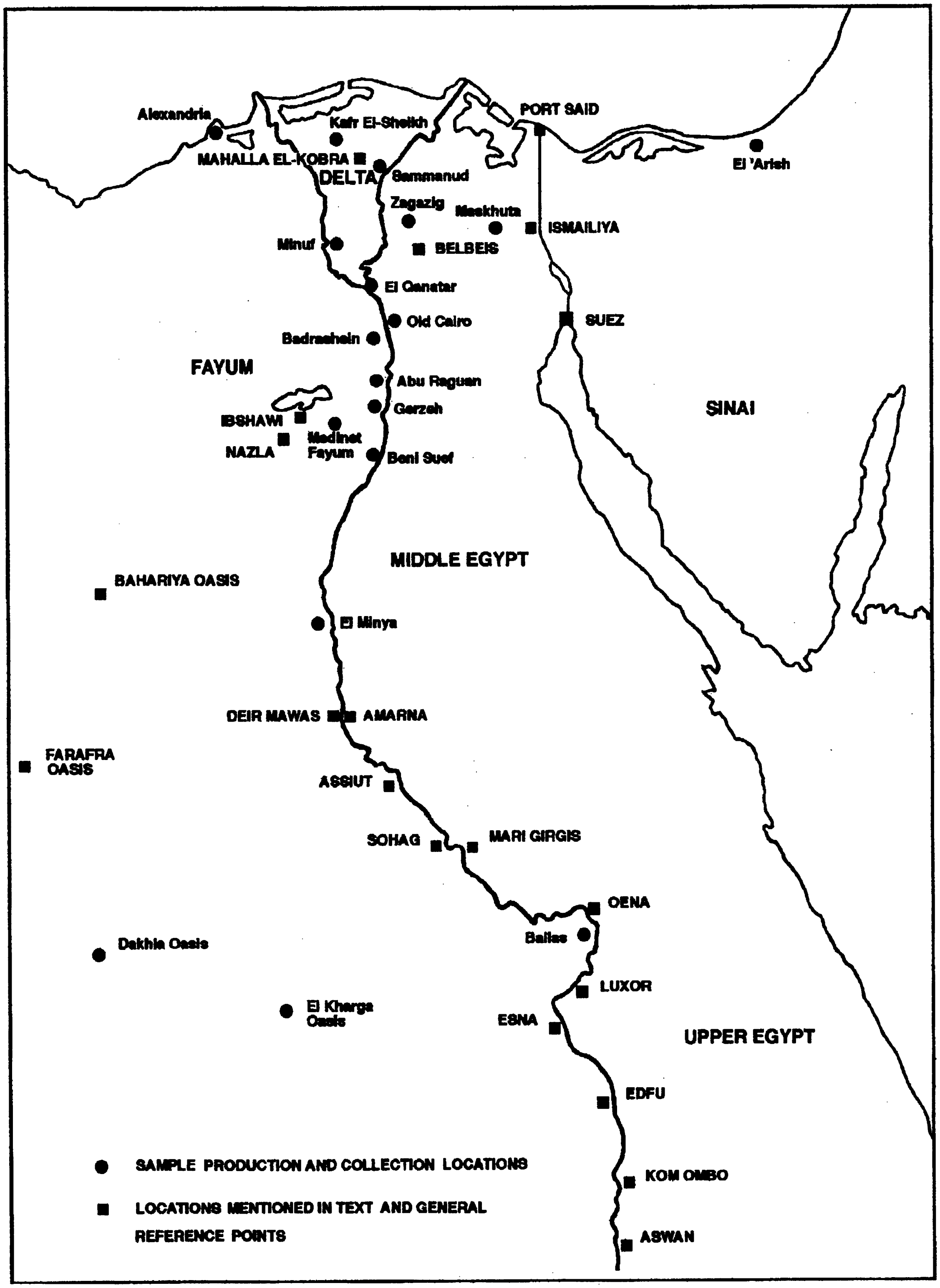


Figure 10.1 Map of Egypt showing sample production and collection locations, locations mentioned in text, and points of general reference. Adapted from Henein 1992.

A. Potters

In four cases pottery was purchased directly from the producers. It was therefore possible to ask the potters themselves direct questions about the raw materials and the manufacturing sequence involved in ceramic production.[7]

Old Cairo Workshop

Located in Old Cairo is a pottery workshop owned and supervised by a 63-year-old master potter (as of 1995; plate 10.1) who has worked in the trade since he was about seven years old. For the past thirty years he has operated this particular workshop; earlier, he worked in the Fustāt potters' complex.[8] The workshop operates year-round and employs ten skilled workers and six young assistants, three girls and three boys aged 12 to 14 years old (plate 10.2). The output of the workshop comprises a variety of ceramic forms, including different kinds of jugs (*'olla, abrī*[9]); flowerpots (*'asreyya*); a vase/candle holder (*šama'danī*); a molasses jar (small *ballās*); drums (*tabla*); water jars (*zīr*); roof tiles (*aramīt*); and occasional other items as dictated by demand. The bulk of the production consists of roof tiles and the *'olla* jugs. The roof tiles and vase/candle holders are mold made (plates 10.3, 4); the other forms are thrown on a kick-wheel (plates 10.2, 5).

The workshop complex is sandwiched between two unpaved streets. The broad axis of the rectangular, fired-brick main structure parallels the streets. The center of the structure is occupied by slatted wooden shelves, drying racks, extending from floor to ceiling (plate 10.6). Around the interior wall perimeter are several work stations (plates 10.1, 2, and 5) . Completed pots and production equipment not in use also are stacked against interior walls for storage (plate 10.7). The workshop building has front and rear entrances located on its broad walls. Outside the front of the workshop are three kilns, as well as an open area for the storage of raw materials and supplies and for vessel drying (plate 10.8). Behind the workshop, bounded on their two long sides by the workshop wall and the unpaved road, and on their two short sides by adjacent fired-brick buildings, are four shallow basins or pits cut into the ground in a line. Running along the road edge of the pit line is a small channel connecting the first pit, the round clay mixing basin (plate 10.9), with three rectangular clay settling basins (plate 10.10).

The workshop owner purchases all of his raw materials except the ash temper, which consists of ash removed from the fuel chambers of the pottery kilns and sifted. The workshop uses four main varieties of clay. Nile silt (*tīn bahrī*) comes from the Cairo area, reportedly from construction sites or other areas where the silt is being disturbed. A desert clay (*tīn gebelī*), yellow in color, is brought from Qatamiya near Helwan. Two other clays, one red (*tīn Aswanī*) and one white (*tīn Aswanī bukla*), are imported from Aswan.[10] The desert clay and Nile silt are stored together in a large dry mound in front of the workshop, with desert clay on one side of the pile and Nile silt on the other (plate 10.8). Aswan clay of both types comes dry, fine, and bagged in heavy plastic.

When a clay is prepared for use, it is first sifted using a coarse fraction screen, and then placed in the circular clay mixing basin, which has a diameter of approximately 4 m. Water is added to the dry clay by means of a metal pipe which extends out over the basin (plate 10.9). The different clay types are hydrated separately.[11] As soon as the clay and water mixture is ready, it is transported via the small channel to

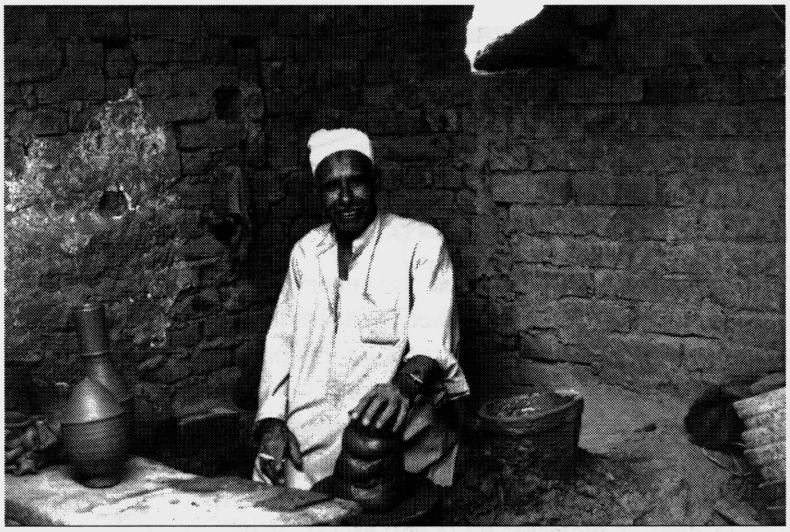


Plate 10.1 Master potter Abdullah Mahmoud Megahit, *raiyiss* of the traditional potter's workshop in Old Cairo, at a potter's wheel. Note the completed and partially completed '*olall* in the left foreground.

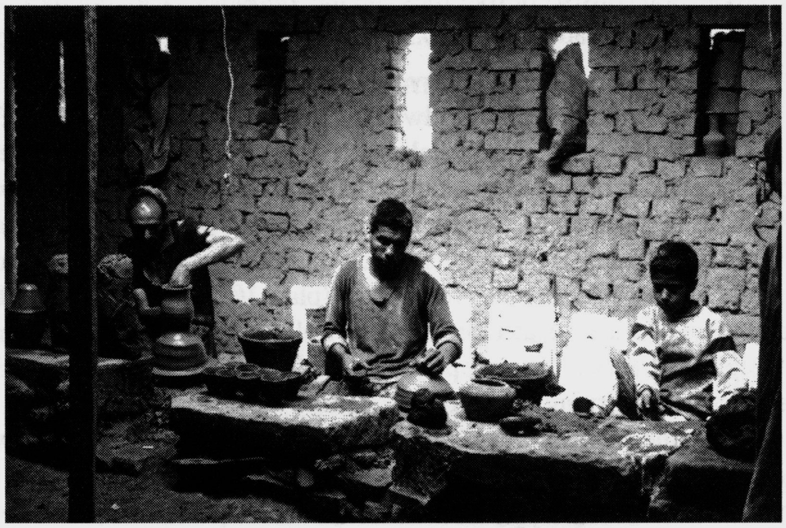


Plate 10.2 Two skilled workers throwing pots at the Old Cairo workshop as a young assistant waits for additional tasks.

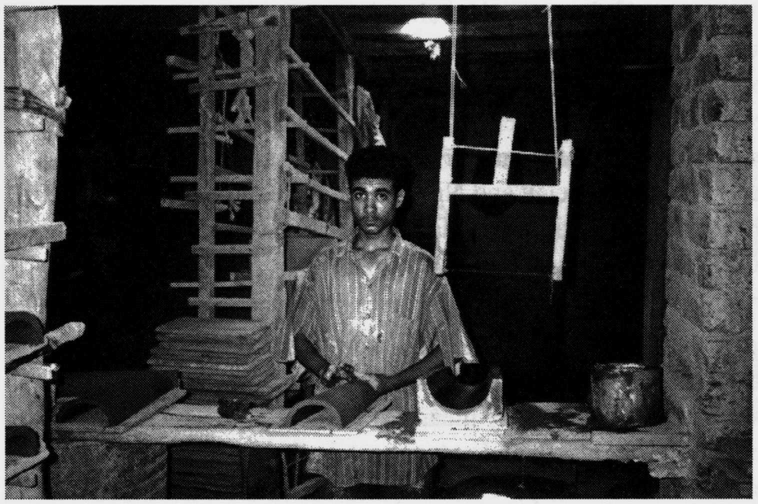


Plate 10.3 A skilled worker putting finishing touches on a molded roof tile (*aramīt*) at the Old Cairo workshop; note the mold at his left elbow. The hanging wooden frame just above the mold has a cord stretched across its lower part; this is used to trim the edges of the roof tile when it is still in the mold.

Plate 10.4 Molds for producing candle holders/vases (*šama'danī*) in the Old Cairo workshop.

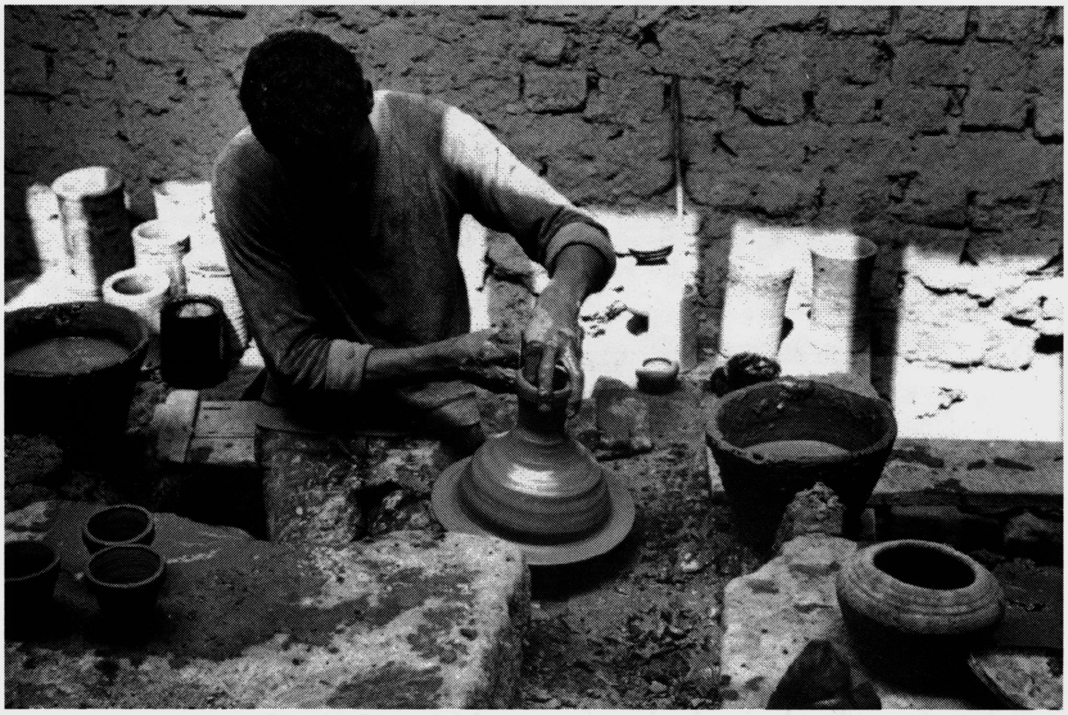


Plate 10.5 A skilled worker throwing a pot on a kick-wheel at the Old Cairo workshop.

one or more of the three rectangular settling basins, each of which measures approximately 7 m x 5 m. The clay and water mixture is left in the rectangular basin(s) for seven days. During this period, the excess water evaporates, leaving the raw clay. The clay is then brought into a small room where a worker tramples and kneads it to a working consistency (plate 10.11) and then covers it with plastic sheeting to keep it moist.

The only temper used by the Old Cairo workshop is sifted ash from the pottery kilns. This is added to the Nile silt and *gebel* clays, but not to the Aswan clays. Quality and price dictate the clay or combination of clays used to manufacture different items. The best quality and most expensive roof tiles are made of red Aswan clay alone; a medium quality, mid-priced tile is produced of half red Aswan clay and half Nile silt; and the poorest quality and cheapest roof tiles are made of Nile silt alone. The preferred recipe for the *'olla* is half silt, half *gebel* clay, and two percent sifted ash; an inferior and less expensive *'olla* is made of Nile silt alone.[12] Articles of pure silt fabric generally are cheaper and regarded as inferior, with the exception of the *zīr* water storage jar, for which Nile silt is the fabric of choice.

The workshop has three modestly sized updraft kilns, all with permanent tops and stokeholes located in front. The largest kiln has a capacity, according to the master potter, of twenty thousand *'olall* (plate 10.12). It takes one month to create enough vessels for a firing in the large kiln, and the jugs are fired for seven days.[13] The color of the fired *'olall* is partly a function of kiln placement: the fully oxidized pots generally are fired towards the back of the kiln and are white; the partially oxidized pots are more orange.[14] The two smaller kilns are used exclusively for firing roof tiles (plate 10.13).[15] One has a capacity of one thousand tiles, the other two thousand tiles. Three of the workshop's skilled workers mold roof tiles full-time. Each of these employees creates three hundred tiles per day, giving the workshop a production total of nine hundred roof tiles per day. The tiles are left to dry for twenty-four hours, either in the open (plate 10.9) or on the slatted wooden shelves in the center of the workshop structure (plate 10.6). They then are fired for twenty-four hours.

Any readily accessible fuel is used in the kiln. Particularly common are wood shavings (plate 10.14) and sugar cane husks acquired from nearby factories. The fuel is stored in the open in the front of the workshop, not far from the kilns.

El Qanatar

Just north of the Cairo barrage, at Basatin el-Qanatar,[16] is a small, government-owned pottery workshop specializing in the production of flowerpots (*'asārī*). Although the workshop was not in operation the day we visited (a Friday), a senior employee who had worked at the place since 1959 was kind enough to show us around and answer our questions.

The workshop, which functioned year-round, comprised a single large room outfitted with six kick-wheels operated, our informant told us, by six craftsmen. Attached to the exterior of the structure in front was a series of drying sheds shaded with thatch supported by poles (plate 10.15). Here the completed flowerpots dried in the open air prior to firing. On another side of the workshop building was a series of rectangular settling basins dug into the ground (plate 10.16). Clay was soaking in four of these basins; two others were dry. Adjacent to the settling basins was a

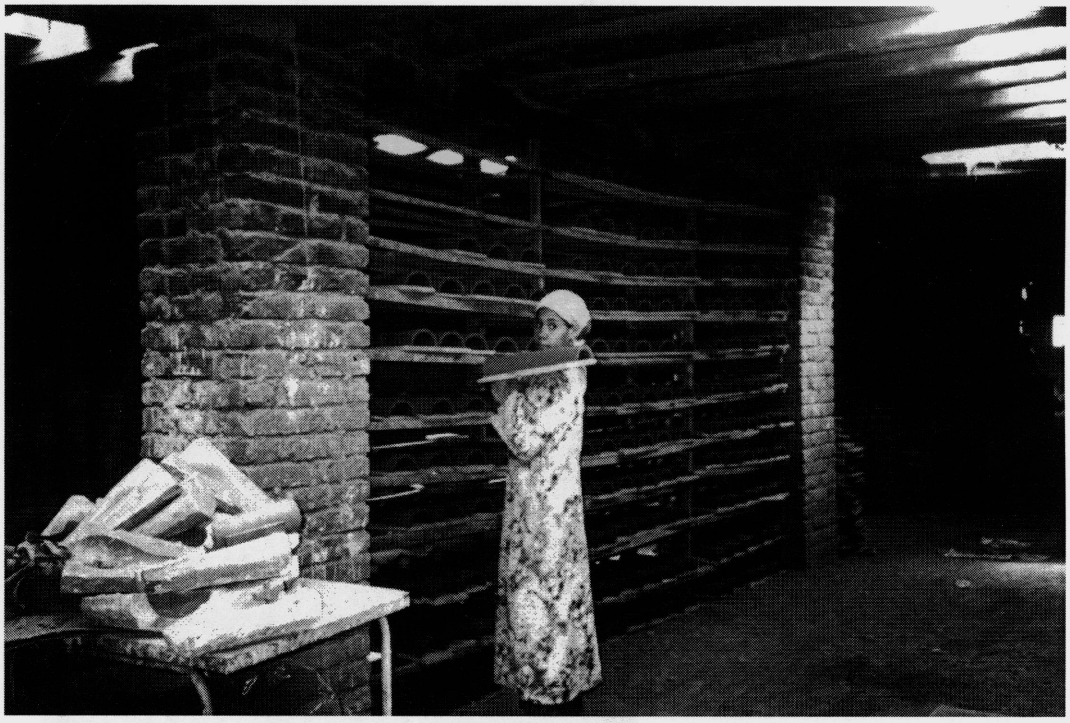


Plate 10.6 Young assistant placing unfired roof tile to dry in the slatted wooden drying racks in the center of the Old Cairo pottery workshop.

Plate 10.7 Production equipment (note molds to left and boards used to support unfired roof tiles) and completed pots stored against Old Cairo workshop walls.

Plate 10.8 View of the front of the Old Cairo workshop looking away from the structure. The car and man in the background are on the unpaved road. To the left are roof tiles drying in the open. To the right is a mound of two different types of unprocessed clay: Nile silt to the right and *gebel* clay to the left. In the right foreground are ash from the pottery kilns and miscellaneous bits of assorted kiln fuel.

waterwheel, which dispensed water obtained from the Nile River with the aid of an electric pump. The river was located one field away from the workshop. A pipe in the lower part of the water-wheel system fed the settling basins. Next to the waterwheel was an old style hand pump, which had evidently fallen into disuse with the advent of the mechanized system.

The flowerpots, the only product of the workshop, were manufactured in different sizes designated by number (e.g., size 5). According to our informant, all the pots were marketed abroad. Two different clay recipes were used by the workshop. The first consisted solely of Nile silt, taken from nearby topsoil and then soaked in the settling basins. No tempering agents of any kind were added. The moist, unfired Nile silt clay body[17] was a very dark brown, almost a grey-brown, in color.[18] The second clay recipe consisted of a mixture of Nile silt and a yellow desert clay brought from Tebbin,[19] near Helwan. The proportions of the mixture were one-third Nile silt to two-thirds *tebbīn* clay. According to our guide, the clay mixture was used solely for reasons of color: it produced a much lighter colored pot than Nile silt alone.

Two updraft kilns (figs. 10.17, 18), approximately 4.1 m in diameter and 3.5 m high, fired the flowerpots. These moderately sized kilns had stokeholes in the back and permanent tops.[20] Two additional kilns were under construction. According to our informant, both of the existing kilns were fired once a week. The firing lasted 42 hours and total output per firing was 5,000 flowerpots. Fuel consisted of anything appropriate that was available.

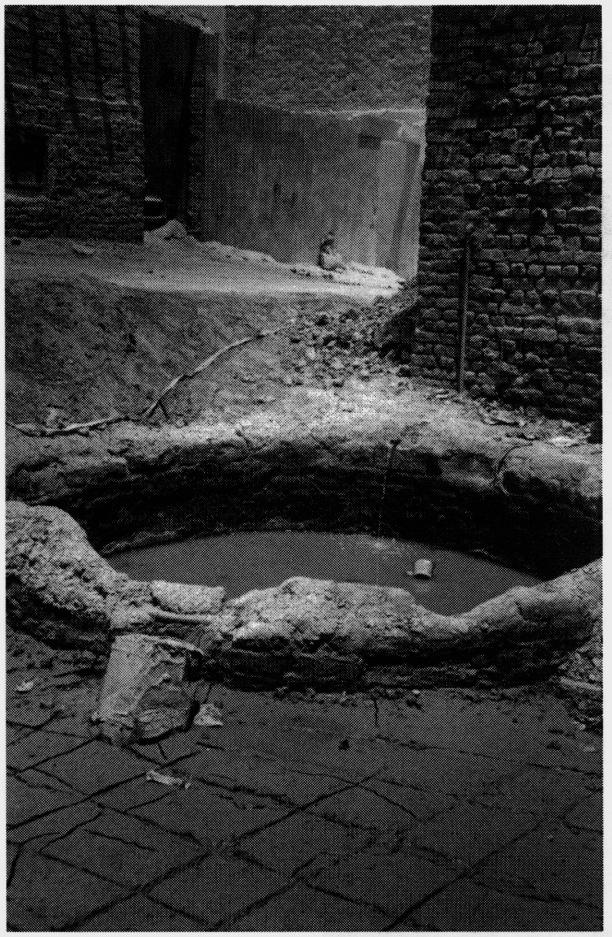


Plate 10. 9 Round hydrating basin for dry clay at Old Cairo workshop. Note pipe with running water extending out over basin. The unpaved road in back of the workshop is visible in the background.

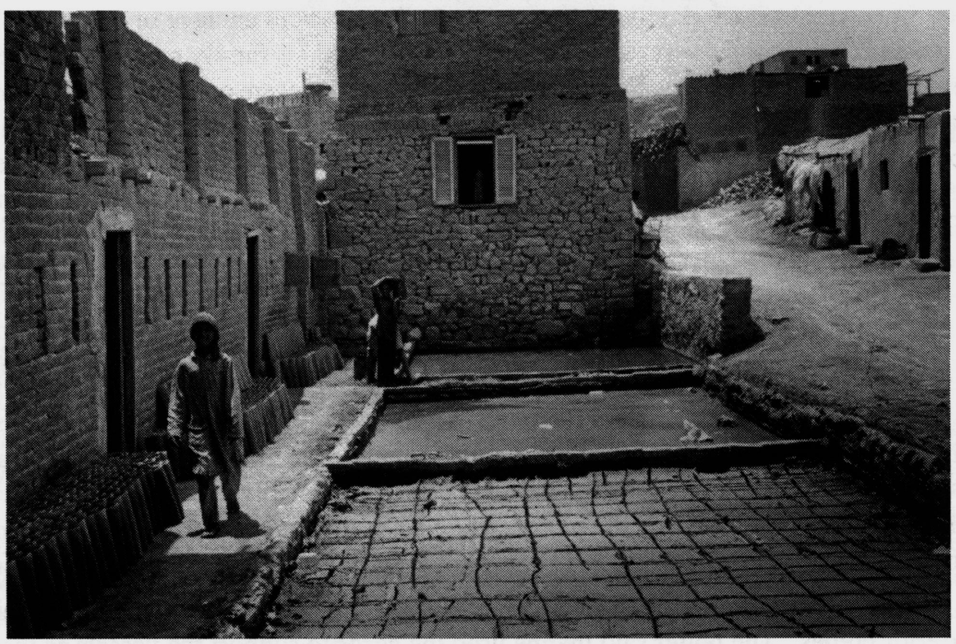


Plate 10.10 The three rectangular settling basins for clay at the Old Cairo workshop. Water remains in the two rear basins but has evaporated almost completely from the basin in the foreground, which is the same basin that appears in the foreground of plate 10.9. Note the two entrances to the workshop to the left and the completed roof tiles stacked against the exterior workshop walls. The girls are two of the young assistants employed at the workshop.

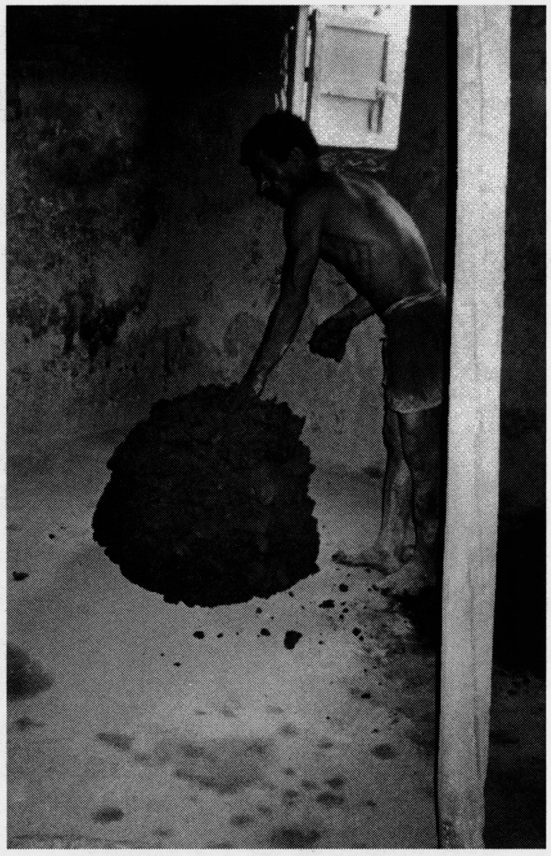


Plate 10.11 Worker inside Old Cairo workshop kneading raw clay taken from the settling basins into an appropriate working consistency.

Badrashein

At Badrashein, a village near Saqqara, lives a small enclave of potters. We stopped at one of the houses and the resident potter and his family readily answered our questions and showed us around. Home and workshop were combined, and household laundry was strung on lines above unfired ceramic pieces drying in the open air (plate 10.19). This potter, who used a kick-wheel (plate 10.20), made only three types of vessels: a large water jar (*zīr*); a large, thick, round griddle (*balata*) used as the baking platform in traditional bread ovens; and a large bowl (*māǧūr*) used predominantly for mixing bread dough. All three of these forms are large, thick-walled, heavy, and clumsy.

The raw clay source used by this potter was Nile silt obtained from dredging nearby canals and from leveling fields for cultivation. The potter did not collect this himself; rather, someone brought it around to him. After the silt had soaked in basins dug into the ground, two tempers were added to make the clay body. The first was ash, the second a bagged white calcareous powder, probably calcium carbonate.[21] The latter was purchased by the potter, who was complaining bitterly about recent price increases. The clay body itself was dark grayish-brown, almost black, in color.

The completed, drying *zīr* and *māǧūr* forms had cords wrapped around their exterior bodies. The potter said that he used the cords to support the vessels as they dried. When we inquired further as to whether the cords might also function to indicate the state of dryness of the vessel, the potter agreed: when the cords fell off the vessel, the vessel was ready for firing.

Pre-firing pot decoration was done by the potter, who painted white designs

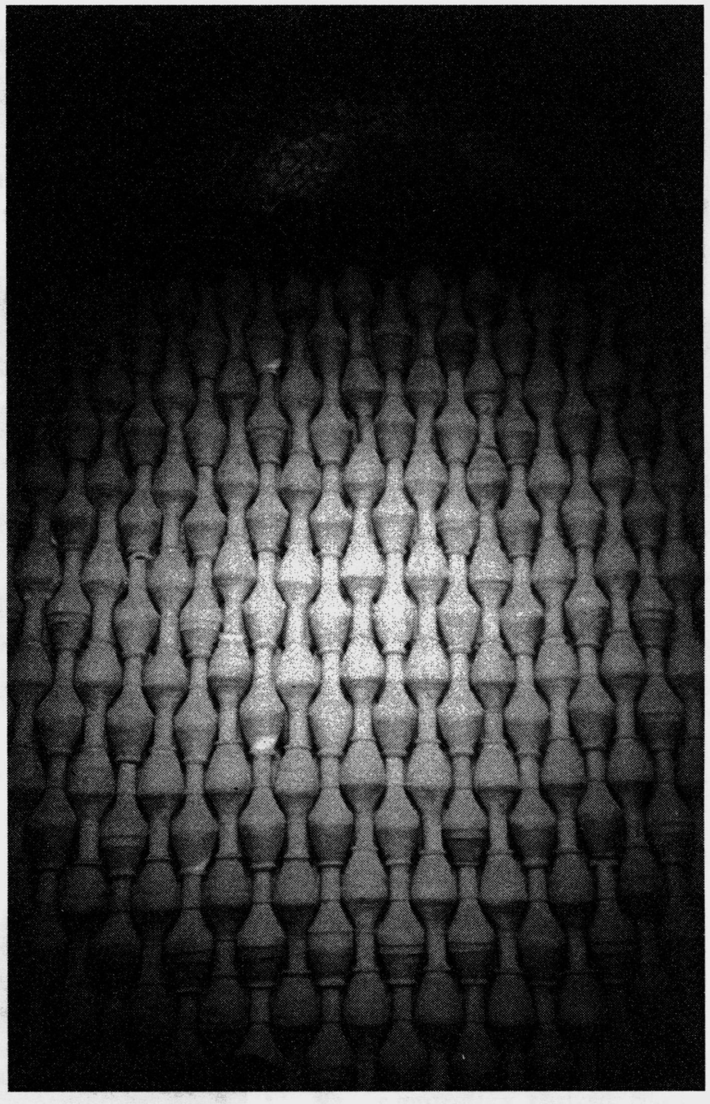


Plate 10.12 'Olall carefully stacked inside the large kiln at the Old Cairo potter's workshop.

only on the upper exterior body of the *zīr* form. Decorative motifs included thick horizontal bands and wavy lines, and circular blobs. After firing, any final decorative treatment of the pot was completed by the women of the family (plate 10.21). First, rough areas on the vessel, particularly on the bottom portions of the *azyār*, were scraped down with a metal implement. Next, washes,[22] of red ocher or white *ǧibs* (calcium sulfate) or both, were applied. When the two washes were combined (producing various shades of rose depending upon the proportions of red and white), the method was as follows. A wash of red ocher and water was mixed together in one bowl, while a second bowl contained only powdered *ǧibs*. In a third bowl, the ocher and water mix was combined with the powdered *ǧibs* and the resulting mixture was then applied with a rag to a pot and wiped on with broad strokes. When asked specifically about the *ǧibs*, the women applying the decoration responded that it was used to smooth out the roughness of the pottery. During such post-firing pot treatment, cord impressions on the fired vessel were typically eliminated, covered, or otherwise obscured, a further indication that the primary function of the cords was not decorative. The entire decorating operation was casual and slapdash. The kiln, not in operation the day we visited, was an updraft kiln without a permanent top (plate 10.22).

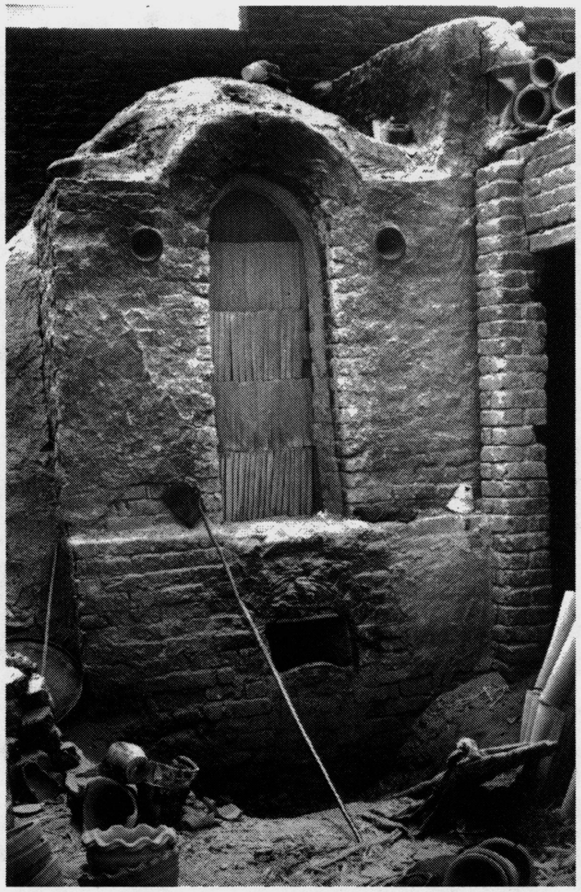


Plate 10.13 One of the two small kilns at the Old Cairo workshop, with roof tiles (*aramīt*) stacked inside ready for firing. Note permanent roof on kiln and stokehole directly below entrance to kiln where tiles are stacked.

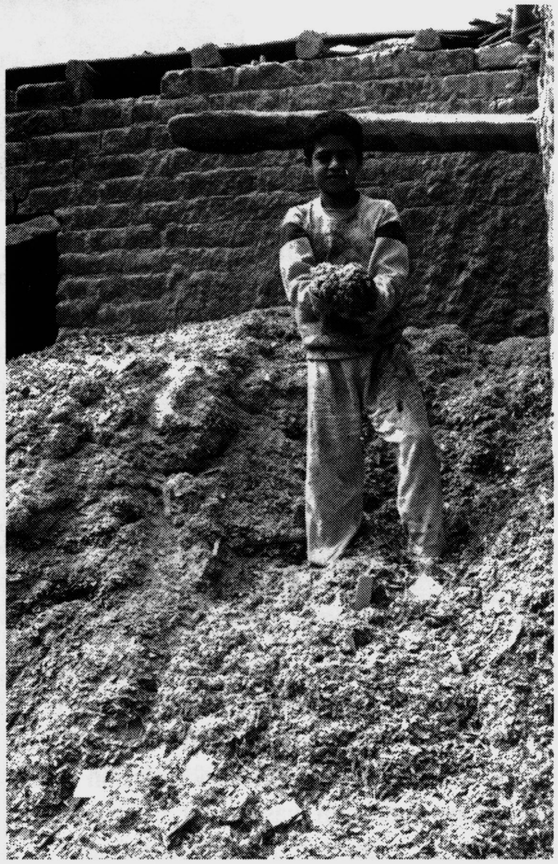


Plate 10.14 One of the young assistants at the Old Cairo potter's workshop holding some of the wood shavings, waste from a nearby factory, used for kiln fuel.

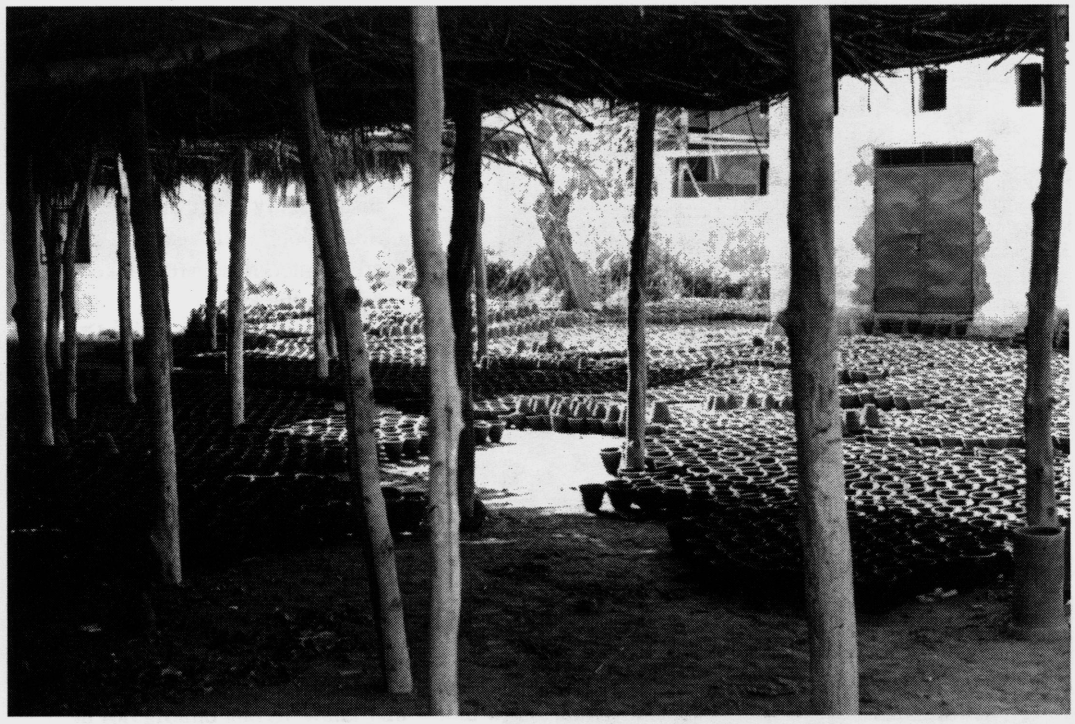


Plate 10.15 Drying sheds at El Qanatar workshop with completed flowerpots drying in the open.

Plate 10.16 Rectangular clay settling basins with water at various stages of evaporation at El Qanatar flowerpot workshop. Note drying sheds in center background; exterior workshop wall appears in left background.

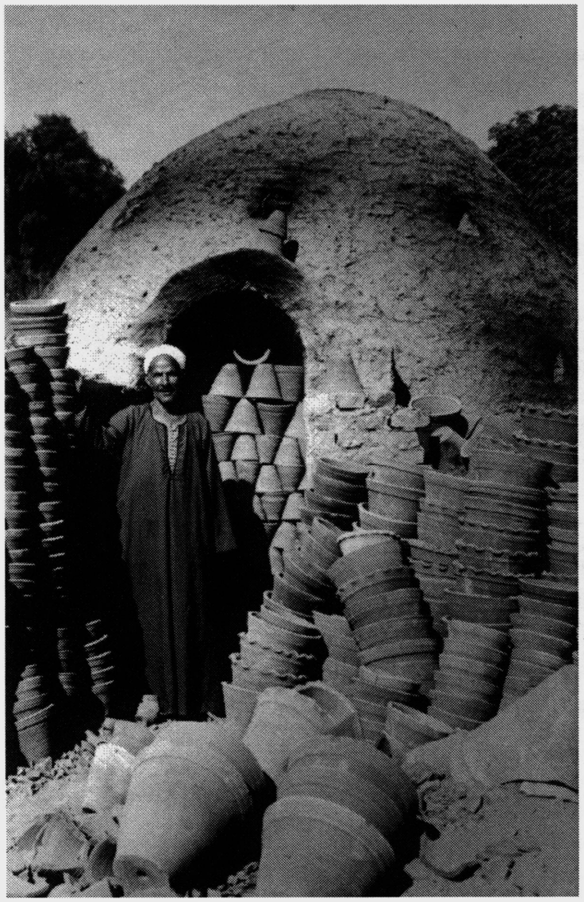


Plate 10.17 Front view of one of the kilns at El Qanatar workshop. Note permanent roof on kiln and flowerpots stacked inside ready for firing. Additional pots, with both plain and crenellated rims, are stacked outside the kiln.

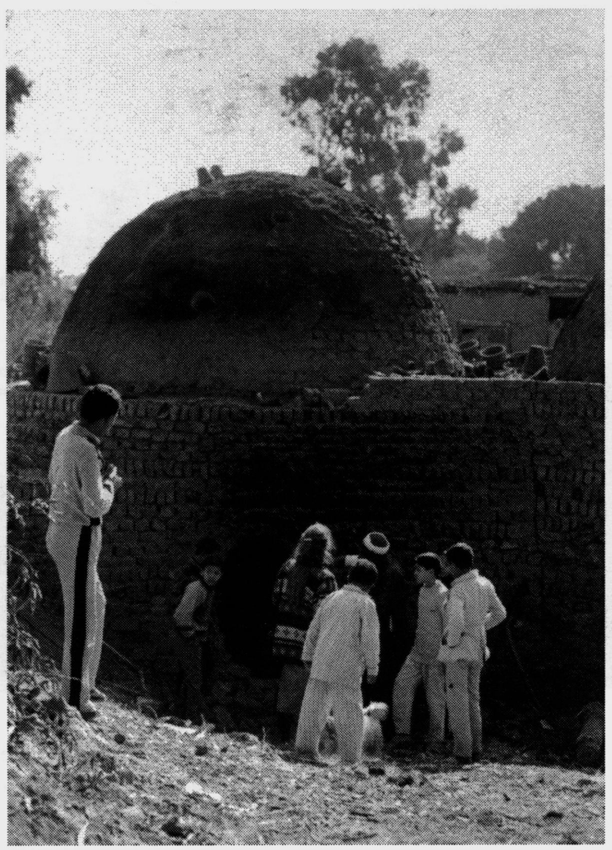


Plate 10.18 Back view of kiln at El Qanatar workshop; note the oval stokehole. A second kiln is just visible to the right.

Plate 10.19 View of potter's compound at Badrashein, with pots (*balata* baking griddles in foreground and *zīr* water jars—note white slip decoration—in background) and household laundry drying together in the open.

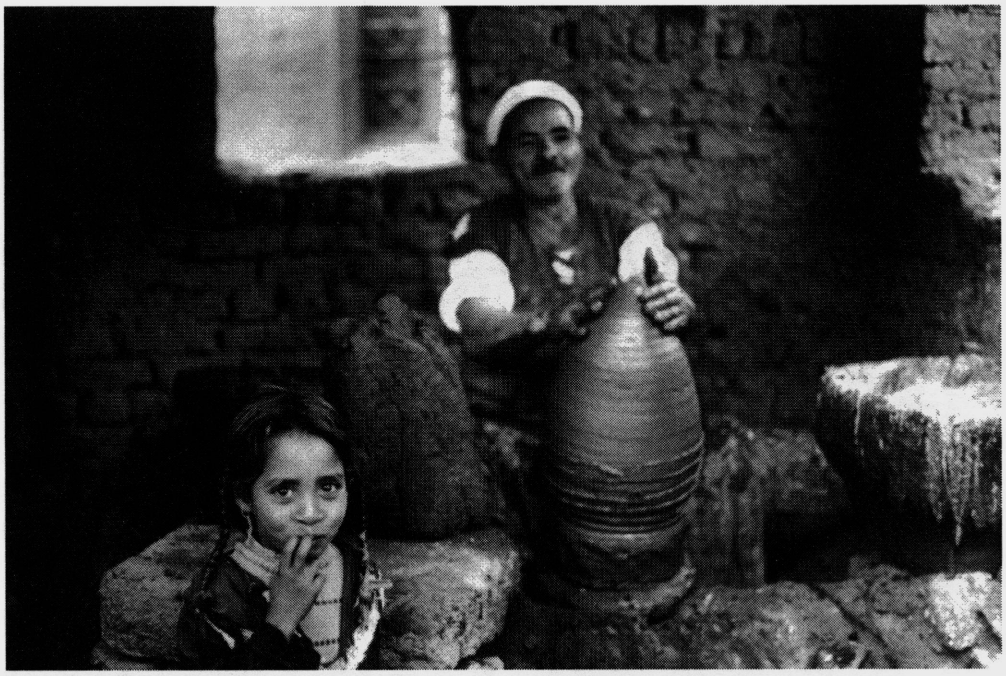


Plate 10.20 Badrashein potter throwing a pot on his kick-wheel.

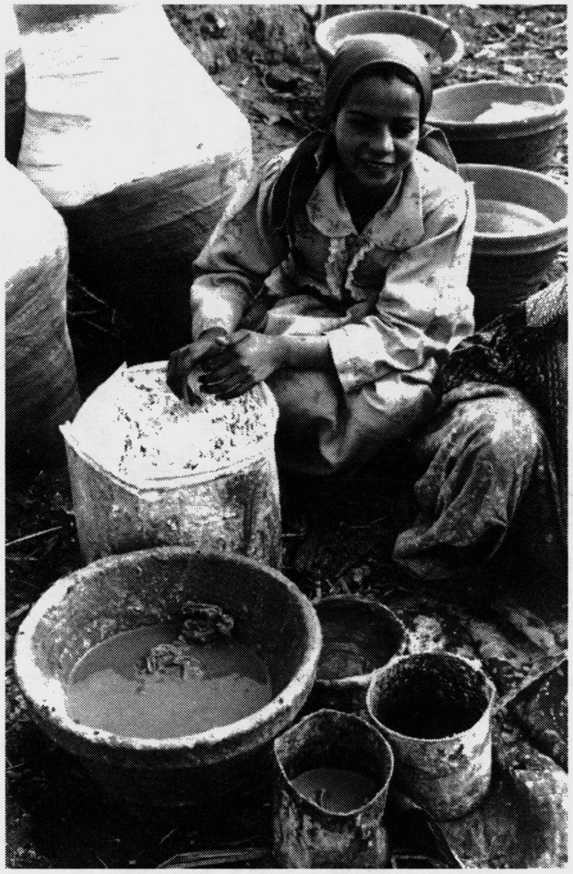


Plate 10.21 Applying post-firing wash to completed pots at Badrashein.

Plate 10.22 Empty Badrashein kiln; note lack of permanent top.

Abu Raguan

On the main road running south between Cairo and Beni Suef, slightly north of the Fayum and just south of the Abu Raguan turn-off, on the east side of road, was a small retail pottery stand, discussed below. The brother of the stand retailer operated a kick-wheel behind the stand. This potter produced a limited repertoire of ceramic forms, including the *zīr*, a milking bowl (*sahfa*), a bowl (*misa'a*) for feeding household birds (chickens, ducks, geese, pigeons) or other small animals, and the large, flat, circular griddle (*balata*) that forms the baking surface for the traditional clay bread ovens. Some of the finished pottery preserved cord impressions on the exterior. When asked about the cord marks, the potter told us that he wrapped cords around a completed but unfired pot in order to ascertain when the clay was appropriately dry for firing. While the pot was wet, the cords adhered. As the pot dried, it shrank, and when the pot shrank sufficiently the cords fell off, indicating the pot was ready for the kiln. The unfired vessels generally were left to dry in the open for one day.

The raw clay body was black in color but fired brown. According to the potter, the clay source was local canal dredgings, and the only temper added was leftover ash from the pottery firings. The potter fired his products in one small updraft kiln, located nearby, with a diameter of approximately 2 m or less. Fuel for the kiln consisted of reeds. The kiln, like that at Badrashein, did not have a permanent top.

B. Pottery Retailers

A series of pottery samples was purchased or collected from five sources representing four common types of retail outlets for traditional pottery: rural roadside stands; an informal urban street "shop"; an open stall (actually a series of mats spread over the ground) in a weekly potters' market; and an open stall in a provincial city market. In all cases the retailers were asked where the pottery was manufactured, the Arabic term(s) for the various pot forms, and the function(s) of the vessels.[23] Some of the vendors were observed applying additional washes, generally white, red, rose pink or some combination thereof, to chosen elements of their stock. Tables 10.1-3 list the sources for the various whole pots and sherds in the EMPP assemblage, including the ceramic forms obtained from each of the retailers.

Mahalla el-Kobra

A few kilometers south of Mahalla el-Kobra (henceforth Mahalla) in the central Delta, on the main road to Cairo, was a rural roadside pot vendor. His wares, comprising a relatively extensive range of forms, came dominantly from Samannûd, a major manufacturing center for both pottery and glass located not far from Mahalla. Only four items or groups of items stocked by this retailer came from elsewhere: a series of white pitchers and jugs (*abārī'* and *'olall*) from Cairo; the distinctive dark grey and black pots from the eastern Delta[24]; *ballās* jars from the Qena region in Upper Egypt; and a distinctive small casserole dish with a clear glaze on the interior (*berām*) that the dealer said came from Alexandria. All of these items or groups of items are widely available at least throughout the Delta and greater Cairo regions; some, such as the marl clay *balālīs* from the Qena area, are marketed throughout Egypt.[25]

The local Samannûd products for sale at the rural pottery stand near Mahalla included pigeon pots (*'adūs*[26]); bird or small animal feeders and waterers (*misa'a*, *taba'*); jars for housing baby animals; flowerpots (*'asārī*); small dishes or bowls for use under flowerpots; small and large *zīr* water jars; milk pots; medium-sized store jars for various commodities (*zarawiyya, megoza*); braziers (*manā'ed, bahūr*); waterpipe heads (*hağar*); and a variety of water jugs (*'olall, abāri, ba'oša, mašrabeyyāt*). A rapid visual assessment suggested that all or almost all of the Samannûd forms were wheelmade of Nile silt. The pottery was largely undecorated except for an occasional white slip design or wash and even more occasional incised decoration or clear glaze.

El Qanatar

Just in from the corniche at El Qanatar, near the barrages north of Cairo, was a pottery retail outlet operating out of an alley. Ceramic wares were piled against the fired-brick walls that formed the sides of the alley (plates 10.23, 24). This urban outlet was tended by a young man in his late teens or early twenties who informed us that he belonged to a family that manufactured pottery in the city of Minouf and that his goods came from three main sources: Minouf, Cairo, and Zagazig. In addition, he sold the marl clay *ballās* jars that came from the Qena region of Upper Egypt. With the exception of the white jugs distinctive to Cairo, he added, Minouf and Cairo produced the same range of products. His stock of black or dark grey pottery from Zagazig included several different forms, some ribbed, others not. The brown Nile silt wares from Minouf, the bulk of the inventory, included water jars (*azyār*); *balālīs*; milk pots of varying size, shape, and decoration (*šalya, hod*); waterpipe heads (*heğāra*); jugs (*'olall, abāri, ba'oša, mašrabeyyāt*); braziers (*manā'ed*); flowerpots (*'asāri*); and drums (*tabl*). Decoration of the pots was again restricted to occasional incised or white-slipped lines and designs, as well as the usual white, red, or pink washes. This retailer also stocked the same small casserole dish (*berām*) with glazed interior as the Mahalla vendor; however, the El Qanatar merchant indicated that the casseroles were made in Cairo by a family that came from Alexandria.

Abu Raguan

The brother of the Abu Raguan potter discussed above operated a small rural roadside pottery stand. In addition to his brother's products, this retailer sold a range of goods originating mostly in Samannûd, with the addition of the usual white jugs (*'olall* and *abrī'*) from Cairo, *balālīs* from Upper Egypt, and black wares from the eastern Delta. His inventory of available products was more or less the same as that of the Mahalla vendor; however the stock was neither as numerous nor as extensive as that of the Mahalla stand. For sale at Abu Raguan were jugs of various kinds and shapes (*'olall, abāri, ba'oša, mašrabeyyāt*); small and large *azyār*; braziers (*manā'ed, bahūr*); dishes for watering and feeding fowl (*tawāğen*); milk pots (*hōd*); and the large, heavy, round baking griddles (*balata*) belonging to the traditional bread ovens.

The Fayum

Once a week, potters of the Fayum region gather together in the provincial capital city of Medinet el-Fayum for the potters' market. This market takes place at a distance from the main market. Wares are generally laid out on mats in a large open area. We purchased several pots from a middle-aged woman who was busy applying the usual washes to her wares. Oddly, the woman was applying a rose wash to the inside of a marl clay *ballās* jar from the Qena region; these jars are generally not

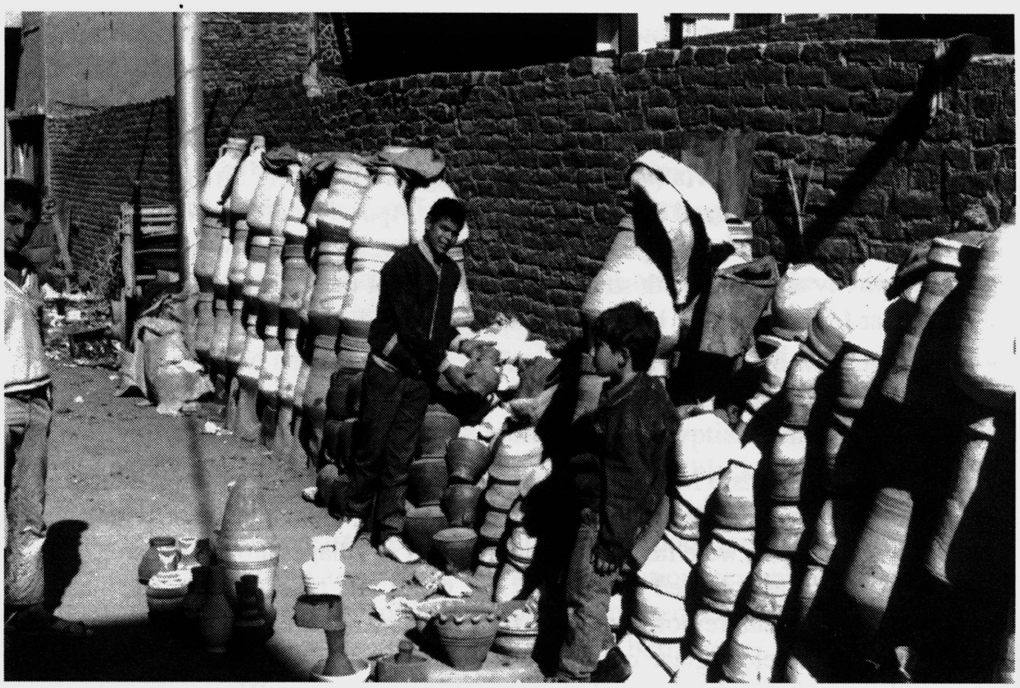


Plate 10.23 Young urban street vendor (center left) retailing pottery in El Qanatar; most of the stock was made by his family in Minouf. Note sampling of wares for sale in left foreground.

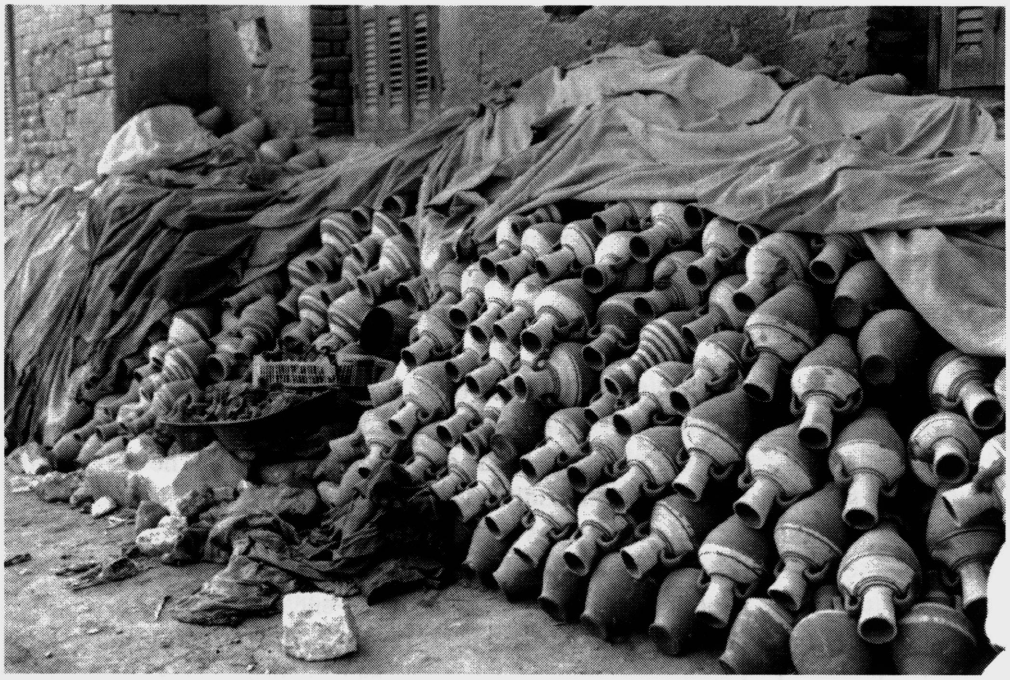


Plate 10.24 Ceramic stock of El-Qanatar retailer lining opposite side of alley shown in plate 10. 23. Pots shown are predominantly Nile silt water jugs (*ba'oša* or *mašrabeyyāt*) from Minouf.

given washes. Some of the forms had incised decoration. The woman's husband, the potter, shifted stock around as he listened to our questions. Occasionally he would answer, but for the most part he let his wife handle our transaction, particularly the business end of it. The vessels for sale included water jars (*azyār*); *balālīs*; globular pots (*bokla, hanāb*); bowls (*misa'a*) for feeding and watering birds or other small animals; and medium-sized bowls (*šalya, sahfa*). Apart from the *balālīs* from Upper Egypt, the products were all produced locally. Several of the forms were made of Nile silt heavily tempered with straw or chaff; some of these may be distinctive to the Fayum. Jar forms typically had a handmade body and a wheel-turned neck and rim; bowls were often handmade.

Minya

Within the main Minya market, a number of local potters plied their wares. According to the potters we spoke to, the local products, often handmade with a heavy straw or chaff temper, were fashioned from Nile silt in villages around the area. Decoration generally was confined to the usual red, white, and rose washes. The marl clay *balālīs* from the Qena region also were for sale, as were the small casserole dishes (*ebrema*) with the clear glaze on the interior. According to one of the Minya merchants, these casseroles were made in Daqahliyah province. We purchased several items from a middle-aged woman who handled retail transactions; our purchases included one of the glazed *berām* casseroles; a *qist* pitcher used for milking; a *taba'*, or small bowl or dish used to feed or water birds or other small animals or placed under flowerpots; a small *mağūr* bowl used for watering small animals or placed under plants; and a *sahfa* bowl with a pink wash on the exterior, used for making cheese or dough or watering birds.

C. Refuse Contexts

Pottery, dominantly broken, also was collected from assorted refuse contexts (see tables 10.2 and 10.3). In the end, accumulating refuse pottery was not a particularly satisfactory approach to studying modern Egyptian ceramics, since it was usually difficult or impossible to confirm provenience or date for the collected material. This tactic was useful, however, for pointing up changes in fabric and potentially form repertoires, especially the discontinuation of particular wares or pots. In the future, this method will be used selectively to seek fabrics and forms no longer manufactured.

Discarded ceramics, mostly broken but occasionally whole, were gathered from apartment roofs and balconies, along walkways at the edge of the Nile and along railroad tracks, and at the sides of rural roads or urban street curbs. The bulk of this pottery consisted of flowerpots. In addition, a considerable amount and variety of material was gathered from the remains of a modern Bedouin encampment encountered fortuitously in the Sinai peninsula. Table 10.3 provides a list of the sherd material discussed in this paper that was recovered from this encampment.

A stone's throw from the Mediterranean sea, just north of El 'Arish, a hotel complex lies perched atop a very large sand dune. This dune slopes downward towards the shore of the Mediterranean Sea. Dispersed along the dune flanks and in a small hollow in the dune were the remnants of a small Bedouin camp. Most of the camp debris was concentrated in the hollow.[27] Along with sherds, the area was carpeted with sheep/goat droppings, miscellaneous broken rubber bits, shoe soles, tops of aerosol cans, bits of plastic, broken pieces of small china tea cups, an occasional glass medicine bottle, *tabūn* fragments from one or more of the traditional Levantine bread ovens, Israeli bullet casings, and a one-*agorôt* Israeli coin. The upper reaches of the sand dune, in back of the campsite and farther away from the sea, were under cultivation by the hotel. Plants in flowerpots had been arranged in more or less semicircular furrows in a sort of terracing that extended down the dune from its crest. It is likely that many if not all of the flowerpot samples collected at the Bedouin camp originally belonged to similar hotel cultivation.

The scattered and thoroughly broken ceramics associated with the Bedouin camp appeared to consist partly of characteristic modern Egyptian forms and fabrics, and partly of anomalous material. The more typical Egyptian items included remnants of white *'olall*, Nile silt flowerpots (*'asāri*), and the black and dark grey wares of the eastern Delta, especially cookpots and *abrī'* pitchers. Anomalous articles, which were in the majority, consisted of bowls, jugs, flowerpots, jars, and possibly other forms manufactured from a variety of fabrics. In addition, several pieces of coarse, handmade cookpots were found, often with a heavy grog temper. Most of these cookpot sherds showed signs of pre-depositional smoking or burning.

Discussion

Results of the fieldwork described above, along with additional discussions with potters and pottery retailers in Egypt, indicate that local and regional traditions have a significant impact on ceramic production techniques and output, and that several different types of manufacturing units and production organization currently exist in Egypt. These findings are not particularly surprising, and it is likely that the situation in ancient times was analogous. Provisional analysis of the EMPP pottery suggests that the major regional divisions for modern ceramic production comprise the Oases, the Fayum, the Delta, the Cairo (capital) region, and Upper Egypt. Whether Middle Egypt has a regional tradition of its own or whether it should be incorporated within the broader region of Upper Egypt remains to be determined. Each of these broad pottery provinces typically has one or more local sub-units, each with its own distinctive ceramic conventions.

The pottery reviewed here comes dominantly from the Delta and the greater Cairo regions. By combining the findings of this study with the discussion of twenty-seven Delta pots collected by Henein (1992a, nos. 1-27), it is possible to begin to characterize modern Nile Delta ceramic traditions. Delta pottery evidently is primarily manufactured by wheel from Nile silt generally obtained from field leveling operations, local construction activities, or canal dredgings. Ash and some form of calcium carbonate are the dominant tempers. Chaff or straw temper occurs rarely. Pre-firing decoration, where present, generally consists of a white slip or, uncommonly, a glaze. Occasionally incised or rouletted decoration is used. Post-firing decoration, which may be added at the production location or point of sale or both, typically consists of white (from *ğibs*), red (from ocher), or rose (from a combination of *ğibs* and ocher) washes.[28]

The distinctive Nile silt black or dark grey wares from the eastern Delta constitute an important local tradition within the larger Delta ceramic province. Many of the forms are ribbed, an uncommon surface treatment in modern Egyptian pottery.

TABLE 10.1 Sample Numbers and Collection Locations of Whole Pots

Sample Number	Figure Number	Arabic Name	Form	Collection Location	Manufacturing Location	Comments
W-1	Figure 10.10.6	*misa'a*	bowl	Mahalla retailer	Samannûd	bird feeder
W-3	Figure 10.10.5	*misa'a*	bowl	Mahalla retailer	Samannûd	bird feeder
W-6	Figure 10.10.1	?	bowl	Mahalla retailer	Samannûd	baby animal house
W-7	Figure 10.9.9	*haǧar*	pipehead	Mahalla retailer	Samannûd	pipehead
W-8	Figure 10.9.6	*haǧar*	pipehead	Mahalla retailer	Samannûd	pipehead
W-9	Figure 10.9.8	*haǧar*	pipehead	Mahalla retailer	Samannûd	pipehead
W-10	Figure 10.4.1	*ballās, balālīs*	jar	Mahalla retailer	Samannûd	storage/water transport
W-12	Figure 10.8.3	*'olla, mašrabeyya*	jug	Mahalla retailer	Samannûd	hold drinking water
W-13	Figure 10.6.4	*zarawiyya; megōza*	jar	Mahalla retailer	Samannûd	hold semna; storage
W-14	Figure 10.10.2	*'adūs*	jar	Mahalla retailer	Samannûd	pigeon house
W-16	Figure 10.10.9	?	bowl/dish	Mahalla retailer	Samannûd	flowerpot dish; fowl feeder?
W-17	Figure 10.11.2	?	bowl	Mahalla retailer	Samannûd	milk processor (curdling milk)
W-18	Figure 10.9.3	*berām*	casserole	Minya market	Alexandria?	cookpot
W-19	Figure 10.7.4	*qist*	pitcher	Minya market	Minya	milking
W-20	Figure 10.10.3	*taba'*	bowl	Minya market	Minya	water birds/small animals; under flowerpot
W-21	Figure 10.12.2	*māǧūr*	bowl	Minya market	Minya	bread dough; water small animals; under flowerpot
W-22	Figure 10.6.1	*sahfa*	bowl	Minya market	Minya	make cheese or dough; water birds/small animals
W-28	Figure 10.8.1	*ba'ōša; mašrabeyya*	jug	Abu Raguan retailer	Samannûd	hold drinking water
W-29	Figure 10.6.3	?	jar	Abu Raguan retailer	Abu Raguan	?
W-30	Figure 10.9.5	*man'ad, bahūr*	brazier	Abu Raguan retailer	Samannûd	brazier/censer
W-31	Figure 10.12.4	*tāǧen*	bowl	Abu Raguan retailer	Abu Raguan	watering birds
W-32	Figure 10.11.5	*hōd*	bowl	Abu Raguan retailer	Abu Raguan	for milk
W-39	Figure 10.8.6	*'olla*	jug	Mahalla retailer	Cairo	hold drinking water; whitish fabric
W-43	Figure 10.9.1	*abrī'*	pitcher	Maskhuta villager	Sharqiya?	pour water; black fabric
W-47	Figure 10.9.2	*būša*	cookpot	Qanatar retailer	Sharqiya	crockpot for beans; milk
W-50	Figure 10.8.5	*abrī'*	pitcher	Qanatar retailer	Cairo	pour water; whitish fabric
W-51	Figure 10.8.4	*'olla*	jug	Qanatar retailer	Cairo	hold drinking water; whitish fabric
W-52	Figure 10.3.2	*zīr*	jar	Qanatar retailer	Minouf	store drinking water
W-54	Figure 10.12.3	*šalya*	bowl	Qanatar retailer	Minouf	for milk; for covering *hōd*
W-55	Figure 10.11.1	*hōd*	bowl	Qanatar retailer	Minouf	store milk products
W-57	Figure 10.11.3	*berām*	bowl	Qanatar retailer	Minouf	watering birds
W-58	Figure 10.10.7	*misa'a*	bowl	Qanatar retailer	Minouf	feeding birds
W-59	Figure 10.10.10	*misa'a*	bowl	Qanatar retailer	Minouf	feeding birds
W-61	Figure 10.8.2	*'olla*	jug	Qanatar retailer	Minouf	hold drinking water
W-62	Figure 10.9.4	*tabla*	drum	Qanatar retailer	Minouf	child's toy; musical instrument
W-64	Figure 10.2.1	*zīr*	jar	Fayûm market	Fayûm	store drinking water
W-65	Figure 10.4.2	*ballās*	jar	Fayûm market	Qena	transport water; storage
W-66	Figure 10.7.1	*bokla*	jar	Fayûm market	Fayûm	holding drinking water
W-68	Figure 10.10.8	*misa'a*	bowl	Fayûm market	Fayûm	feeding and watering birds
W-69	Figure 10.7.3	*hanāb*	jar	Fayûm market	Fayûm	?
W-70	Figure 10.11.4	*šalya*	bowl	Fayûm market	Fayûm	for milk
W-71	Figure 10.7.2	*sahfa*	bowl	Fayûm market	Fayûm	watering birds
W-72	Figure 10.6.2	*ballās*	small jar	Giza	Cairo?	molasses jar
W-73	Figure 10.9.7	*haǧar*	pipehead	Qanatar retailer	Cairo	pipehead; black fabric
W-75	Figure 10.12.1	*māǧūr*	large bowl	Badrashein potter	Badrashein	making bread dough

TABLE 10.2 Numbers and Collection Locations of Sample Sherds Not from Sinai

Sample Number	Figure Number	Arabic Name	Form	Collection Location	Manufacturing Location	Comments
1.4	Figure 10.16.10	*ʿasreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.7	Figure 10.16.5	*ʿasreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.10	Figure 10.16.11	*ʿasreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.12	Figure 10.16.4	*ʿasreyya*	flowerpot	Minya	Minya?	flowerpot rim
2.1	Figure 10.16.22	*ʿasreyya*	flowerpot	Minya	Minya?	flowerpot base
4.1	Figure 10.15.10	?	jug?	Mahalla	Samannûd?	neck/shoulder; hold liquid; no sieve
5.1	Figure 10.16.13	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.4	Figure 10.16.14	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.5	Figure 10.16.20	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot base
5.6	Figure 10.16.7	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.9	Figure 10.16.3	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.10	Figure 10.16.16	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.13	Figure 10.16.21	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot base
5.15	Figure 10.16.6	*ʿasreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
7.12	Figure 10.16.15	*ʿasreyya*	flowerpot	Hurghada	?	flowerpot rim
9.3	Figure 10.15.20	*ʾolla?*	jug?	Gerzeh area	Gerzeh?	ring base; closed form; lt yellowish fabric
10.8	Figure 10.15.13	*ʾolla?*	jug?	Gerzeh area	Gerzeh?	neck, sieve; hold liquid; lt greenish fabric
10.35	Figure 10.16.2	*ʿasreyya*	flowerpot	Gerzeh area	Gerzeh?	flowerpot rim
11.2	Figure 10.5.2	*ballās*	jar	Gerzeh area	Gerzeh?	body; storage/transport; orange marl fabric
11.3	Figure 10.5.3	*ballās*	jar	Gerzeh area	Gerzeh?	body; storage/transport; orange marl fabric
11.6	Figure 10.5.1	*ballās*	jar	Gerzeh area	Gerzeh?	rim; storage/transport; orange marl fabric
11.9	Figure 10.14.4	*ballās*	jar	Gerzeh area	Gerzeh?	rim; storage/trasnport; orange marl fabric
14.2	Figure 10.12.5	?	large bowl	Abu Raguan	Abu Raguan	rim; ?
14.3	Figure 10.3.4	*zīr*	jar	Abu Raguan	Abu Raguan	rim; store drinking water
14.5	Figure 10.10.4	?	bowl	Abu Raguan	Abu Raguan?	rim; ?
14.6	Not drawn	*balata*	griddle, tray	Abu Raguan	Abu Raguan	baking surface in bread oven
14.9	Figure 10.3.3	*zīr*	jar	Abu Raguan	Abu Raguan	rim; store drinking water
15.1	Figure 10.16.12	*ʿasreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.2	Not drawn	*ʿasreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.3	Not drawn	*ʿasreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.4	Figure 10.16.8	*ʿasreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
16.1	Figure 10.3.1	*zīr*	large bowl	Badrashein potter	Badrashein	rim; make bread dough

This particular ceramic tradition, most likely derived from a "Gaza Ware" ancestry (Rosen and Goodfriend 1993, 143), is, as noted above, generally identified with either the town of Zagazig or the province of Sharqiya. Henein (1992a, 11-16, nos. 1-3, 5) illustrates black pots made in both Zagazig and Bilbeis. He also, however, discusses four additional black pots, all from Ashmûn Goreis in the province of Minoufia in the south central Delta, that were manufactured in the same manner as the Zagazig/Bilbeis examples (Henein 1992a, pp. 14-16, nos.7,9,12,13; note that no. 9 does not appear to be black or even dark-colored in the black and white photograph). The tradition thus appears to be fairly widespread in the eastern and central Delta. According to Henein (1992a, 11.1) the production technique for this dark grey and black ware may be summarized as follows. At the end of the firing process, the potter pours a bit of tar into the kiln. He then recovers the kiln with a supplementary layer of potsherds and earth and blocks up the stokehole in the same manner. A reducing atmosphere is thereby created inside the kiln that both blackens the pots and decreases their porosity.[1] Note that Henein's description of recovering the kiln indicates that the kiln type used in this process lacks a permanent top.

TABLE 10.3 Pottery from Sinai Bedouin Camp

Sample Number	Figure Number	Arabic Name	Form	Collection Location	Manufacturing Location	Comments
13.1	Figure 10.17.6	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.2	Figure 10.18.1	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.3	Figure 10.16.9	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.5	Figure 10.18.4	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.6	Figure 10.14.14	?	cookpot?	Sinai	?	cookpot rim, handmade
13.8	Figure 10.17.7	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.10	Figure 10.17.5	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.11	Figure 10.16.19	*ʿasreyya*	flowerpot	Sinai	Egypt?	flowerpot base
13.13	Figure 10.16.1	*ʿasreyya*	flowerpot	Sinai	Egypt?	flowerpot rim
13.14	Figure 10.16.18	*ʿasreyya*	flowerpot	Sinai	Egypt?	flowerpot base
13.17	Figure 10.14.5	?	jug?, bottle?	Sinai	?	rim, neck; hold liquids?
13.19	Figure 10.15.6	?	?	Sinai	?	handle, small to medium sized pot
13.21	Figure 10.17.1	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.22	Figure 10.14.11	?	cookpot	Sinai	?	cookpot rim; handmade
13.26	Figure 10.15.5	*abrī* ?	pitcher?	Sinai	?	handle; small to medium sized pot
13.27	Figure 10.15.8	*ʾolla*?	jug? bottle?	Sinai	?	neck; hold liquid?
13.28	Figure 10.15.14	*ʾolla*?	jug?	Sinai	?	neck; hold liquid?
13.30	Figure 10.17.3	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.31	Figure 10.14.15	?	cookpot	Sinai	?	cookpot rim, handmade
13.34	Figure 10.17.4	*ʿasreyya*	flowerpot	Sinai	Egypt?	flowerpot rim
13.37	Figure 10.15.18	*abrī* ?	pitcher?	Sinai	?	ring base; closed frm; blck fabric
13.38	Figure 10.14.10	?	jug?	Sinai	?	neck and shoulder; no sieve
13.39+103	Figure 10.14.7	?	jug?, bottle?	Sinai	?	rim and neck; ribbed, black fabric
13.40	Figure 10.14.2	*ballās*?	jar?	Sinai	?	rim
13.42	Figure 10.13.3	?	bowl	Sinai	?	rim; black fabric
13.47	Figure 10.15.3	*abrī* ?	pitcher?	Sinai	?	strap handle; black fabric
13.49	Figure 10.15.21	?	jar?	Sinai	?	omphalos base; closed frm; blck fabric
13.49A	Figure 10.14.1	*ballās*?	jar?	Sinai	?	rim
13.50	Figure 10.18.5	*ʿasreyya*	flowerpot	Sinai	Egypt?	flowerpot, complete profile
13.58	Figure 10.16.17	*ʿasreyya*	flowerpot	Sinai	?	flowerpot base
13.59	Figure 10.18.3	*ʿasreyya*?	flowerpot?	Sinai	?	ring base
13.60	Figure 10.18.6	*ʿasreyya*?	flowerpot?	Sinai	?	ring base
13.61	Figure 10.18.2	*ʿasreyya*?; *tabla*	flowerpot?, drum?	Sinai	?	flowerpot?, drum?
13.63	Figure 10.14.9	?	krater?, bowl?	Sinai	?	rim; open form
13.67	Figure 10.17.9	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.68	Figure 10.17.8	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.69	Figure 10.17.12	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.70+73	Figure 10.17.11	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.71	Figure 10.17.13	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.72	Figure 10.17.10	*ʿasreyya*	flowerpot	Sinai	?	flowerpot rim
13.75	Not drawn	*tabūn*	oven	Sinai	Sinai?	traditional bread oven fragment
13.77	Figure 10.15.7	?	jug??	Sinai	?	double-strand handle
13.80	Figure 10.15.9	?	jug??	Sinai	?	neck; hold liquid?
13.81	Figure 10.15.15	*ʾolla*?	jug?	Sinai	Egypt?	base; closed form
13.86	Figure 10.14.12	?	cookpot	Sinai	?	cookpot rim; handmade
13.87	Figure 10.14.13	?	cookpot	Sinai	?	cookpot rim/handle; handmade
13.88	Figure 10.14.8	?	bowl	Sinai	?	rim; open form
13.94	Figure 10.14.6	?	jug?, bottle?	Sinai	?	rim and/or neck
13.100	Figure 10.15.2	*abrī* ?	pitcher?	Sinai	?	strap handle; black fabric
13.106	Figure 10.15.4	*abrī* ?	pitcher?	Sinai	?	strap handle; black fabric
13.107	Figure 10.14.3	*ballās*?	jar?	Sinai	?	rim
13.109	Figure 10.15.1	*abrī* ?	pitcher?	Sinai	?	strap handle; black fabric
13.110	Figure 10.17.2	*ʿasreyya*	flowerpot	Sinai	?	flowerpot
13.111	Figure 10.13.5	?	bowl	Sinai	?	carinated bowl rim; black fabric
13.112	Figure 10.13.4	?	bowl	Sinai	?	carinated bowl rim; black fabric
13.115	Figure 10.13.1	?	bowl	Sinai	?	carinated bowl rim; black fabric
13.116	Figure 10.13.7	?	bowl?	Sinai	?	flat base; open form; black fabric
13.117	Figure 10.13.2	?	bowl	Sinai	?	carinated bowl rim; black fabric
13.118	Figure 10.15.16	*abrī* ?	pitcher?	Sinai	?	ring base; closed form; black fabric
13.119	Figure 10.15.19	*abrī* ?	pitcher?	Sinai	?	ring base; closed form; black fabric
13.121	Figure 10.15.17	*abrī* ?	pitcher?	Sinai	?	ring base; closed form; black fabric
13.122	Figure 10.13.6	?	bowl?	Sinai	?	ring base; open form; black fabric
13.200	Figure 10.15.12	*ʾolla*?	jug?	Sinai	Egypt?	body; whitish fabric
13.204	Figure 10.15.11	*ʾolla*?	jug?	Sinai	Egypt?	body; whitish fabric

Preliminary characterizations may also be suggested for ceramic manufacturing traditions in the greater Cairo region. Again the pottery is dominantly wheel-made, but a greater variety of clay types and combinations is employed. Along with Nile silt, one or more calcareous desert clays from the Helwan area often are used. Additional clays also are imported from Aswan; these Aswani clays may be used individually or in combination with any of the other clays available to the potter. Individual workshops do not seem to specialize in particular clays; rather, they typically work with all of the available raw materials. One of the best known products of the Cairo workshops is a distinctive whitish or cream-colored *'olla* drinking jug, generally manufactured from a mixture of calcareous desert clay, Nile silt, and ash. These *'olall* are in fierce competition with the perhaps even better known and similarly colored *'olall* manufactured in Qena in Upper Egypt. The Cairo potters say that after several weeks of use an *'olall* from Qena will no longer be porous, whereas one from Cairo will last for years and years and the water in it always will remain sweet. At the town of Ballas near Qena, it is said that an *'olla* from Qena keeps water tasting better because Cairo soil is "salty" (Matson 1974, 133).

Only cursory, suggestive comments may be offered at this point regarding production traditions in other major ceramic provinces. Upper Egypt and the oases seem to have their own very strong regional traditions. Handmade pottery, talc temper or a heavy chaff temper (Henein 1992a, 25-42, nos. 28-55), and burnishing, all rare at best in the Delta, seem to be components of Upper Egyptian Nile silt ceramic customs. The distinctive marl clay *ballās* jars that are marketed throughout Egypt apparently represent a local production tradition in Upper Egypt (Lacovara 1985; Nicholson and Patterson 1985a,b; 1992), as do the *'olall* manufactured in Qena, also of a marl clay.[30] Other, less specialized Upper Egyptian ceramic traditions belonging to the Luxor region are discussed by Brissaud (1982).[31]

The Fayum also appears to have its own pottery traditions. The source clays are dominantly Nile silts; many derived from the Bahr Yusuf. A heavy straw or chaff temper is common. Here, too, there is a strong handmade component to the pottery, and a number of pots have handmade bodies and wheel-turned rims and necks. One common manufacturing technique proceeds as follows (Henein 1992a, 45.56; all eight of the Fayum pots he illustrates are made in this way). The potter excavates a hemispherical hollow in the ground and places in this cavity a disc of clay mixed with straw. He then beats the clay and straw mixture with a large terracotta pebble, turning it as needed, so that the clay spreads out and thins against the sides of the hole and gradually takes on the rounded contours of the cavity. After shaping the pot from the inside in this manner, the potter next removes the vessel from the ground and permits it to dry. The partly completed vessel is then paddled with a piece of curved wood, such as part of a round sieve frame, and allowed to dry again. During this second drying period the vessel becomes stronger. Finally, the pot is placed on the wheel and the potter joins a coil of clay to the unfinished vessel opening. He then wheel-forms the neck and rim of the pot from the clay coil. Henein suggests that this manufacturing technique may result from the poor plasticity of the local clay. He further notes that all the forms produced in the Fayum start off with a round bottom.[32]

Pottery production units operating in Egypt today may be ranked provisionally by a combination of size, type and amount of output, and proximity to other production units. Most of the units seem to operate year round.[33] Peacock's (1982, 8-51) production classification system provides a useful general framework for reviewing the Egyptian production units. Peacock identifies eight modes of ceramic production that he discusses in hierarchical order from simple to complex: 1) household production; 2) household industry; 3) individual workshops; 4) nucleated workshops; 5) the manufactory; 6) the factory; 7) estate production; and 8) military and other official production. All but one of the Egyptian producers discussed here fall into Peacock's workshop classification mode of ceramic production. The exception is the government workshop producing flowerpots: this would be categorized in Peacock's system as "production by official organizations." By definition, workshop potters derive their main livelihood from their craft. The pottery workshops themselves may be individual or nucleated.

The first, smallest type of production unit in Egypt today is typically rural. It consists of the individual potter who, largely in isolation from other potters, produces a limited number of a restricted repertoire of vessels. The Abu Raguan workshop represents this level of production, as does the Deir Mawas potter investigated by Nicholson (1995) and the Mari Girgis potter studied by Henein.[34]

The second, middle tier of Egyptian pottery production organization comprises either a) comparatively small, single workshops that employ more than one professional potter and are not located near other workshops or potters; or b) small groups of individual potters who live in proximity to each other and form a limited production enclave. The former, which do not appear to be common, may in theory be owned privately or by the government. If under private ownership such workshops would likely fall into Peacock's estate production category; if government owned they would belong to Peacock's category of production by an official organization. The El Qanatar government flowerpot workshop and the Badrashein potter, who was one of a small compound of potters, represent this second production tier.[35] In general, the middle tier of pottery production seems to specialize in the manufacture either of particular forms (such as flowerpots) or of a limited number of items that cater to local demand. As was the case with the individual potters, small enclaves of potters seem to concentrate on fabricating specific common forms, such as the bread oven baking trays (*balata*), the *mağūr* bowls and the *zīr* water jars. These items are often large, heavy, unwieldy, and easily broken, and there is thus a clear advantage to producing them relatively close to their point of sale and use.

Lastly, at the top of the hierarchy for traditional pottery production in Egypt, are the major manufacturing centers such as Samannûd, Minouf, the Zagazig region, Cairo, the Fayum, Dakhla Oasis, and the Qena region. These centers, which may have rural or urban hubs, produce abundant quantities of pottery that are typically marketed over considerable distances, sometimes much or all of the country. They generally produce either a wide range of pottery forms (e.g., Samannûd, Minouf) or, alternatively, specialize in and are widely known for a limited number of distinctive items (e.g., *ballās* jars and *'olla* jugs from the Qena region; or the black wares manufactured in the Zagazig region). These manufacturing centers, however, are not large, monolithic entities. Rather, they are composed of agglomerations of numerous and often related groups of small workshops and may be classified with Peacock's nucleated industries. Peacock (1982, 9, 38-43) distinguishes between rural and urban nucleated industries and notes that urban industries characteristically produce a wide variety of pottery types whereas rural centers often produce more specialized wares. Preliminary analysis suggests that this division does in fact hold true for modern traditional ceramic production in Egypt.[36]

3. Sample Corpus

The sample corpus of modern traditional Egyptian pottery evaluated during the EMPP's pilot phase totalled 76 whole pots and 296 broken vessels or sherds. A variety of ceramic forms and fabrics is represented in this corpus. As noted above, collection of material was confined to selected geographic areas, mostly Sinai, the Delta, the Fayum, and the northern Nile valley. Of the 372 ceramic samples, a total of 165, comprising both whole vessels and potsherds, was given an extended processing treatment in Cairo. This included macroscopic and microscopic fabric examination as well as the drawing and photographing of each sample and the completion of a detailed evaluation form for all items. One part of this evaluation sheet recorded data concerning vessel type, condition, general appearance, and observable indications of manufacturing technique. The remainder dealt with fabric characteristics and inclusions seen by the naked eye or observed under a binocular microscope at a power of 20. In the following account, 141 of these pilot phase EMPP pottery samples are discussed (tables 10.1-3), 138 of which are illustrated (figs. 10.2-18; complete descriptions are found in appendix 10.C).[37]

Ceramic Forms

A considerably more restricted variety of ceramic shapes and forms occurs in Egypt today than was the case in antiquity. The pottery repertoire seems to have shrunk steadily over time, most notably in the recent past. Until relatively recently, most Egyptians would have possessed kitchen, dining, and food storage wares made predominantly, if not exclusively, of fired clay. An extensive range of ceramic vessel types and qualities, generally reflected in the archaeological record, resulted from a vigorous demand. Today, however, even basic utilitarian forms and shapes are sharply reduced in diversity and number as a result of the marked decrease in ceramic utilization. Traditionally made Egyptian pottery available today is almost exclusively pedestrian and carelessly manufactured, and confined in use to fundamental domestic tasks.[38] The number of traditional potters working in Egypt also has declined, as ceramic production in general has fallen victim to an increasingly technological era in which plastic, metal, and glass have become or are becoming paramount.

Nevertheless, given the rural character of much of Egypt's society, and the usefulness, inexpensiveness, and easy availability of household pottery, it appears unlikely that the craft will die out completely any time soon. Indeed, the recent monograph by Henein (1992a) suggests that the industry as a whole remains widespread and productive and that considerable local variation in output and manufacturing technique still exists. The greatest use of pottery occurs in rural settings where ceramic vessels are still widely employed for household functions such as transporting and storing water, animal watering and feeding, milking, and particular aspects of food preparation, storage, and cooking.

Figures 10.2 to 18 illustrate the range of pot forms collected during the EMPP's pilot phase. The figure descriptions (appendix 10.C) provide a variety of data about the individual pots, including the field number, place of production (where known), point of purchase or collection, manufacturing technique, and Munsell Soil Color Chart (1973) readings, where relevant, for the vessel's exterior surface, interior surface, fabric, core, and decoration. Information is given also on the type of fabric (known or surmised), as well as the extent and type of fabric core. The general English language designation for the form is recorded, followed by any Arabic terms provided by informants in the field. Other pertinent data are noted in the comments section.

The discussion of the vessels below is organized according to simple and generic form categories such as jar, bowl, cookpot, and so forth.[39] This arrangement provides the most straightforward method of analysis for the purposes of this study, and also has the advantage of easy comparability with most archaeological form typologies used in Egypt and the Near East. Function as a classification criterion for these modern pots is more problematic, since, for the most part, considerable flexibility in use patterns appears to be the norm. Confusing matters further, a certain elasticity of nomenclature, sometimes cutting across primary form and function categories, also characterizes the vessels. Thus, the same basic pot may be used differently or called different things in various areas of the country; conversely, dissimilar pots may be used for identical purposes or the same term may be used for vessels of widely different shape and function. Clearly, it would be unwise to adopt too rigid a typological framework in dealing with this pottery assemblage. Unless otherwise indicated, the pots under discussion are all manufactured from the ubiquitous brown to red firing Nile silt.

JARS

Ceramic jars continue to be manufactured in Egypt today in widely assorted sizes and shapes, although the diversity of form and size is far less than that found in antiquity. Jars are used for long-term and short-term storage, transport, and occasionally for the sale of various liquid, solid, or viscous commodities, mainly foodstuffs. The term storejar generally refers to vessels at the larger end of the size scale.

One of the most ubiquitous jars presently found in Egypt is the *zīr*, plural *azyār*, illustrated in figures 10.2 and 3 (see also Henein 1988, pl. 57a; and Henein 1992a, 18.18A, 35.42, 71). The *zīr* is a large, coarse vessel used to store drinking water for human consumption. It is produced locally all over the country. Nile silt is the fabric of choice for this form, as the porous silt promotes cooling of the water. There are numerous regional variations in *zīr* shape, but all are large and deep, with a pointed or rounded bottom and a wide mouth. The EMPP samples come from the Fayum (fig. 10.2, which has a rose-colored wash over the interior except for the bottom tip), Badrashein (fig. 10.3.1), Minouf (fig. 10.3.2) and Abu Raguan (fig. 10.3.3,4). *Azyār* as a group seem to be dominantly coil built on the wheel (Henein 1992a, 18.18; Matson 1974, 133; Blackman 1968, 138). Simple incised or combed decoration at or above the carination or just below the rim is fairly common, as is painted or slipped decoration applied to the upper portion of the jar prior to firing. Because of the base shapes, the completed vessels must be supported in order to stand upright; supports are made from a variety of materials. Iron rings and stands, ceramic pedestals, and clay block cabinets with appropriately sized hole(s) are particularly common as *zīr* supports. Originally the *zīr* was used to filter drinking water, and a bowl or basin was placed underneath the jar to collect the filtered water (see Henein 1992a, 18.18A,B). More than twenty years ago, however, *zīr* use changed. Households ceased to use the vessel to filter their drinking water, although they continued to store and cool drinking water in the *zīr* (Linda Oldham, personal communication). A flowerpot saucer is placed sometimes under the *zīr* today to catch seepage, but this filtered water is used for animal rather than human consumption. In order to inhibit seepage, all or part of the *zīr* is sometimes now coated with a slip or wash (e.g., fig. 10.2[40]).

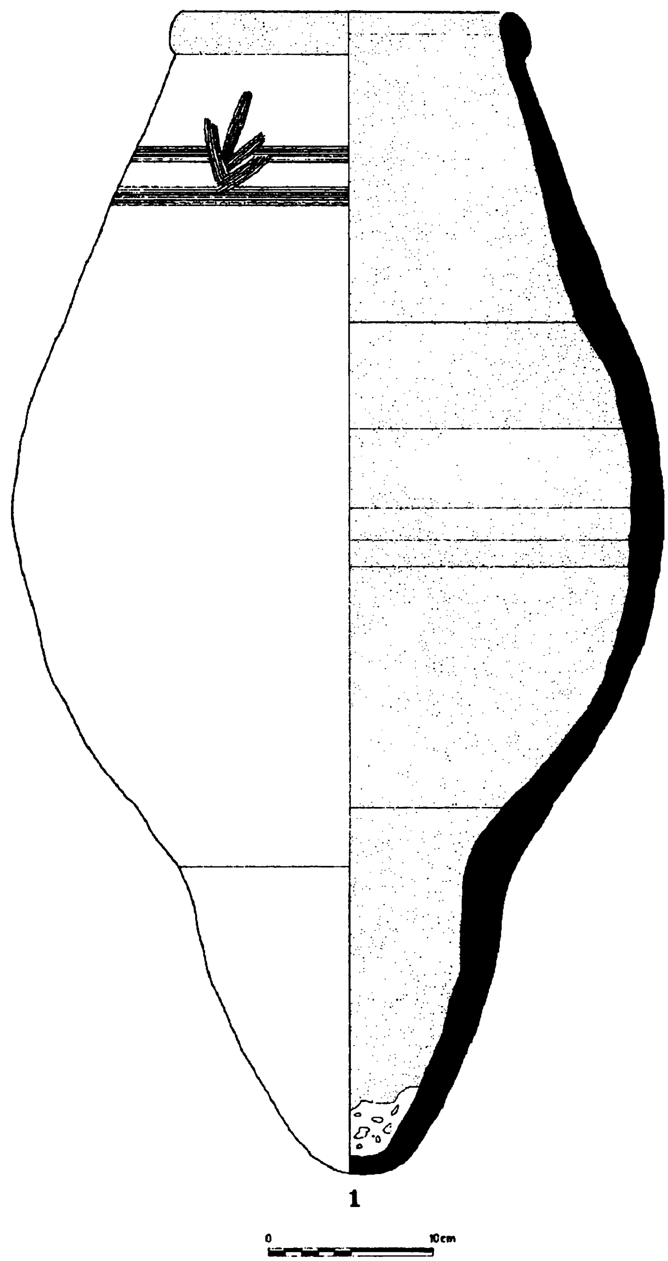


Figure 10.2 *Zīr* water jar from the Fayum.

The Abu Raguan potter who produced the jar illustrated in figure 10.6.3 called it a small *zīr*. The decoration, created by a white slip or paint applied prior to firing, consisted of horizontal bands, wavy lines, and large blobs. According to the potter, the jar type is used for storing water.

Figures 10.4, 10.5, and 10.14.4 represent several *ballās* (plural *balālīs*) jars (see also Henein 1992a, 37.43, 78.43). It also is possible that the sherds depicted in figures 10.14.1,2,3 belong to the same type of jar. The amphora-like *ballās* jar has a long history and is mentioned by name and illustrated in the account of the French

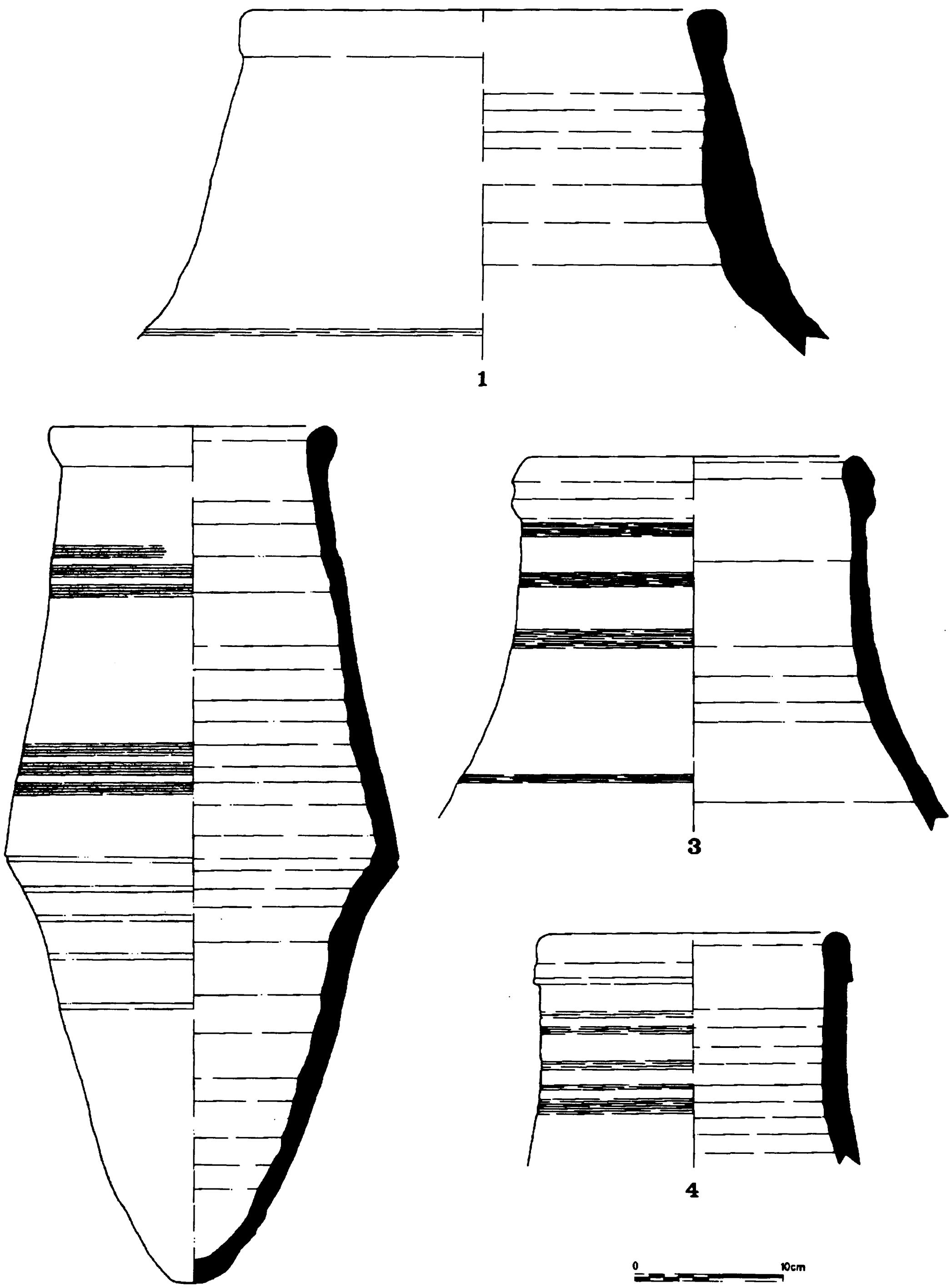


Figure 10.3 *Zīr* water jars: 1. From Badrashein; 2. From Minouf; 3-4. From Abu Raguan

Expedition's work in Egypt at the turn of the eighteenth century, the *Description de l'Égypte* (1824, 204). The relevant passages in the *Description* record that the *ballās* jar has a specific form, that it is highly fired, that it is made principally in a village from which the vessel takes its name, and that it is used as a container for oil and clarified butter. The jar depicted in the *Description* (1994, 734, E.M. vol. II, pl. EE.21) bears a close resemblance to the one illustrated in figure 10.4.2. This latter pot comes from the Qena region of Upper Egypt, either from the village of Ballas for which the jar is named, or possibly from another nearby village that also produces the distinctive jars.[41]

The *ballās* jar has two handles, a rounded, convex base, and a bottom-heavy, baggy profile with the widest part of the jar close to the base. It is found today in a range of sizes and seems to have a variety of uses, although its best known and most common functions are for the transport and short-term storage of water. The *ballās* also may be used in the house for making or storing or aging cheese, or for storing grain or *gibna adīma* (old cheese) or other food commodities, most often on the roof. In a molasses factory, *balālīs* might be used as molasses containers. Once their fabric has worn through, the smaller *balālīs* may be used as pigeon nests or birthing places for rabbits.

The Upper Egyptian *balālīs*, such as the example shown in figure 10.4.2, are the type jars for the form. They are made out of marl clays found in the hills of the western desert near the villages that manufacture the jars. These clays appear to have been known and exploited also in antiquity. Marl clays are found in the hills throughout this area, however, not just in the vicinity of Ballas; collectively but somewhat inaccurately all the clay sources of the region are often referred to as *ballās* clays[42] (Nicholson and Patterson 1992, 25).

Figure 10.4.1 is a Nile silt imitation, from Samannûd, of the Upper Egyptian marl clay *ballās* jar. Such imitations in locally available fabrics, especially the ubiquitous Nile silt, are common (see also Henein 1992a, 16.14). Figures 10.5.1-3 and 10.14.4 depict *balālīs* fragments, collected from a roadside near Gerzeh in Middle Egypt, that were manufactured from a distinctive orange marl clay. This is the only occurrence in the EMPP sample assemblage of this clay type. The rim profiles illustrated in figure 10.14.1-3, although somewhat smaller, resemble those of the *balālīs*. The black and dark grey fabrics of these three vessels, however, would be unusual for the form. If not *balālīs*, the vessels were perhaps jugs or another type of jar.

Figure 10.6.2 is a small jar commonly used for selling *'asal iswid* (molasses). This particular specimen was purchased in Giza; identical jars were part of the Old Cairo potter's output. The form is called a *ballās* or small *ballās* throughout the country.

The *zarawiyya*, or *semna* (clarified butter) pot (fig. 10.6.4),[43] is a special kind of storejar that may be handed down from generation to generation. This particular pot was manufactured in Samannûd. The entire vessel interior and the upper half of the exterior is coated with a clear glaze containing greenish streaks;[44] the glaze is intended to prevent moisture from getting inside the pot. The *zarawiyya* is used to transport and store *gibna adīma* (old cheese) or other special items, or to store miscellaneous foodstuffs, such as *semna*, for lengthy time periods.

Figure 10.7.1 illustrates a *bokla* (plural *baklāyāt* or *bokal*) from the Fayum. This figure shows the round-bottomed globular jar with no handles, but it can also be made with handles (Henein 1992a, 47.62). According to Henein, very large versions of the form may have three or even four handles, which permit more than one person to lift the full jar (ibid.). The body is handmade, but the neck and rim are wheel-turned. The fabric has a very heavy chaff or straw temper. The primary use of the *bokla* is to cool water, although it also is employed for transporting water. Sometimes

Figure 10.4 Ballās jars: 1. Imitation *ballās* jar of Nile silt from Samannûd in the Delta; 2. *Ballās* jar of marl clay from Qena region of Upper Egypt.

women carry it on their heads; other times men take *bokal* of water to the fields with them. The *bokla* also is used to cool water in the house (Linda Oldham, personal communication).

The *hanāb* (plural *ehneba*) shown in figure 10.7.2 comes from the Fayum. It is another globular jar with a very heavy chaff or straw temper. As with the *bokla*, the body is handmade but the neck and rim are wheel-turned. The form has no handles and a rounded profile with a rounded bottom. One of the main uses of the *hanāb* is for milking: the farmer places it between his or her knees to receive the jets of milk spewing from the teats of the cow (Henein 1992a, 45.56). According to Henein (ibid., 46.59) the form also may be called a *berām* (plural *ebrema*) and be used as a container for pickled peppers, salted beans, and so forth.

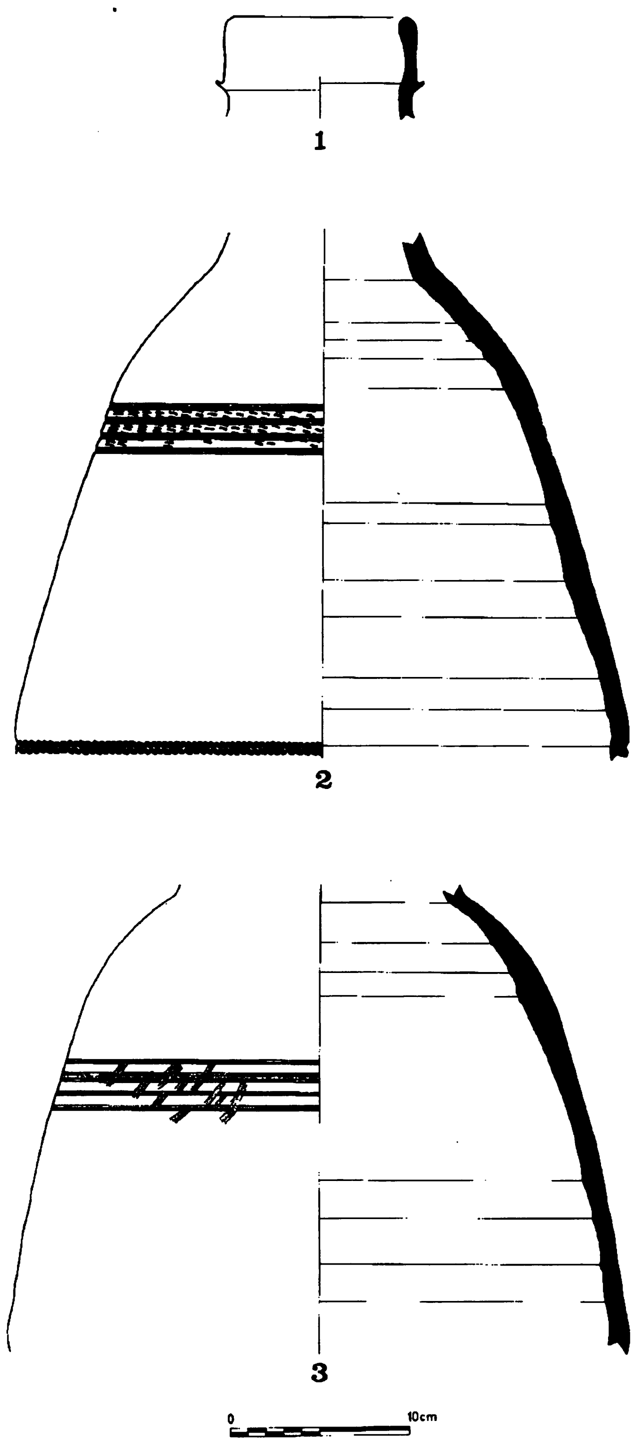


Figure 10.5 Ballās jar pieces of orange marl clay collected in the Gerzeh area: 1. Rim; 2-3. Neck, shoulder, and body. Note incised decoration on body, 2 and 3, and rope impressions on 2.

JUGS/PITCHERS

Pitchers or jugs are used for holding and pouring liquids or semi-liquids and generally have narrow necks and limited rim diameters. Pitchers normally have a spout on the body or shoulder of the vessel or a spouted lip on the vessel rim, as well as one or more handles. Jugs may or may not have handles and have neither a spout nor a spouted lip. Many of the modern Egyptian jugs have a coarse ceramic filter or strainer at the base of the neck. This is designed to keep insects, other large foreign particles,

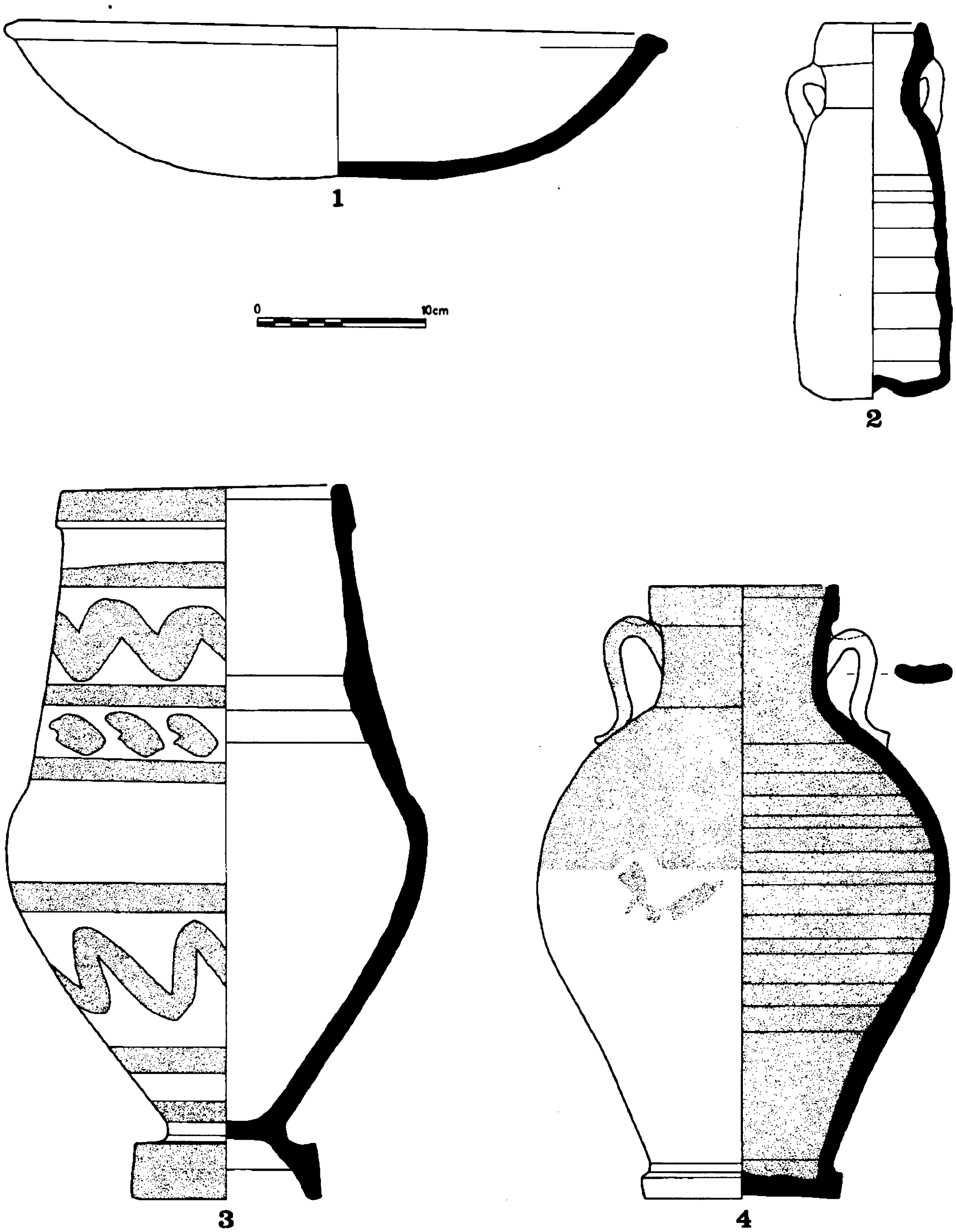


Figure 10.6 1. *Sahfa* bowl from Minya; 2. Molasses jar purchased at Giza; 3. "Small *zīr*" from Abu Raguan; 4. *Zarawiyya semna* jar from Samannûd.

and scorpions out of the body of the vessel (Golvin, Thiriot, and Zakariya 1992, 28). Figures 10.7.4, 10.8.1-6, and 10.9.1 illustrate various pitcher and jug forms.

The *qist* shown on figure 10.7.4 was manufactured in Minya; the vessel is used for milking animals.[45] Except for the inturned rim and the spout on the lip, the pot has the same basic globular shape as the *bokla* and *hanāb* from the Fayum (fig. 10.7.1,2). Like those two vessels, this *qist* has a heavy chaff or straw temper and a handmade body with a wheel-turned rim and neck. There is also a thin, deep red wash on the exterior of the vessel and the interior of the rim.

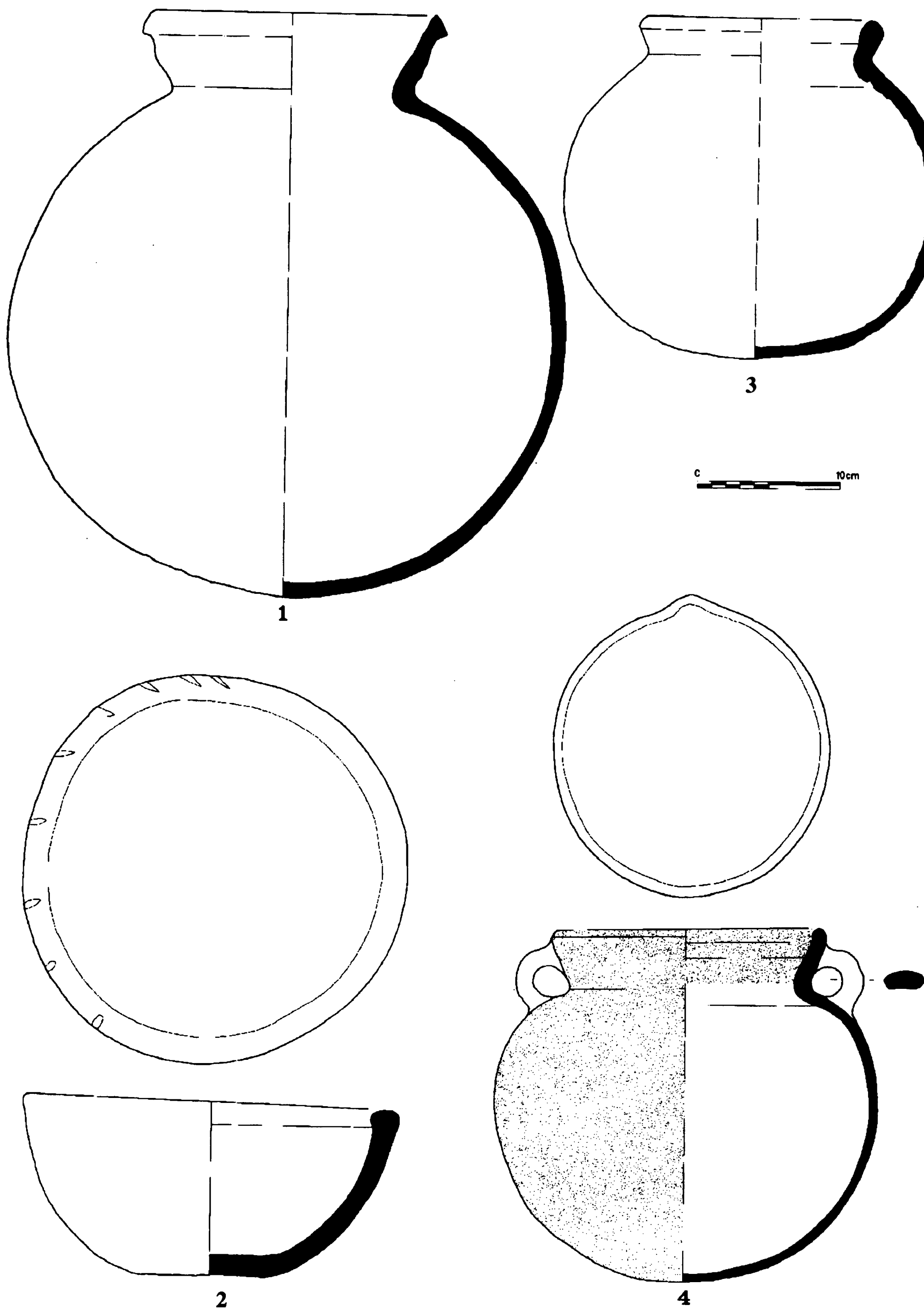


Figure 10.7 1. *Bokla* jar from Fayum; 2. *Hanāb* jar from the Fayum; 3. *Sahfa* jar from the Fayum; 4. *Qist* pitcher from Minya.

Another very widely used ceramic form in Egypt today is the *'olla*, plural *'olall*.[46] The examples illustrated in figure 10.8.2-4,6 (see also Henein 1992a, 12.4, 51.65A, 73.4,65) were manufactured and purchased in different places. Figure 10.8.2 was made in Minouf and bought from the El Qanatar retailer; figure 10.8.3 was acquired from the Mahalla merchant and manufactured in Samannûd; figure 10.8.4,6 were both produced in Cairo but the former was bought at the El Qanatar retail outlet and the latter at the Mahalla roadside stand. *'Olall* come in a number of different subtypes,[47] but all are handleless, all have a comparatively long, narrow neck so they may be grasped easily by hand, and most have a coarse filter at the inside base of the neck. *'Olall* are used to hold and, because of their porosity, cool drinking water, which is drunk most often directly from the jug.

The *ba'oša* shown in figure 10.8.1 represents another jug form, generally slightly larger and with a wider and shorter neck and a wider body diameter (usually with its widest point more or less midway down the body) than the *'olla*. This example comes from Samannûd. Two small handles connect neck and shoulder; the inside base of the neck has a strainer. Henein (1992a, 15.10, 20.21-22, 73.10,21,22) calls this form a *mašrabeyya*, plural *mašrabeyyāt*.[48] Like the *'olla*, the *ba'oša/mašrabeyya* is used to hold and cool drinking water and as a drinking vessel. This particular jug form may not be part of the ceramic repertoire in Sharqiya governorate (Linda Oldham, personal communication).

The *abrī'*, plural *abāri'*, is a common pitcher form with one or two handles and a spout extending upwards from the shoulder.[49] Two examples are illustrated here, figures 10.8.5 and 10.9.1 (see also Golvin, Thiriot, and Zakariya 1982, 29, figs 20.d,j,k; and Henein 1992a, 12.2, 72.2, with variations shown in 45.57, 47.61, 57.77, and 72.77, 73.57,61). Figure 10.8.5 is very light, almost white, in color and was made in Cairo and purchased from the El Qanatar retailer. Figure 10.9.1, black and with a ribbed body, was a gift from a resident of the village of Maskhuta (located not far from Ismailiya) and most likely was manufactured in Sharqiya province, where the form is sometimes also called a *būša*. *Abāri'* are used to hold water for ablutions and as containers for drinking water. They also are employed sometimes for boiling water on a small portable stove and for separating cream.

A number of the sherds collected from refuse contexts, especially from the Bedouin camp in Sinai, likely belong to pitcher or jug forms. Specifically, figures 10.15.1-4 are probably *abrī'* handles; figures 10.15.16-18 and possibly 19 may be *abrī'* bases; figures 10.15.11-12 and probably 10.13 and 10.14 are *'olla* necks or bodies; and 10.15.15 is an *'olla* base. In addition, the ceramic pieces illustrated in figures 10.15.5-10 and 20 probably all belong to some kind of jug form. Other presumable jug fragments include figures 10.14.5-7.

COOKPOTS

Cooking pots are employed to heat food (and water) either on top of some kind of stove or in an oven. They come in many different shapes and sizes. Today the majority of cookpots used in Egypt are made of aluminum. Nevertheless, a number of different ceramic cooking vessels continue to be used, especially in Upper Egypt, and some, such as the small casserole dish discussed below, have a wide distribution.

Two types of cookpots are included among the pilot phase EMPP whole pots. Figure 10.9.2 illustrates a *būša*[50] manufactured from the characteristic black fabric of Sharqiya province and purchased from the El Qanatar retailer. This form, which may

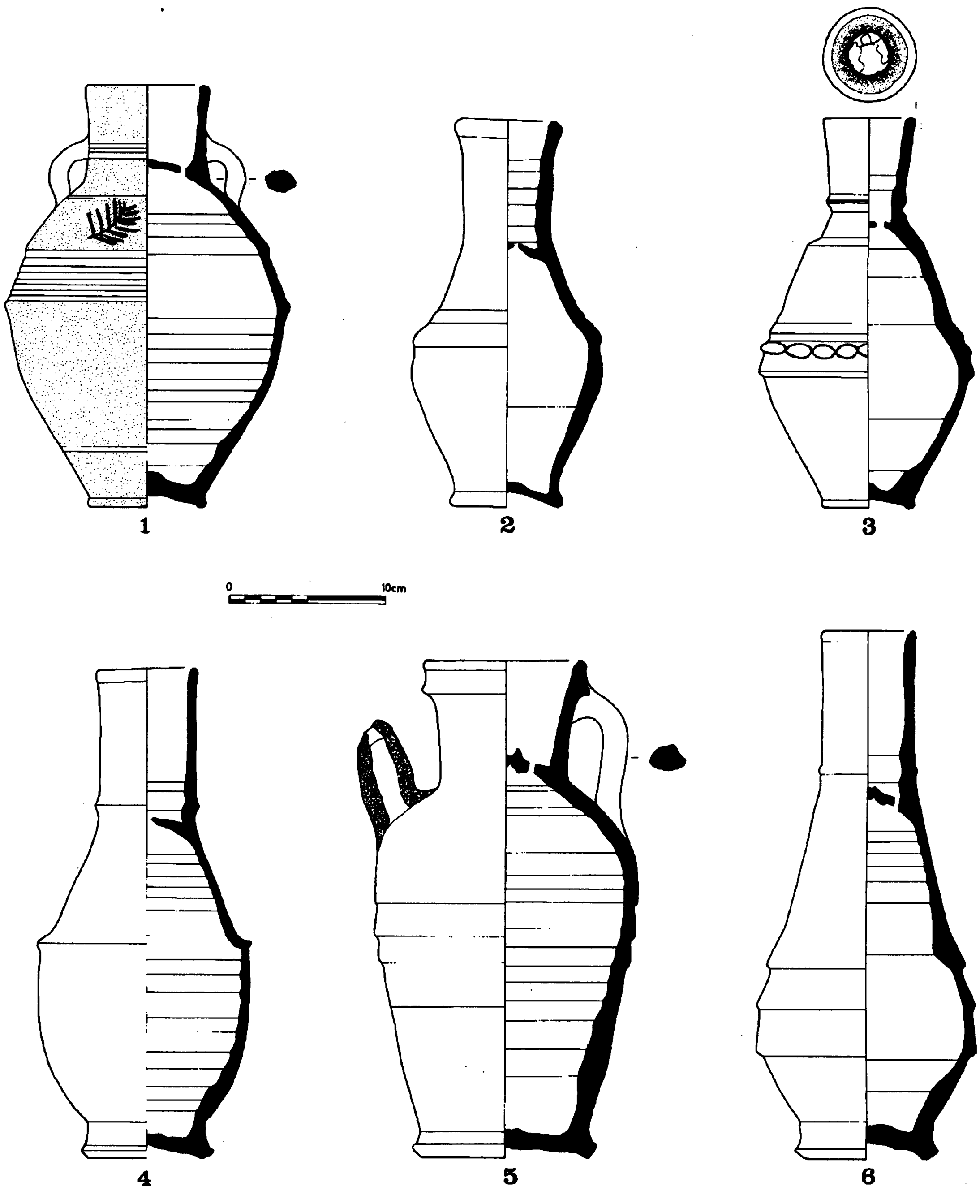


Figure 10.8 1. *Ba'oša* jug from Samannûd; 2. *'Olla* jug from Minouf; 3. *'Olla* jug from Samannûd; 4. *'Olla* jug from Cairo; 5. *Abrī'* pitcher from Cairo; 6. *'Olla* jug from Cairo.

be ribbed or unribbed, functions essentially as a crockpot. In Sharqiya province it is called a *mahlaba*[51] (Linda Oldham, personal communication). It is used to cook *fūl* (fava beans) or as a milk container. Henein (1992a, 13.5, 16.13, 71.5, 75.13) also depicts two very similar ribbed pots. The first, called an *'edra gazzāwī*,[52] is a jar used to stew beans or to store *semna* (a clarified butter), molasses, or water over the long-term. The second vessel, somewhat smaller than the first, is called a *mazbad geresī*. This Henein identifies as a stewing vessel used to prepare beans and lentils that also functions as a storage container for *semna*. A third more or less comparable pot shown by Henein (1992a, 11.1, 77.1) has two handles and a slightly wider rim diameter. This vessel, known as a *halla* (a term which also refers to copper and aluminum cookpots), is used for milking.

Figure 10.9.3 is a distinctive small, straight-sided casserole called a *berām* (plural *ebrema*). It is made of fine Nile silt and has a clear glaze on the interior and two vestigial handles on the exterior body (cf. Henein 1992a, 27.33). According to the Mahalla merchant, these pots are made in Alexandria. According to the Minya merchant, from whom this speciman was purchased, the pot was produced in Daqaliyah province. According to the El Qanatar retailer, the type is manufactured either in Alexandria or in Cairo by a family from Alexandria. The form is widely marketed throughout much or all of the country.

The remnants of several cookpots (fig. 10.14.11-15) also were collected from the Bedouin camp in Sinai. All were handmade, and were identified as cookpots mostly on the basis of pre-depositional smoking or blackening. The pieces illustrated in figures 10.14.11-13 are most likely from a single vessel; a complete example of this type of Bedouin cookpot was on display at the ethnographic museum in El-Arish in 1989. Figure 10.14.15 is interesting because of the stick hole remnant visible just below the rim. This feature hole is reminiscent of similar stick holes that occur on one type of the so-called MBIIA handmade cookpots found in the eastern Delta during the Second Intermediate period (e.g., Redmount 1995b, fig. 5). Two additional sherds from the Bedouin camp, of a black or dark grey fabric, also probably belonged to cooking vessels: figure 10.14.10, a gutter rim and body, resembles a form often called a casserole in the archaeological literature; and figure 10.15.21 is a black omphalos base.

Bowls

Bowls are one of the most common and most basic ceramic form categories. A wide range of bowl shapes and sizes, which function in many different capacities, is still manufactured in Egypt today. At the smaller end of the scale are vessels chiefly used to feed and water small household animals, especially pigeons, geese, ducks, and chickens. These feeders and waterers are typically small and very carelessly made. A rough and far from consistent distinction is sometimes made between the small bowls used for feeding animals (*misa'a*) and those used for watering (*taba'*). The feeding bowls generally take more closed forms (e.g., fig. 10.10.5-8); the watering bowls are typically more open and sometimes fairly shallow (e.g., fig. 10.10.3). The shallower bowls, "dishes" in some form classification systems, are used also under flowerpots. The vessels illustrated in figure 10.10.3-10 give some idea of the variety of available animal feeders and waterers. Figures 10.10.5-6 (*misa'a*) and 9 (*misa'a*?) were manufactured in Samannûd. Figures 10.10.7 (*misa'a*) and 10.10.10 (called a *misa'a* by the El Qanatar retailer, but the form is closer to a *taba'*) were made in Minouf. Figure 10.10.3 is a *taba'* from Minya; the *misa'a* shown in figure 10.10.8 came from the Fayum; and figure 10.10.4 is a small bowl, probably a *taba'*, made by the Abu Raguan potter. In addition and atypically, the El Qanatar retailer called figure 10.11.3, produced in Minouf, a *berām* and indicated it was used to water pigeons.

Bowls at the larger end of the size range take a variety of forms and are used for many diverse tasks. A series of deep bowls, shown in figure 10.11, hold, store, or process milk and milk products. Figure 10.11.1 from Minouf and 10.11.5 from Abu Raguan, as well as probably figure 10.11.2 from Samannûd, are *hōd* bowls, used to store milk and other milk products or for curdling milk. The *šalya* is used primarily as a milk container or as a cover for the *hōd* or both; it also can be employed for burning corn waste to heat a room in winter. Figures 10.11.4 from the Fayum and 10.12.3 from Minouf suggest the range of possible *šalya* shapes. Sometimes a large bowl functions as an animal waterer: according to the Abu Raguan potter who made it, figure 10.12.4 is called a *tāǧen* (plural *tawāǧen*) and is used to water fowl (fig. 10.12.5 is likely another version of the same thing). Figures 10.6.1 from Minya and 10.7.3 from the Fayum depict *sahfa* bowls, which come in many shapes and sizes. The larger bowls are employed to make cheese or bread dough, the smaller ones to water ducks, geese, chickens, or other fowl. According to Henein (1992a, 21.24), the *sahfa* also functions as a platter used mostly for cooking fish.

At the largest end of the bowl size scale is the full-sized *māǧūr* (plural *mawāǧīr*). The example illustrated in figure 10.12.1 was made in Badrashein. *Mawāǧīr* are heavy, coarse bowls best known for their use in bread production; they are used regularly for mixing and kneading bread dough (Henein 1992a, 59.79, 76.79; Henein 1988, 166, fig. 162; Rizqalla 1978, 19, pls. VI.4, X.1-2, XI.1).[53] The *māǧūr* also comes in smaller versions (e.g., fig. 10.12.2), which can be employed for a variety ofof household functions including watering small animals or serving as dishes under plants.

Sherds from a distinctive group of large, dark grey, carinated bowls (fig. 10.13) were found at the Sinai Bedouin camp near El 'Arish. One of these bowls had been repaired at some point: the sherd drawn in figure 10.13.4 exhibits a clear mend hole. Dark grey ring and flat bases (figs. 10.13.6 and 10.13.7, respectively) also were recovered, and their fabrics matched those of the large bowls. Two other miscellaneous bowl fragments were collected at the Bedouin camp: figure 10.14.8 made of a fine, dense orange-brown fabric; and figure 10.14.9 manufactured from a hard orange fabric with a dark buff core.

FLOWERPOTS

The flowerpot (*'asreyya*, pl. *'asāri*), along with the *zīr*, is one of the most ubiquitous ceramic forms found in Egypt today. It comes in a range of sizes, rim shapes (squared, rectangular, oval, rounded and scalloped), and fabrics (figs. 10.16-18). The widest diameter of the Egyptian flowerpot is at the rim. The body tapers down at a straight angle to the flat base, the point of narrowest diameter. All the flowerpots in the EMPP assemblage with preserved bases have a round hole in the middle of the base for water drainage (e.g., figs. 10.16.8, 17-22; 10.18.4). Flowerpots collected in Sinai sometimes were made of distinctive fabrics found only among the ceramics from the Bedouin camp. Figures 10.18.1-3 and 5-6, from Sinai, probably represent flowerpots, although the sherds conceivably could come from other vessel types. Certainly the ring bases of figure 10.18.5-6 are atypical. Without the distinctive hole in the base, and especially if only the rim and a small part of the body profile were preserved, it could be difficult to distinguish a flowerpot from another ceramic form, such as a bowl.

MISCELLANEOUS FORMS

Most of the vessels illustrated in figures 10.2-18 belong to a major form class such as jar or bowl. The remaining ceramic products, however, fall into a miscellaneous category. This grouping comprises such diverse items as braziers, drums, pipeheads, and animal shelters.

Figure 10.9.5 depicts a brazier purchased from the Abu Raguan retailer and

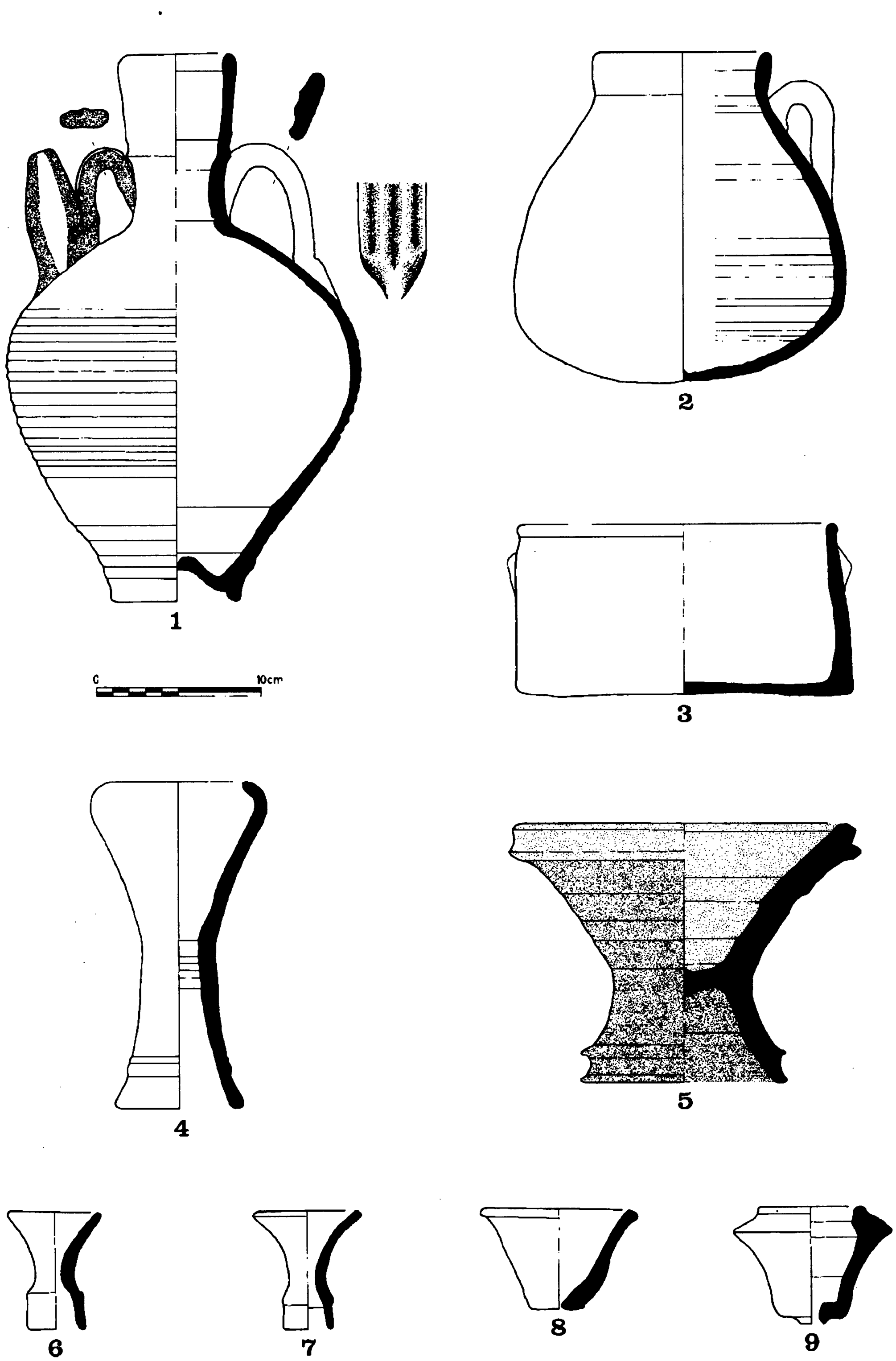


Figure 10.9 1. *Abrī'* pitcher made in Sharqiya (?); 2. *Būša* cookpot made in Sharqiya; 3. *Berām* casserole cookpot made in Alexandria (?); 4. *Tabla* drum made in Minouf; 5. *Bahūr/man'ad* brazier made in Samannûd; 6. *Hağar* pipehead made in Samannûd; 7. *Hağar* pipehead made in Cairo; 8-9. *Hağar* pipeheads made in Samannûd.

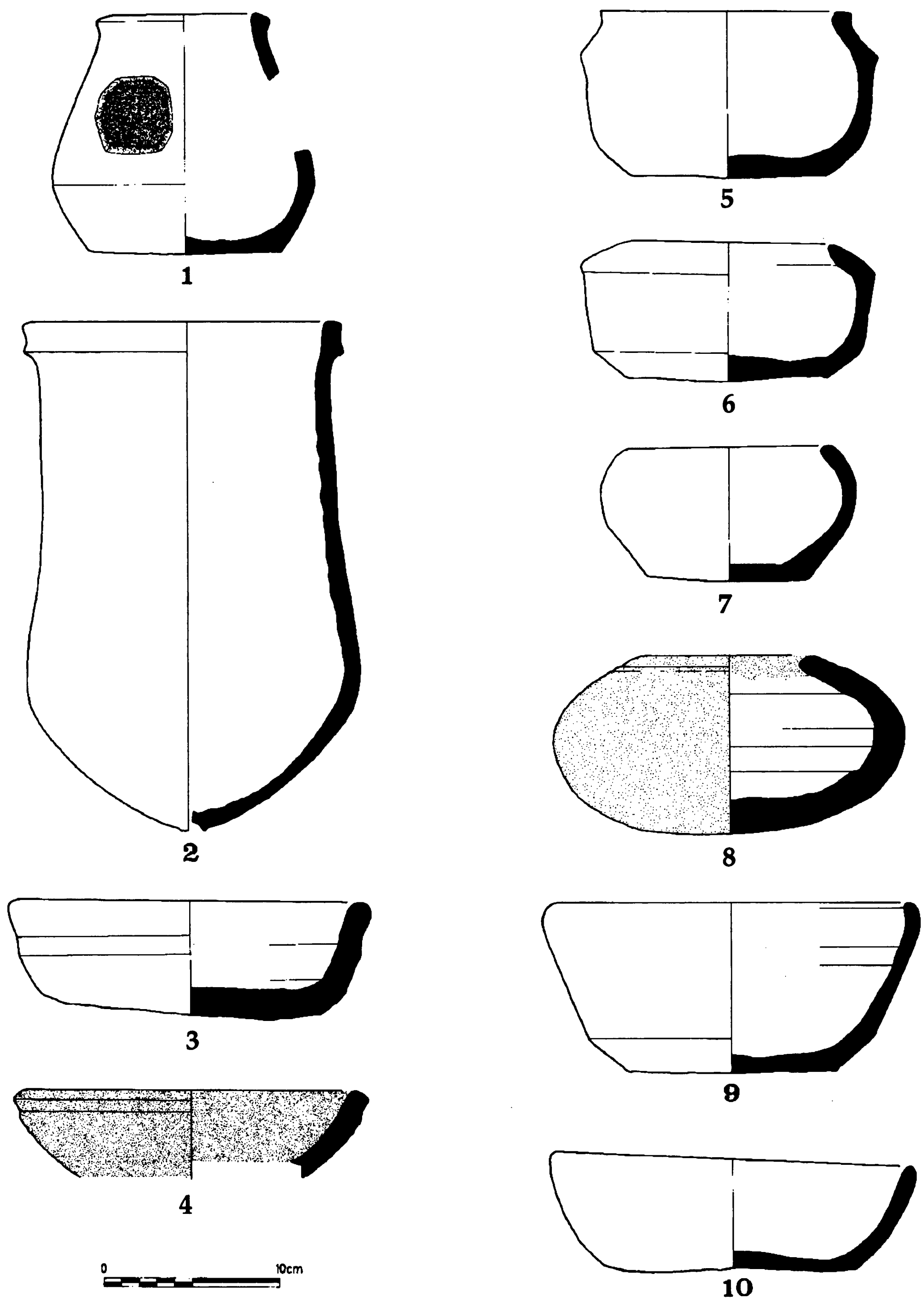


Figure 10.10 1. Small animal refuge/feeder from Samannûd; 2. *Gadūs* pigeon pot from Samannûd; 3. *Taba'* bowl from Minya; 4. Bowl from the Fayum; 5-6. *Misa'a* bowls from Samannûd; 7. *Misa'a* bowl from Minouf; 8. *Misa'a* bowl from the Fayum; 9. Bowl from Samannûd; 10. *Misa'a* bowl from Minouf.

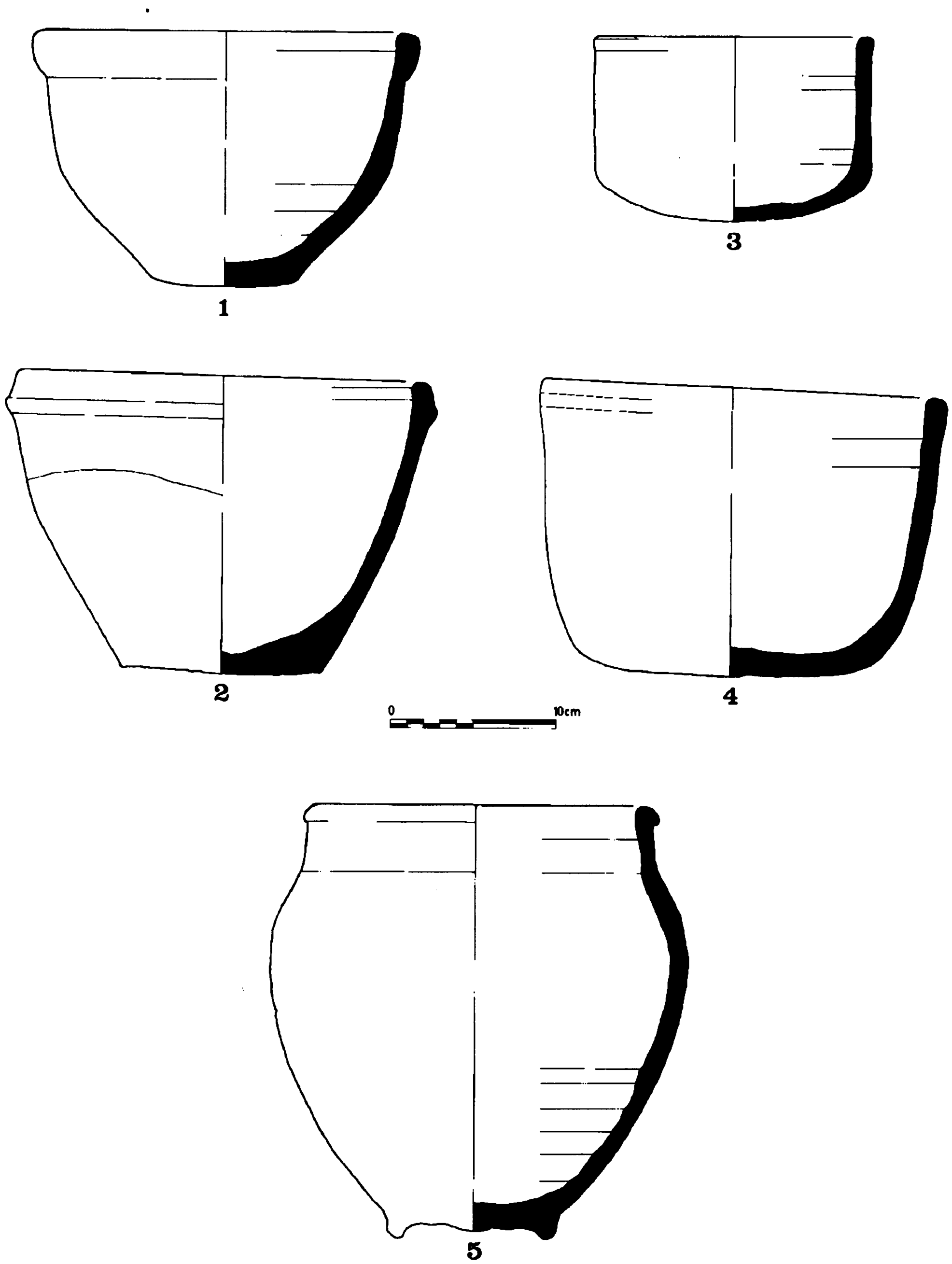


Figure 10.11 1. *Hōd* bowl from Minouf; 2. Bowl from Samannûd; 3. *Berām* bowl from Minouf; 4. A *šalya* bowl from the Fayum; 5. *Hōd* bowl from Abu Raguan (?)

manufactured in Samannûd (for a virtually identical example see Henein 1992a, 17.15; 76.5). This brazier is called a *man'ad* (plural *manā'ed*) or *bahūr* and is used to provide warmth during cold weather. Henein (1992a, 21.26) also illustrates a second, smaller version of the form, called a *man'ad* or *mabhara* (plural *mabāher*). This smaller vessel is employed to hold hot charcoal used for igniting tobacco when smoking a waterpipe. If found in an archaeological context, these braziers likely would be classed as pedestalled bowls or, if smoking or burning marks were apparent, as incense burners.

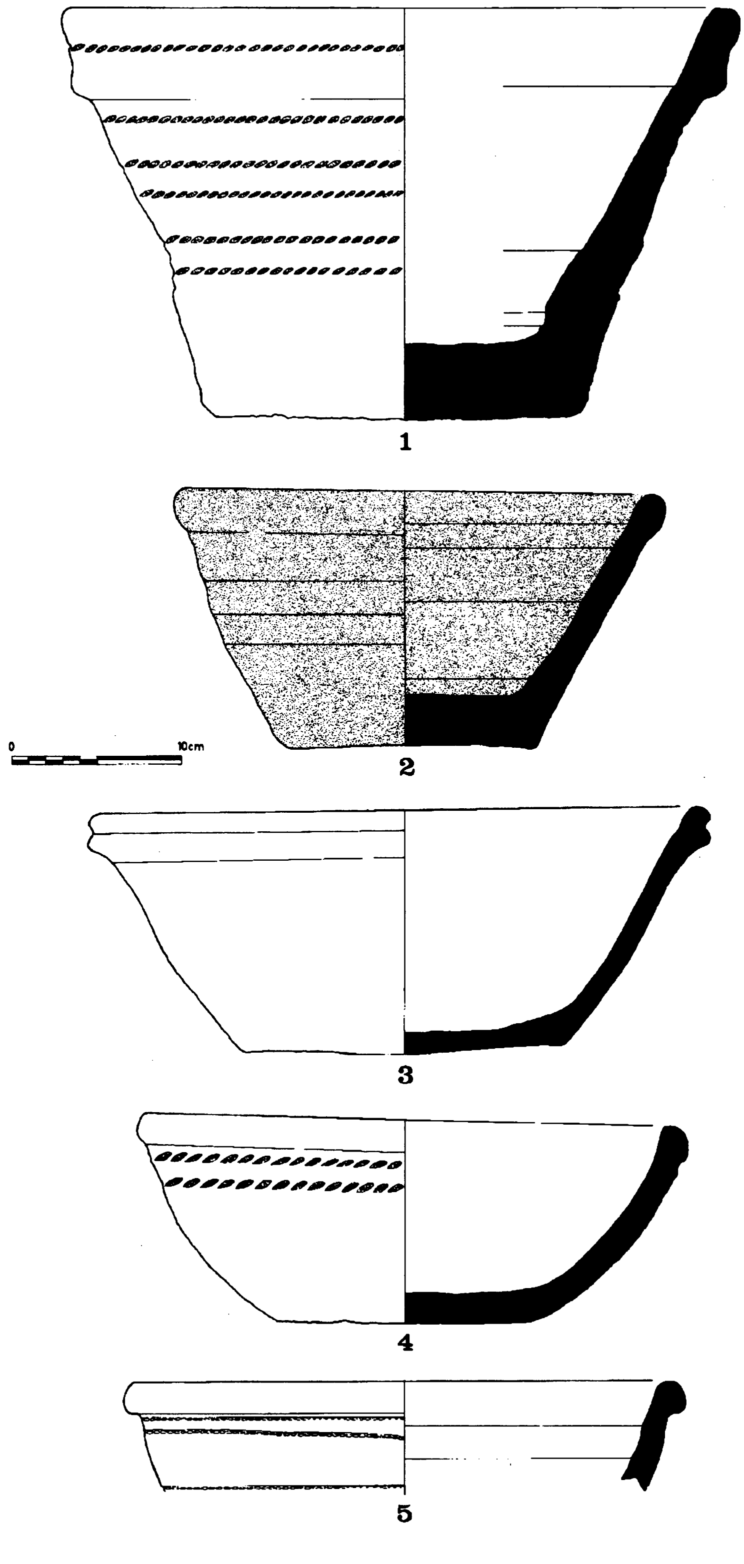


Figure 10.12 1. *Māğūr* bowl from Badrashein; 2. *Māğūr* bowl from Minya; 3. A šalya bowl from Minouf; 4. *Tāğen* bowl from Abu Raguan; 5. Bowl from Abu Raguan.

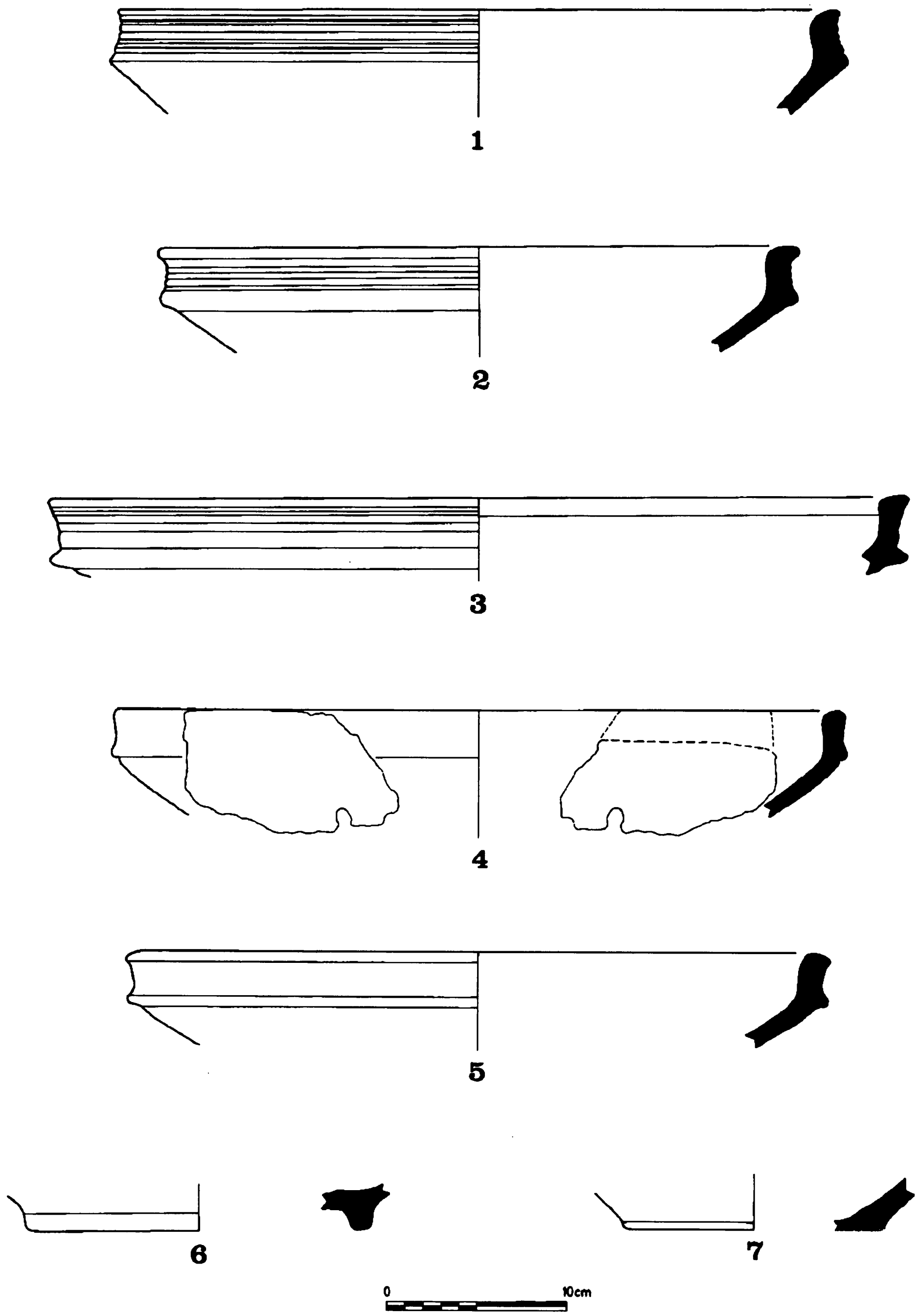


Figure 10.13 Large, dark grey bowl fragments from the Sinai Bedouin camp.

Pottery is also used for the body of a drum called a *tabla* (plural *tabl* or *tobūl*). The *tabl* vary somewhat in form and especially in dimensions,[54] but all consist of a hollow ceramic cylinder with one end usually wider than the other. A skin is stretched taut over the rim with the greatest diameter to provide a percussive surface (see Henein 1992a, 28.35 for a completed drum). The smallest *tabl* are generally children's toys; the larger versions are functional musical instruments. The *tabla* cylinder shown in figure 10.9.4 was manufactured in Minouf and acquired from the El Qanatar retailer.

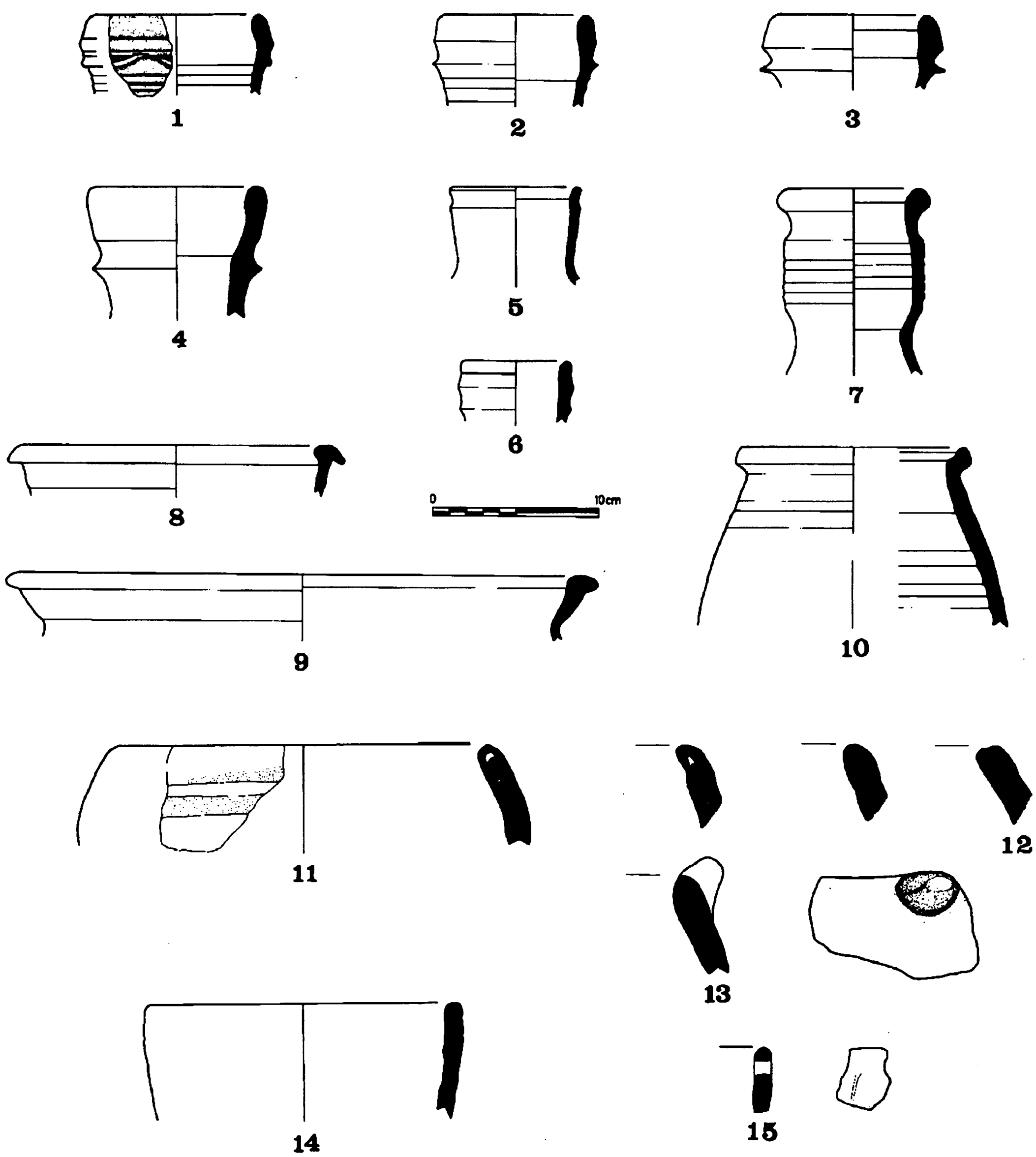


Figure 10.14 Fragments of jars and jugs (1-7), bowls (8-9), and cookpots (10-15). All were collected from the Sinai Bedouin camp except no. 4, which came from a roadside near Gerzeh.

It also is possible that figure 10.18.3 from Sinai, made of a distinctive orange-brown sandy fabric, represents the top or more likely the base of a drum rather than the rim of a flowerpot.

Different waterpipe (*narğīla* or *šīša*) bowls or heads (*hağar*, plural *heğāra*) are illustrated in figure 10.9.6-9.[55] These pipe bowls hold the tobacco smoked in the water pipe. Figure 10.9.6-7 and 9 were manufactured at Samannûd and purchased from the Mahalla retailer. Figure 10.9.7, made of a black Nile silt fabric, was produced in Cairo and obtained from the El Qanatar merchant. The waterpipe heads, like the waterpipes, come in different sizes and shapes. All of the pipe bowls, however,

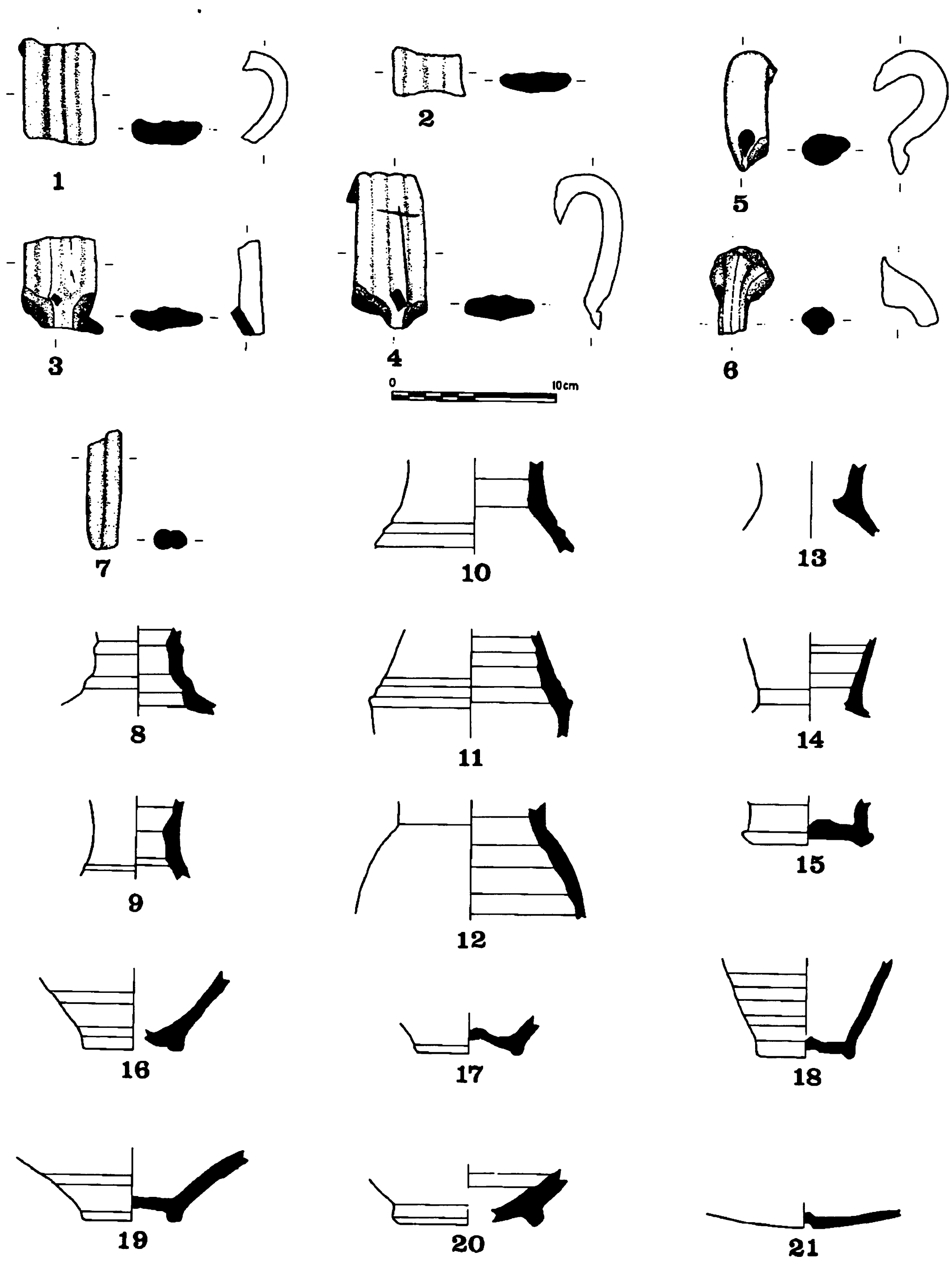


Figure 10.15 Probable *abrī'* pitcher and *'olla* jug handles, necks, shoulders, and bases.

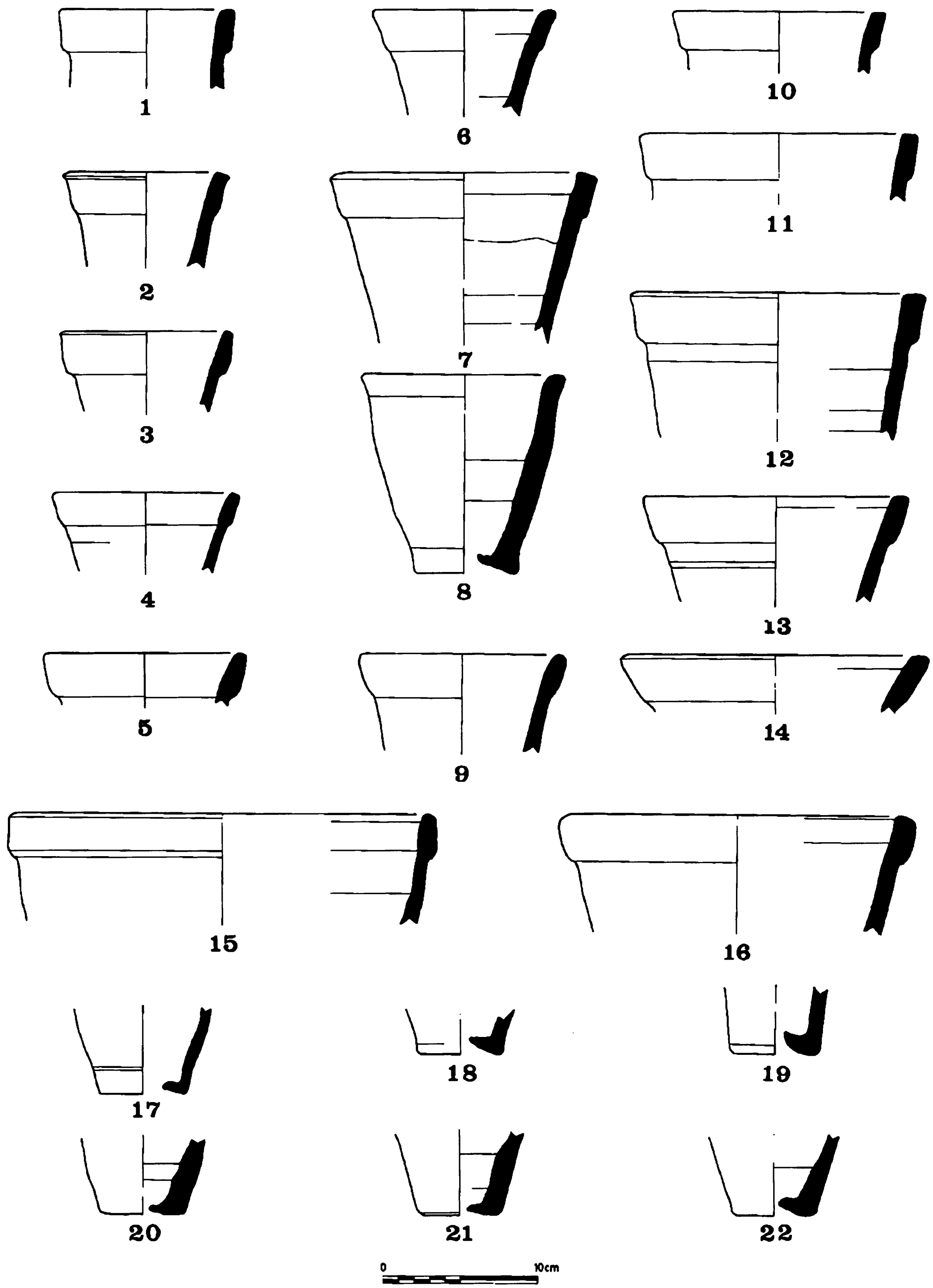


Figure 10.16 Flowerpot rims, bases, and profiles.

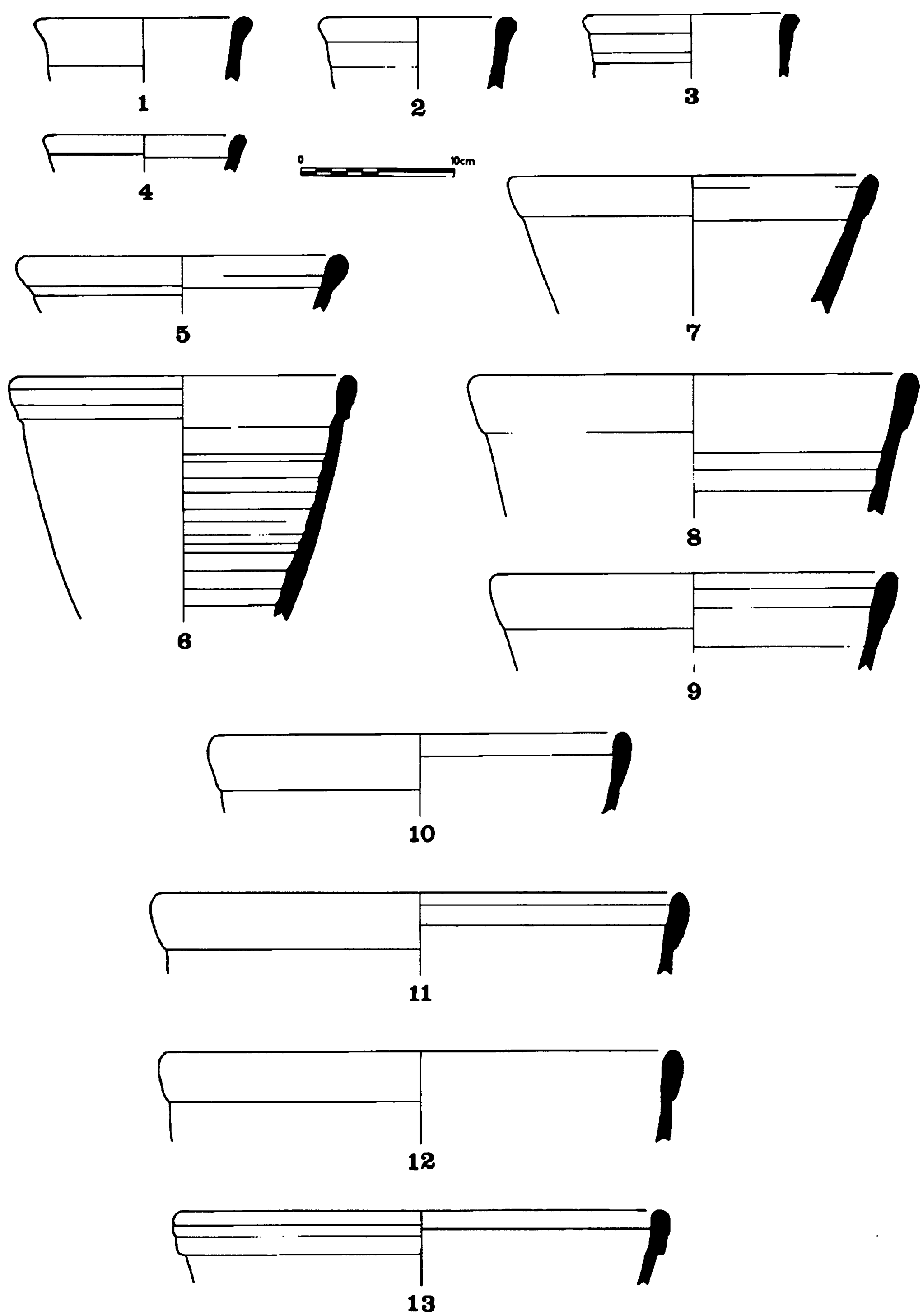


Figure 10.17 Flowerpot rims collected from the Sinai Bedouin camp.

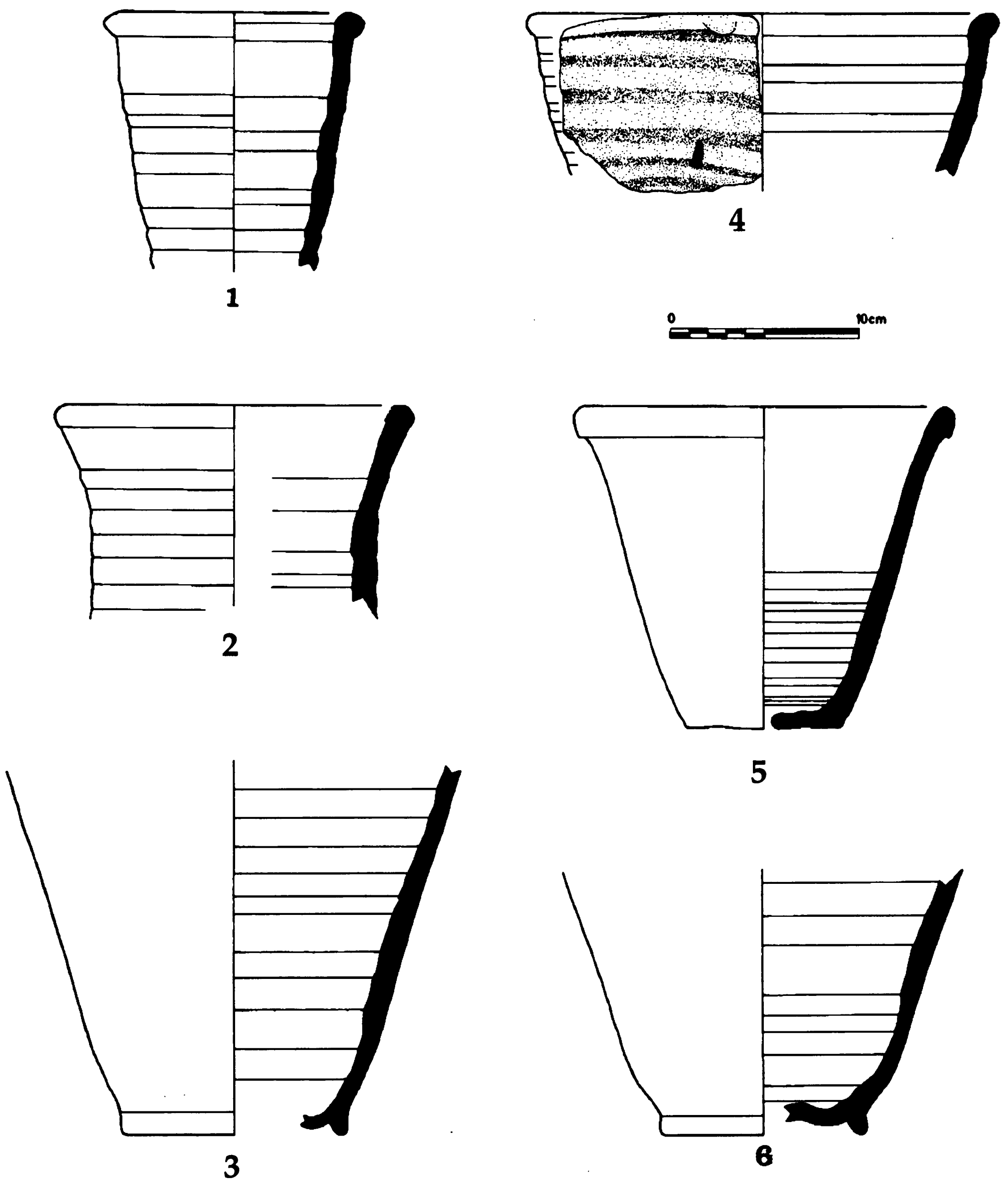


Figure 10.18 Flowerpot rims, bases, and a profile collected from the Sinai Bedouin camp.

are small and open at both ends. The uppermost opening, the rim, has a wider diameter, often much wider, than the lower or base opening.

One of the more striking uses of clay pots in rural Egyptian society is as animal havens and houses. In particular, fired clay vessels are used as pigeon nests and as protective shelters for small baby animals such as rabbits and chicks. Figure 10.10.2 illustrates a pigeon pot, called a *gadūs* (plural *gawādīs*), that was made in Samannûd. Pigeon pots have a wide mouth, elongated body, and small hole in the convex base. Pigeon towers, which function as large pigeon coops, are common in the Egyptian countryside. They are constructed by placing pigeon pots on their sides and stacking them like bricks, using mud-mortar as binder (see Henein 1988, 15-18, figs. 10.5-6). The pot mouth faces the interior of the tower, which is hollow; the exterior of the structure is shaped and smoothed with mud-mortar and sometimes white-washed. Such pigeon towers may be round or square or rectangular. They are often quite large and high.[56] Many are free-standing structures; others are erected on the roofs of houses. Another type of ceramic animal shelter consists of a small, relatively closed bowl with 'window' cut-outs. Such vessels provide a refuge for baby rabbits or chicks or other small animals living within the household. The example shown in figure 10.10.1 was manufactured in Samannûd.

Samples not Illustrated

Four items discussed below in the fabric analysis section of this paper are not illustrated in figures 10.2-18. The first, sample 14.6, is a fragment of a *balata* (also known as *el-'arsa*), the thick, flat, coarse and heavy round disc that constitutes the main baking platform or griddle of traditional Egyptian bread ovens.[57] Two undistinguished flowerpot specimens (samples 15.2 and 15.3) were collected as fabric samples. Finally, sample 13.75 is one of a series of *tabūn* (plural *tawabīn*) fragments gathered at the Sinai Bedouin camp. A *tabūn* is one of the traditional clay bread ovens used in the Levant (McQuitty 1984).

Discussion

The pottery forms represented in the pilot phase EMPP sample collection depicted in figures 10.2-18 and discussed above would have functioned in many different capacities, focused mainly around the following major domestic themes: water collection, transport and storage; milk collection and processing; food preparation and storage; animal sustenance and housing; and, to a lesser degree, cooking and heating. Conspicuously absent from the assemblage are items such as plates, bowls, serving dishes, cups and glasses traditionally used for the display and consumption of human food. This lack is attributable to more than just the limited size of the EMPP collection: plastic, glass, china, enamelled metal (tin?), and aluminum are used almost universally now in Egypt for tableware. Some ceramic mugs and tableware are commercially available, but these are generally either glazed products manufactured by more modern elements of the Egyptian ceramic industry or wares created by traditional potters specifically for the tourist or foreign resident market.[58]

The degree to which particular ceramic vessels, such as *balālīs*, are used in local industries (e.g., molasses production), is unknown and provides another potential avenue of research.[59] Also notable are the marked differences between the current ceramic repertoire illustrated in figures 10.2-18 and that shown in the *Description de l'Égypte* (1994, 734-35, E.M. vol. II, pls. EE-FF) dating almost two hundred years earlier. The very few points of correspondence between the two corpora suggest, not surprisingly, that major changes in ceramic design have occurred over the past two centuries. These changes likely were triggered or accompanied by significant shifts in pottery usage and production patterns, as well as by evolving fashions.

Table 10.4 summarizes the functions of the whole pot forms included in the EMPP sample collection. Like the collection itself, the table is intended to be suggestive rather than comprehensive. It deals only with those complete forms shown in the illustrations, and, more importantly, lists only the uses identified for those particular forms by the limited EMPP field research and by the few available references. The range of functions is, if anything, understated for many of the forms. Secondary reuse of vessels, such as employing a worn *ballās* jar for a pigeon nest, is not taken into consideration. Table 10.4 classifies the vessels both by their most basic usage—human food-related[60] or nonhuman food-related—as well as by more specific functions. The latter are categorized according to what appear to be the central foci and usage categories of the ceramic corpus to date, namely water, milk, and animal care; heating or cooking; food preparation; short- and long-term storage; and transport.[61]

What is immediately striking, both in table 10.4 and in the above commentary on the corpus, is the range of functional variability for specific pot forms. Some are used for a wide variety of unrelated tasks. Others have consistent functions and restricted uses. It is possible, on the basis of table 10.4, to suggest potential areas of correlation among ceramic use categories, functional variability, and form. Highly specialized needs appear to result in distinctive forms that typically are used for one purpose only. Examples from the EMPP corpus include the *hağar* (waterpipe head), *tabla* (drum), *balata* (griddle), *gādūs* (pigeon pot), *'asreyya* (flowerpot), and probably also the *bahūr/man'ad* (brazier). Similarly, certain functional foci may correlate with confined use ranges. It is suggestive and possibly significant, for example, that most of the ceramic forms involved with collecting, storing, cooling, and dispensing potable water for humans—the *ba'oša*, *bokla*, *'olla*, and *zīr*—are employed almost exclusively[62] in those capacities. The two exceptions, the *abrī'* and the *ballās*, appear to relate to water in its broader use contexts (e.g., washing and cleaning as well as drinking). Similarly, some of the milking vessels, such as the *qist*, *šalya*, and *hod*, may have functions restricted to milking activities. Other milking vessels do have diverse uses, however, so the relationship here is less than clear. Obviously, these tentative hypotheses require further investigation. At the opposite end of the functional variability range are vessels used for a number of dissimilar tasks. Examples of such pottery in the EMPP corpus include a pitcher (*abrī'*), two jars (*ballās* and *zarawiyya*), a cookpot (*būša*), and two bowls (*māğūr* and *sahfa*). Additional research should help identify further patterns in functional variability. By investigating such usage patterning in greater detail, it may prove possible to identify cultural parameters that determine which vessels or types of vessels are multi-functional and which are used for one purpose only. Such an understanding, in turn, has potential implications for the interpretation of archaeological data.

The inconsistency of the Egyptian nomenclature applied to the pottery forms discussed above is striking. Clearly, user terminology by itself makes a very poor guide to vessel form or function, with occasional exception. As the following examples demonstrate, identical terms are used for a number of distinctly dissimilar pots. The term *tāğen* is applied to many different vessels, including an animal watering bowl, a milk pot, a frying pan for items such as eggs, fish or vegetables, a cooking dish used on a small portable stove (Henein 1992a, 17.16, 26.31, 40.49, 41.52), and a casserole for baking food in the bread oven or in the increasingly prevalent electric and gas ovens of the countryside. Similarly, *berām* (plural *ebrema*) may denote a casserole (fig. 9.3; Henein 1992a, 27.33), a type of globular jar (Henein 1992a, 46.59), or an animal watering dish (fig. 10.11.3). The general term *gadūs*, *qadūs*, or *'adūs*[63] is used for a number of different ceramic forms with varied functions (Henein 1988, 170). Pigeon pots, milking pots, and *saqiyah* irrigation pots may all be termed *gawadis*. Sometimes an additional modifier, such as *gadūs hamām* for pigeon pot, *gadūs laban* or *tāğen halīb* for milking pot, is used for specification with this pottery, sometimes not.[64] Conversely, identical or closely similar pot forms may be called by different terms. Thus, for example, the same two-handled jar form may be termed a *zarawiyya* or a *megoza*; a specific globular jar may be called a *hanāb* or a *berām*; the same pitcher may be termed an *abrī'* or a *būša*; and an identical cooking pot may be known as a *būša* or a *mahlaba*. Henein again provides a series of further examples of this terminological looseness (ibid., 75.8,71 and 78.70; 73.29,61,4, and 20; 71.7 and 72.3).

Much of the variability among ceramic form, function, and nomenclature appears to be the result of strong and diverse local and regional customs operating in Egypt. Unfortunately, the precise boundaries and interrelationships among local, regional, and national cultural patterns and practices as these relate to traditional pottery production and usage are largely unknown. Presumably broader national influences would provide an impetus towards ceramic uniformity while the more local and regional practices would promote diversity. As an anthropologist fluent in Egyptian Arabic, with more than twenty years experience working in Egypt in villages all over the country, has commented:

> I think in the end you will have to speak of classes of things, arranged by use and shape, and then show the distribution about Egypt. Everybody has the functional things—some kind of zir, regardless of name, some kind of dough bowl and bird water dish. But they use these things, particularly the dear ones, like zirs, in their various permutations, to demarcate regional cultural patterns. These mean a lot to Egyptians, who believe that people from specific governorates have specific personality traits: Alexandria is loud and hardheaded; Sharqiyya and Sohag are generous, Aswan is dignified and clean, and so forth. The national social network which is used to access social/institutional goods is based to a large extent on connections among people from the same place of origin, so the traits which serve to identify a given place of origin are important and taken as meaningful (Linda Oldham, personal communication).

The situation is clearly enormously complex. The various interrelationships among pot form, pot function, nomenclature, and regional and cultural identities and practices are intricate and far-reaching. Present evidence suggests that an investigation of the sociocultural parameters affecting specialization or lack of specialization in ceramic usage may provide potentially valuable ethnoarchaeological insights into relationships of form and function. Far more research is needed, however, to speak with anything approaching authority on this or the other issues discussed above.

4. Fabric Analysis

A comparatively narrow range of fabric types is represented in the limited EMPP pilot phase ceramic assemblage. Nevertheless, this restricted sample set shows clearly that a more circumscribed repertoire of ceramic fabrics occurs today in Egypt than was the case in antiquity. As with the form and shape variations of Egyptian pottery, fabric diversity seems to have become increasingly restricted over time, especially in the recent past.

Sample fabric chips[65] were taken from all of the processed EMPP ceramic material. Freshly broken edges were used for this stage of the investigation. Repeated experimentation confirmed that notable differences in fabric appearance often

TABLE 10.4 Names and Functions of Whole Pots in EMPP Pilot Phase Sample Corpus

Arabic Name	Form Name	Figure Number	NON-FOOD RELATED*	FOOD RELATED*	Water Related	Milk Related	Animal Related	Heat/ Cooking	Food Prep	Short-Term Storage	Long-Term Storage	Transport	Other	Comments
abriʾ	pitcher	10.8.5;10.9.1	X	X	X	X		X		X				ablutions
ʿasreyya	flowerpot	10.16-18	X										X	planting
bahūr	brazier	10.9.5	X					X						
balata	griddle	not drawn		X				X	X					bread oven tray
ballāṣ	jar	10.4-5		X	X				X	X	X	X	X	sell molasses
baʾoša	jug	10.8.1]		X	X					X				drinking vessel
beram	casserole	10.9.3		X				X	X					
	bowl	10.11.3	X				X							water pigeons
bokla	globular jar	10.7.1		X	X					X		X		
būša	cookpot	10.9.2		X		X		X	X	X				
gadūs	jar	10.10.2	X				X							pigeon house
hanāb	globular jar	10.7.3		X		X			X	X	X			
hağar	pipehead	10.9.6-9	X					X						smoke tobacco
hōd	bowl	10.11.1,5		X		X								
mağūr	bowl	10.12.1,2	X	X			X		X				X	under flowerpot, feed animals
manʾad	brazier	10.9.5	X					X						
misaʾa	small bowl	10.10.5-8	X				X							feed animals
ʾolla	jug	10.8.2-4,6		X	X					X				drinking vessel
qist	pitcher	10.7.4		X		X			X					
sahfa	bowl	10.6.1,10.7.2	X	X			X	X	X					water animals
šalya	bowl	10.11.4,10.12.5		X		X								
tabaʾ	bowl/dish	10.10.3	X				X						X	under flowerpot, water animals
tabla	drum	10.9.4	X										X	toy/musical instrument
tāğen	bowl	10.12.4	X				X							water fowl
zarawiyya	jar	10.6.4		X						X	X	X		
zīr	jar	10.2-3		X	X						X			
?	small zir	10.8.3		X	X					X				
?	small bowl	10.10.1	X				X							baby animal shelter

* These two basic categories apply to all vessels. Food-related refers to pots involved with any foodstuffs, including water, consumed by humans.
Non-food related indicates pot functions not related to food or water consumed by humans. A given vessel may fall into only one or both categories.

occurred when chip sections were cut at varying angles. Thus, significant differences in visual appearance might result depending upon whether the cross-section was established parallel, diagonal, or perpendicular to the rim of the pot. Wherever possible, therefore, fabric sections were cut perpendicular to the vessel rim in order to ensure consistency of comparison. Preliminary macroscopic (with the naked eye and a 10X loupe) and microscopic (with a binocular microscope at a power of 20) fabric examinations were undertaken in Cairo. Interpretation of these observations was aided by occasional consultations with Dr. Hany Hamroush, a geologist/geo-archaeologist who has worked extensively with ancient Egyptian pottery. This preliminary field analysis identified six main fabric groups among the EMPP's pilot phase ceramic corpus: marl clays, Nile silts, mixed marl clays and Nile silts, Sinai fabrics, black fabrics, and anomalous fabrics. Except for the anomalous grouping, each of these larger categories was also subdivided to create a more detailed fabric classification for the EMPP assemblage (table 10.5A; appendix 10.B).[66] For the most part, the six primary divisions, discussed below, were easy to distinguish from each other. Establishing consistent subgroups within those divisions, however, usually proved more problematic.

Marl clay fabrics are rare in the EMPP corpus. Only two different types of marl clay wares occur, both associated with the *ballās* jar form: 1) a grey-pink marl with yellow speckles from the Qena region in Upper Egypt (color plate section 10.1); and 2) a fairly uniform orange marl represented by a series of jar fragments collected from a roadside not far from Gerzeh (color plate section 10.2).[67] Marl clays by definition contain significant amounts of calcium carbonate.[68] They are characterized by a dense, often sintered, hard fabric that usually contains mudstone inclusions. The speckled appearance of the Qena *ballās* marl is the result of numerous calcium oxide-coated pores in the fabric (color plate section 10.3). All the EMPP marl clay fabrics had a white or cream-colored "self-slip" on the exterior pot surface.[69] None had organic temper.

By far the most common Egyptian fabrics in the EMPP sample set are those manufactured from Nile alluvium (color plate section 10.4-9, 15, 17). Nile silt fabrics generally have a grainier texture and less dense appearance than the marls and are softer. In an oxidizing atmosphere they fire to a wide range of brown (which predominates), orange, red, pink, and sometimes even purplish hues.[70] In a reducing atmosphere the firing turns the alluvium dark grey to black on the surface, and usually varying shades of grey in section. The EMPP Nile silt fabrics proved somewhat problematic to subdivide, especially consistently. Most had a considerable number and variety of inclusions and pores. Well-levigated "fine wares" were rare. The preliminary field typology of table 10.5A and appendix 10.B groups the Nile alluvial fabrics into four basic classifications: soft-fired, hard-fired, coarse, and straw or chaff-tempered. The first two categories were subdivided further on the basis of amount and type of inclusions (appendix 10.B). Classification of a fabric as soft-fired (e.g., color plate section 10.6, 8, 9a) or hard-fired (e.g., color plate section 10.4, 5, 10a) was determined on the basis of relative hardness,[71] texture, and color. Harder fired fabrics were typically more brittle, more difficult to break, and more difficult or impossible to scratch with a fingernail. They often had a smoother, comparatively less grainy texture and appearance. Orange or lightish pink-brown tones or both were common for the harder fired silts. The coarse silt fabrics had copious and large inclusions, dominantly inorganic (e.g., color plate section 10.7a, 9b). Straw or chaff-tempered wares generally had abundant chaff impressions on the surfaces of the pottery, and numerous chaff impressions, voids, and sometimes carbonized and phytolithic plant debris in section (e.g., color plate section 10.7b, 11).

The mixed fabric category consists of wares classified as combinations of Nile silts and marl clays (e.g., color plate section 10.12, 13). These were comparatively easy to distinguish from the pure silts and marls of the EMPP sample set. Not surprisingly, they exhibited characteristics belonging to both marl and Nile alluvial clays, as well as traits intermediate between the two. The most diagnostic features of the mixed group as a whole were color and texture. Paste colors were generally closer to those of the marl clays, but the tones were considerably more muted than is typical for the marls. The dominating colors of the mixed Nile silt and marl clay fabric group were varying shades of buff—brownish buff, greenish buff, whitish or yellowish buff, and orange or orange-pinkish buff. Although generally closer to the marls in hardness, the texture and appearance of the mixed fabrics was usually grainy like the silts. Some had white or cream-colored self-slipped surfaces like the marls. One group exhibited a fabric with a finely mottled or speckled appearance, as if different colored powders had been mixed together and sprinkled throughout the paste. Others were more uniform in texture and color. Mudstone and straw voids occurred occasionally. Quartz sand was common. In general, the mixed category was less porous than the silts but not quite as dense as the marls.

The Sinai Bedouin camp produced a wide range of pottery that incorporated several fabric groupings not encountered elsewhere in the EMPP ceramic assemblage. Although called Sinai fabrics for convenience, based on their collection location, the origin of these wares is unknown. The first fabric group, the most numerous, consisted of a distinctive sandy orange ware that almost always had a brown or brown-grey core (color plate section 10.14). This fabric was hard, dense, and grainy in texture. A second set of sherds was composed of a brown to orange buff, very hard, very dense, fine-grained sandy fabric. This was the hardest of all the EMPP fabrics. A third distinctive Sinai group, really a descriptive functional category rather than a ware classification, comprised fragments from four handmade Bedouin cookpots. Finally, a number of black wares (e.g., color plate section 10.10a) were represented at the Bedouin camp; these are discussed separately below.

The preliminary EMPP field fabric typology included one major classification—"black" wares—that was based on color rather than on paste type. The dark color resulted from firing the pottery in a reducing atmosphere. The exterior surfaces of the vessels assigned to this category actually ranged in hue from black to dark grey to grey brown to occasionally grey. The interior surfaces and pastes displayed the same color range, with the addition of light grey (color plate section 10.10a, 3, 11). The rationale behind creating this particular color category in a typology otherwise based on clay source types was twofold. First, entirely black fabrics are unusual in the ceramic repertoires, modern and ancient, of Egypt and the Near East. They almost always function as useful temporal, regional, or cultural horizon markers, if not all three. Second, it is generally more practical to compare the dark wares with each other rather than with other fabrics, since the dark color often obscures many of the features that normally aid in distinguishing among clay paste types. The EMPP black fabrics were divided into two groups, neither of which was completely satisfactory. The first consisted of fine- to medium-grained, fairly uniform, mostly sandy wares that exhibited numerous tiny "shiny" particles that reflected light. More detailed observation revealed that these particles consisted of quartz sand (rather than mica). The second group of black fabrics, although called fine silt in table 10.5A, was really more of a miscellaneous category that comprised the remaining dark wares not subsumed under the first group (appendix 10.B). All of the black fabrics were evidently manufactured from silts.

The last of the EMPP preliminary fabric classifications was the inevitable anomalous category. This consisted of fabrics that could not be incorporated into any of the other groups (e.g., color plate section 10.10b). For the most part this category was composed of unique specimens, although occasionally two pieces of what was almost certainly the same vessel (e.g., 13.28 and 13.77, illustrated in figs. 10.8.1 and10.15.7) were both characterized as anomalous. All of the anomalous fabrics in the field typology came from the Sinai Bedouin camp.

Additional studies of the EMPP fabric chips were conducted in the United States. Following the advice of Dr. Maury Morgenstein, the geologist and geoarchaeologist who undertook the petrographic analysis described below, one or more of the sides of the fabric chips was sanded to a level surface using three different grades of sandpaper—coarse, medium, and fine, in that sequence.[72] The sanding was done entirely under a lightly running water tap. The final, fine sanding eliminated traces of the earlier abrasions and smoothed or polished the fabric surfaces. Differing characteristics of the various wares emerged, sometimes quite forcefully, during the sanding. The softer silts wore down easily and created a muddy, red-brown mess. The harder fabrics, in particular the dense Sinai groups, the marls, and some of the mixed fabrics, were difficult to abrade and generally took considerably more time and effort to work down to a level surface. The marl pastes in particular took on a polished sheen after the final sanding; the silt fabrics, on the other hand, almost always remained grainy and matte. Various inclusions, such as quartz, also became lustrous after sanding.

All of the chips were re-examined after their treatment with sandpaper. On the basis of this inspection, two revised fabric classifications were developed. The first comprised a very basic typology of fabric pastes by clay type or source: Nile silts, marl clays, mixed Nile silts and marl clays, Sinai fabrics and Sinai anomalous fabrics (table 10.5C). The second consisted of a reworking of the categories belonging to the more detailed field classification system (table 10.5B).

A series of scanning electron microscope (SEM) photographs were taken of selected fabrics in the United States. These SEM photographs represent six different SEM texture types that may be defined as follows.[73] Type 1 (color plate section 10.1b,c; 10.2b,c) represents a clay-carbonate, high porosity texture that is characteristic of the two marl clay types in the EMPP pilot phase sample corpus. Type 2 is a granular silt with tabular clays (figs. 10.5b,c; 10.10b,c; 10.18a,b) that occurs in a number of the Nile alluvial fabric samples. Also characteristic of a group of Nile silts is Type 3, a granular silt with reticulated clay texture (color plate section10.6b,c; 10.11b,c). Type 4 comes from a chaff-tempered Nile silt fabric, and is composed of granular silt with an organic cast texture (color plate section 10.18b,c). Type 5 occurs in the mixed Nile silt and marl clay samples, and consists of granular silt and tabular clays with mudstone fragments and calcium oxide coated pores (color plate section 10.15d,e; 10.13b,c). Finally, Type 6, which comes from a Sinai silt fabric ("orange-brown sandy"), contains granular silt with calcium oxide coated pores (color plate section 10.14b,c).

TABLES 10.5A and 10.5B Fabric Groupings

NILE SILT				MARL CLAY		[illegible]		[illegible]			BLACK		ANOM
Soft Fired	Hard Fired	Coarse	Chaff	Orange	Greyish	Powder	Fine Buff	Orange-Brown Sandy	Hard Sandy	Handmade Bedu	Fine Shiny	Fine Silt	
W-6	W-1	W-20	W-19	11.2	W-65	W-39	W-50	13.1	13.2	13.6	W-43	W-47	13.3
W-7	W-3	W-21	W-22	11.3		W-51	W-72	13.8	13.5	13.22	13.39+103	W-73	13.17
W-9	W-8	W-64	W-66	11.6	*T=1*	2.1	1.4?	13.10	13.21	13.31	13.42	13.37	13.19
W-14	W-10	W-70	W-69	11.9		9.3	1.7	13.59	13.30	13.86	13.100	13.38	13.63
W-16	W-12	14.3	W-71			10.8	1.10	13.60	13.34		13.106	13.47	13.75
W-31	W-13	14.6		*T=4*		13.11	1.12	13.61	13.40	*T=4*	13.107	13.49	13.80
W-52	W-17	16.1	*T=5*			13.13	5.1	13.67			13.109	13.118	13.94
W-54	W-18					13.14	5.6	13.68	*T=6*		13.111		
W-57	W-28	*T=7*				13.26	5.9	13.69			13.112	*T=7*	*T=7*
W-59	W-29					13.28	7.12	13.70			13.115		
W-61	W-30					13.50	13.27	13.71			13.116		
W-62	W-55					13.77	15.1	13.72			13.117		
W-68	W-58					13.81	15.2	13.88			13.119		
W-75	4.1					13.200					13.121		
5.4	5.10					13.204	*T=13*	*T=13*			13.122		
13.58	5.13												
14.2	5.15					*T=15*					*T=15*		
14.5	10.35												
14.9	15.4												
15.3													
	T=19												
T=20													

NILE SILT					MARL CLAY		MIXED						SINAI			BLACK			ANO
Very Crs	V.Crs, Chaff	Coars	Fine-grain, incls	Fine-grain, porous	Orng	Grey	Green	Brown-Green	Brown-Pink	Misc.	Orange-Brown Sandy	Hard Buff	Hand-Made Bedu	Sinai Black Fine	Sinai Black Sandy	Black Fine, Porous	Black, Mixed Incls	Black Dense Sandy	
W-21	W-19	W-6	W-1	W-13	11.2	W-65	W-39	W-50	W-72	W-51	13.1	13.5	13.6	13.115	13.42	W-47	W-43?	13.38	13.[illegible]
W-64	W-22	W-7	W-3	W-14	11.3		1.4	1.7	13.30?	1.10	13.8	13.21	13.22	13.116	13.111	W-73	13.37?	13.47	13.[illegible]
14.6	W-66	W-9	W-8	W-18	11.6		9.3	1.12		2.1	13.10	13.40?	13.31	13.117	13.112		13.100	13.49	13.[illegible]
	W-69	W-16	W-10	W-30	11.9		10.8	5.1	*T=2*	13.50	13.59		13.86		13.122	*T=2*	13.39+103	13.107	13.[illegible]
T=3	W-71	W-20	W-12	W-54	13.2?		13.11	5.6			13.60	*T=3*		*T=3*			13.106	13.118	13.[illegible]
		W-31	W-17	W-55			13.13	5.9		*T=4*	13.61		*T=4*		*T=4*		13.109	13.119	13.[illegible]
	T=5	W-52	W-28	W-57	*T=5*		13.14	7.12			13.67						13.121		13.[illegible]
		W-68	W-29	W-58			13.81	13.34?			13.68							*T=6*	13.[illegible]
		W-70	4.1?	W-59			13.200	15.1			13.69						*T=7*		13.[illegible]
		W-75	5.10	W-61			13.204	15.2			13.70								13.[illegible]
		5.4?	5.13	W-62							13.71								
		13.3?		5.15			*T=10*	*T=10*			13.72								*T=1*
		14.2	*T=11*	10.35															
		14.3		13.19?							*T=12*								
		14.5		13.26?															
		14.9		15.3															
		16.1		15.4															
		T=17		T=17															

TABLE 10.5C Basic Fabric Groupings

NILE SILT		MARL	MIXED	SINAI	SINAI ANOMALOUS
W-1	14.5	W-65	W-39	13.1	13.6
W-3	14.6	11.2	W-50	13.2	13.17
W-6	14.9	11.3	W-51	13.5	13.22
W-7	15.3	11.6	W-72	13.8	13.26
W-8	15.4	11.9	1.4	13.10	13.27
W-9	16.1	*T=5*	1.7	13.21	13.28
W-10			1.10	13.30	13.31
W-12	*T=57*		1.12	13.38	13.63
W-13			2.1	13.39+103	13.75
W-14			5.1	13.42	13.77
W-16			5.6	13.47	13.80
W-17			5.9	13.49	13.86
W-18			7.12	13.58	13.88
W-19			9.3	13.59	13.94
W-20			10.8	13.60	
W-21			13.11	13.61	*T=14*
W-22			13.13	13.67	
W-28			13.14	13.68	
W-29			13.34	13.69	
W-30			13.40??	13.70	
W-31			13.50	13.71	
W-43			13.81	13.72	
W-47			13.200	13.100	
W-52			13.204	13.106	
W-54			15.1	13.107	
W-55			15.2	13.109	
W-57				13.111	
W-58			*T=26*	13.112	
W-59				13.115	
W-61				13.116	
W-62				13.117	
W-64				13.118	
W-66				13.119	
W-68				13.122	
W-69					
W-70				*T=34*	
W-71					
W-73					
W-75					
4.1					
5.4					
5.10					
5.13					
5.15					
10.35					
13.3					
13.19					
13.37					
13.121					
14.2					
14.3					

Petrographic Analysis

A basic petrographic study of 136 EMPP pilot phase ceramic samples was undertaken by Dr. Maury Morgenstein of Geosciences Management Institute, Inc.[74] The results of the study are summarized in table 10.6. On the basis of this analysis, a revised elementary fabric classification, presented in tables 10.5D, 7 and 8, was generated, as well as a final revised detailed fabric typology (table 10.5E). In addition to the original primary fabric categories of Nile silts (N), marl clays (M), mixed Nile silts and marl clays (NM), and anomalous fabrics (SX), two new groupings were created: Sinai silts (SS) and mixed Sinai silts and marl clays (SM). Samples found in Sinai that closely resembled mixed Nile silt and marl clay wares collected in Egypt were classified as NM and identified as coming from Egypt.

Fabric characteristics examined in the petrographic study included paste type; percent inclusions; modal grain size of inclusions; and the presence and relative frequency, noted in the petrographic tables as rare (R), common (X), or abundant (XX), of various inclusions such as quartz, feldspar, mica, rock fragments, specific heavy minerals, ash, grog, organic debris, and calcium carbonates. Over-fired sherds also were recorded, and magnetic susceptibility readings were taken on all samples. These general fabric attributes, separately and in combination, are used to characterize the EMPP ceramic fabrics, both individually and as groups. They also provide clues regarding clay, inclusion and temper sources for the various fabrics.

The ceramic paste of a vessel may be defined as its dominant fabric matrix: the clay itself plus any other naturally occurring and dominating sediment type such as silt. Another term for the paste in this context is groundmass.[75] The paste or groundmass types represented in the EMPP pilot phase collection have been classified, in ascending particle size order (fig. 10.19),[76] as mud marls (a lime mud-?marl is defined as half clay, half silt); mixtures of silts and marls in various estimated percentages; muds; silty muds; clay silts; muddy silts; silts; sandy silts; very sandy silts; and silty sands.

Table 10.9 lists the EMPP samples by paste type and fabric classification. Interestingly, all the Sinai silt fabric samples fall into either the clay-silt (30 samples; 85.7%) or silt (5 samples; 14.3%) paste categories; the clay-silt paste group comes entirely from the Sinai. Nile silt fabrics exhibit a broad range of paste types, from mud to very sandy silt; however, the majority (38 out of 53, or 71.7%) fall into the silt category. The five marl clay fabric samples all belong to the mud marl paste type. Mixed marl clay and silt wares vary in estimated composition from 10% to 98% silt and 2% to 90% marl clay. Of the total 31 mixed fabric examples,[77] 11 (35.5%) were composed of 80% or more silt or marl clay; 8 (25.8%) consisted of approximately three-quarters to two-thirds of either clay type; and 12 (38.7%) were composed of approximately equal proportions (40%-60%) of the two clays. Mixing practices clearly varied considerably.

Inclusions are defined as grains natural to the clay paste and material purposely added by the potter (temper). Whereas the natural inclusions provide clues to the origins of the clay source materials, the intentionally added temper supplies information about human activities related to the creation of a desirable clay body.[78] Temper is mixed into the clay by the potter to "correct stickiness, increase porosity, reduce shrinkage, decrease drying time, reduce deformation in drying and improve firing characteristics" (Rice 1987, p. 74). In some cases it is easy to distinguish between natural inclusions and added tempers; in others it is impossible.

TABLE 10.5D Revised Basic Fabric Groupings

NILE SILT		MARL	MIXED NILE SILT/MARL CLAY	MIXED SINAI SILT/MARL CLAY	SINAI SILT	SINAI ANOMALOUS
W-1	14.9	W-65	W-39	13.2	13.1	13.6
W-3	15.3	11.2	W-50	13.5	13.3	13.17
W-6	15.4	11.3	W-51	13.21	13.8	13.22
W-7	16.1	11.6	W-72	13.28	13.10	13.26
W-8		11.9	1.4	13.30	13.19	13.27
W-9	T=53		1.7	13.63	13.37	13.31
W-10	(39%*)	T=5	1.10	13.77	13.38	13.75
W-12		(3.7%*)	1.12		13.39+103	13.80
W-13			2.1	T=7	13.40	13.86
W-14			5.1	(5.1%*)	13.42	13.88
W-16			5.6		13.47	13.94
W-17			5.9		13.49	
W-18			7.12		13.58	T=11
W-19			9.3		13.59	(8.1%*)
W-20			10.8		13.60	
W-21			13.11		13.61	
W-22			13.13		13.67	
W-28			13.14		13.68	
W-29			13.34		13.69	
W-30			13.50		13.70	
W-31			13.81		13.71	
W-43			13.200		13.72	
W-47			13.204		13.100	
W-52			15.1		13.106	
W-54			15.2		13.107	
W-55					13.109	
W-57			T=25		13.111	
W-58			(18.4%*)		13.112	
W-59					13.115	
W-61					13.116	
W-62					13.117	
W-64					13.118	
W-66					13.119	
W-68					13.121	
W-69					13.122	
W-70						
W-71					T=35	
W-73					(25.7%*)	
W-75						
4.1						
5.4						
5.10						
5.13						
5.15						
10.35						
14.2						
14.3						
14.5						
14.6						

*These figures represent percentages of the total 136 samples included in the petrographic analysis.

TABLE 10.5E Final Revised Fabric Groupings

NILE SILT					MARL CLAY		MIXED				SINAI		BLACK			ANOM
Very Crs	Chaff	Crs	Fine-grain, smooth	Fine-grain, grainy	Orng	Grey	Smooth	Grainy	Orange-Brown Sandy	Hard Buff	Sinai Black Fine	Sinai Black Sandy	Black Fine, Dense	Black, Mixed Incls	Black Nile Silt	
W-21	W-13	W-1	W-8	W-59	11.2	W-65	W-51	W-39	13.1	13.2	13.115	13.42	13.38	13.100	W-43	13.3
W-64	W-19	W-3	W-18	5.15	11.3		W-72	W-50	13.8	13.5	13.116	13.47?	13.40	13.39+103	W-47	13.6
	W-22	W-6	W-30	10.35	11.6	T=1	1.4	1.7	13.10	13.21	13.117	13.111	13.49	13.106	W-73	13.17
T=2	W-66	W-7	W-54	15.3	11.9		1.10	13.11	13.59	13.30		13.112	13.107	13.109	13.37	13.19
	W-69	W-9	W-57				1.12	13.13	13.60		T=3	13.122	13.118		13.121	13.22
	W-71	W-10	W-58	T=4	T=4		2.1	13.14	13.61	T=4			13.119	T=4		13.26
	14.6	W-12	W-61				5.1	13.34	13.67			T=5			T=5	13.27
		W-14	15.4				5.6	13.50	13.68				T=6			13.28
	T=7	W-16					5.9	13.81	13.69							13.31
		W-17	T=8				7.12	13.204	13.70							13.58
		W-20					9.3	15.1	13.71							13.63
		W-28					10.8	15.2	13.72							13.75
		W-29					13.200									13.77
		W-31						T=12	T=12							13.80
		W-52					T=13									13.86
		W-55														13.88
		W-62														13.94
		W-68														16.1
		W-70														
		W-75														T=18
		4.1														
		5.4														
		5.10														
		5.13														
		14.2														
		14.3														
		14.5														
		14.9														
		T=28														

The amount or percentage of inclusions present in the groundmass of the EMPP pottery samples was estimated using a grain count along a spacing of 0.25 mm for an area of 10^2 mm (M. Morgenstein, personal communication). Where a range of values was encountered, the median percentage was taken. Table 10.10 presents the samples by fabric type and percent inclusions in the clay paste. Table 10.11 groups the inclusion percentages of the fabrics into five categories: 10% or less inclusions; 11% to one-quarter (24%) inclusions; one-quarter to one-third (25%-33%) inclusions; one-third to one-half (34% to 49%) inclusions; and one-half (50%) or more inclusions. The 53 Nile silt samples exhibited the greatest range of inclusion amounts, varying from only 3% to as much as 65%. Nile silt fabrics alone fell into the lowest inclusion percentage grouping, and almost one-fifth (10 samples, or 18.9%) contained 10% or less inclusions. At the other extreme, only five (9.4%) of the Nile silt samples had a groundmass with 50% or more inclusions. The remaining Nile silt fabrics were distributed in the three middle percentage groupings as follows: 14 (26.4%) contained 11%-24% inclusions; nine (17%) had 25%-33% inclusions; and 15 (28.3%) had 33-49% inclusions. The Sinai silts also displayed a wide range of inclusion amounts in their groundmass, varying from 15% to 68%. Almost half (17 samples or 48.6%) had pastes composed of 33%-49% inclusions; one-quarter (9 samples or 25.7%) contained 50% or more inclusions. The remaining Sinai silt samples were almost evenly split between the 25%-35% inclusion grouping (5 examples or 14.3%) and the 11%-24% inclusion grouping (4 examples or 11.4%). The five marl clay fabric samples[79] all belonged to the highest two inclusion percentage groupings: their pastes contained from 39% to 62% inclusions. Interestingly, all seven of the mixed marl clay and Sinai silt samples fell into the highest inclusion percentage grouping of 50% or more; the ceramic pastes of this fabric category consistently contained 50% to 65% inclusions. The mixed marl clay and Nile silt samples exhibited another wide range in inclusion percentages, varying from 18% to 73%. Only three (12%) of these mixed samples had pastes consisting of less than 25% inclusions. The remainder of the mixed marl clay and Nile silt fabric group was spread more or less equally among the three highest inclusion percentage groupings: eight or 32% fell into the 25%-33% range; seven or 28% contained 33%-49% inclusions; and another seven or 28% had 50% or more inclusions in the groundmass. Finally, samples classified in the Sinai anomalous fabric category contained from 15% to 65% inclusions.

It is notable that the great majority of the 53 samples from Sinai fall into the two highest inclusion percentage groupings: 19 (35.8%) contain 50% or more inclusions; and a total of 40 samples (75.5%) have a paste comprised of 33% or more inclusions. The lowest percentages of inclusions were found exclusively in Nile silt fabrics. At the other end of the spectrum, ceramic pastes containing comparatively high percentages of inclusions seem to characterize the Sinai fabrics as a group, as well as the marl fabrics (if the limited sample is an accurate indicator).

The modal grain size of a ceramic sample indicates the size, or size range, of the most frequently occurring inclusions in the groundmass. Categories used for size classification, in descending order of magnitude (table 10.12), are: granular, very coarse sand, coarse sand, medium sand, fine sand, very fine sand, and coarse silt. In addition, three different modal grain size distribution types are represented among the EMPP samples: unimodal (e.g., coarse sand sized, or coarse to very fine sand sized); bimodal (e.g., very coarse and very fine sand sized); and trimodal (e.g., granular and medium and very fine sand-sized). A unimodal grain size distribution represents a

TABLE 10.6 Initial Summary Petrographic Analysis of EMPP Sample Pottery

Sample Number	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-01	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-22	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-28	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-29	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-31	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-39	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-43	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-50	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-52	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-58	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-62	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-64	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-65	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
W-66	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-68	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-69	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-70	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
W-72	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
W-73	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-75	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
1.04	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
4.01	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
5.01	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.04	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.06	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med

TABLE 10.6 Initial Summary Petrographic Analysis of EMPP Sample Pottery con't.

Sample Number	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
5.09	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
5.10	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			high
5.13	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
5.15	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
7.12	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
9.03	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
10.08	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high
10.35	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
11.02	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.03	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
13.001	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.002	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.003	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.005	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.006	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.008	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.010	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.011	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.013	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.014	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.017	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.019	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.021	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.022	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.026	Silt	15	MedSand	xx						x			xx	x				med
13.027	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.028	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.031	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.034	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.037	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.038	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.040	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.050	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.058	Clay -Silt	55	MedSand	xx						x			xx					low
13.059	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.063	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.067	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.075	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.077	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low

TABLE 10.6 Initial Summary Petrographic Analysis of EMPP Sample Pottery con't.

Sample Number	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.080	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.081	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
13.086	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
13.100	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Clay-Silt	45	MedSand	xx									xx					med
13.119	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.200	Silt60 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
13.204	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
14.02	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.03	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.06	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
14.09	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.01	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite, Powder			x		high
15.03	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
16.01	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3-biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium= reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
\# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.

TABLE 10.7 Manufacturing Location, Fabric Type, and Summary Petrographic Analysis for EMPP Pottery

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-01	Samannud	N	Silt	43	Cre-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Cre&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Cre-CreSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Cre&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Samannud	N	Silt	18	V.CreSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CreSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Samannud	N	Sandy Silt	65	V.CreSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Cre-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Cre&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Minya	N	Mud	40	V.Cre&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CreSand	xx		x				R	x	x	xx	x	x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-28	Samannud	N	Silt	15	CreSand	xx				M		xx	R	R	xx Powder		x			med
W-29	Abu Raguan	N	Silt	61	V.CreSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-31	Abu Raguan	N	Silt	24	V.CreSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-50	Cairo	NM	Silt75 Marl25	46	Cre&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-52	Minouf	N	Silt	20	Gran-V.CreSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-62	Minouf	N	Silt	30	Cre&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
W-73	Cairo	N	Silt	18	Cre-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	x			high
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.04	Cairo	N	Silty Mud	37	Cre-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.06	Cairo	NM	Silt10 Marl90	30	Cre&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Cre-Cre&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
5.10	Cairo	N	Silt	51	V.Cre-CreSand	xx		R		M	A	x			x	x	x			high
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			x		high
5.15	Cairo	N	Silt	10	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					high
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
9.03	Gerzeh	NM	Silt75 Marl25	30	Cre-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high

TABLE 10.7 Manufacturing Location, Fabric Type, and Summary Petrographic Analysis for EMPP Pottery con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed..Type
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			x Quartz Sandstone	H	P	x			xx Sparite	x				med
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	x Mudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	x Mudstone	M	A	xx			xx Micrite					low
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.026	Sinai	SK	Silt	15	MedSand	xx						x			xx	x				med
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.028	Sinai	SM	Silt30 Marl70	65	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	65	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med

TABLE 10.7 Manufacturing Location, Fabric Type, and Summary Petrographic Analysis for EMPP Pottery con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.01	Qaratar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qaratar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
15.03	Qaratar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Qaratar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
18.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
\# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

TABLE 10.8 EMPP Summary Petrographic Analysis by Fabric Type

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made" Fragments	Over Fired	Magnetic Sed. Type
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-28	Samannud	N	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.10	Cairo	N	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			high
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
10.36	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.03	Abu Raguan	N	Silty Mud	28	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med

TABLE 10.8 EMPP Summary Petrographic Analysis by Fabric Type con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med

TABLE 10.8 EMPP Summary Petrographic Analysis by Fabric Type con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SX	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SX	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.022	Sinai	SX	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.026	Sinai	SX	Silt	15	MedSand	xx						x			xx	x				med
13.027	Sinai	SX	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.031	Sinai	SX	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.075	Sinai	SX	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.080	Sinai	SX	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.086	Sinai	SX	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Sinai	SX	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SX	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
\# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Mad=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

TABLE 10.9 EMPP Summary Petrographic Analysis by Paste Type and Fabric Type

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med

TABLE 10.9 EMPP Summary Petrographic Analysis by Paste Type and Fabric Type con't.

Sample	Manufacture	Fabric	Paste Type	Inclusions	Inclusions:	Quartz	Qtz&Feld	Mica	Rock	Magnetite	Pyroxene	Ash	Grog	Organic	Carbonate	Ca-Oxide	Burned	Man-Made*	Over	Magnetic
Number	Location	Type		%	Modal Grain Size	Rounded	Angular		Fragments	Hematite	Amphibole			Debris	Type	Coated Pores	Carbonate	Fragments	Fired	Sed. Type
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			x Quartz Sandstone	H	P	x			xx Sparite	x				med
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
W-08	Samannud	N	Mud	38	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	x Limestone		A	x	xx	xx	xx Bio-Sparite					med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-22	Minya	N	Mud	30	MedSand	x			x Limestone			R		xx	xx Limestone					med
W-66	Fayum	N	Mud	27	V.FineSand	x			xx Caliche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xx Caliche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xx MudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xx MudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xx MudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xx MudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
W-65	Qena	M	Mud-Marl	62	Gran	R			xx LimeMudstone			R			xx Sparite,Micrite	x				low
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med

TABLE 10.9 EMPP Summary Petrographic Analysis by Paste Type and Fabric Type con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
13.075	Sinai	SX	Silty Sand	52	Gran	xx							xx	xx	x	x				low
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med

R=Rare

x=Common

xx=Major Concentration

* Man-Made Fragments are carbonate with ash and/or quartz, among other items.

**Igneous Rock Fragment (IRF) with quartz and pyroxene.

*** The paste is a clay-mud due to finely ground mudstone.

Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.

Note: Inclusions include temper and grains natural to the paste.

Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.

Note: Bio-Sparite=Large crystals of calcium carbonate shell material.

\# Igneous Rock Fragment (IRF) with quartz and amphibole.

V.=Very

Gran=Granule

Crs=Coarse

Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.

Mud=A 50/50% mixture of clay and silt.

Mud-Marl=A lime-mud ("marl clay")

Micrite=fine grained calcium carbonate.

Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.

Muddy Silt=A silt with a clay content between 0-25%.

Silty Mud=A mud with a silt content greater than 50%.

Clay-Silt=A silt with a clay content from 26-49%.

Clay-Mud=A mud with greater than 50% clay content.

M = Marl clay fabric

N = Nile silt fabric

NM = Mixed Nile silt - Marl clay fabric

SM = Mixed 'Sinai' silt - Marl clay fabric

SS = 'Sinai' silt fabric

SX = Anomalous 'Sinai' silt fabric

TABLE 10.10 EMPP Summary Petrographic Analysis by Fabric Type and Percent Inclusions

Sample	Manufacture	Fabric	Paste Type	Inclusions	Inclusions:	Quartz	Qtz&Feld	Mica	Rock	Magnetite	Pyroxene	Ash	Grog	Organic	Carbonate	Ca-Oxide	Burned	Man-Made*	Over	Magnetic
Number	Location	Type		%	Modal Grain Size	Rounded	Angular		Fragments	Hematite	Amphibole			Debris	Type	Coated Pores	Carbonate	Fragments	Fired	Sed. Type
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CreSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.15	Cairo	N	Silt	10	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					high
14.06	Abu Raguan	N	Silt	10	V.CreSand	xx		x		M	A	xx	xx	x						high
W-16	Samannud	N	Silt	11	V.Cre-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
W-28	Samannud	N	Silt	15	CreSand	xx				M		xx	R	R	xx Powder		x			med
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	x			high
W-09	Samannud	N	Silt	18	V.CreSand	xx	x	x		M	A	x	xx		x					low
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-73	Cairo	N	Silt	18	Cre-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-52	Minouf	N	Silt	20	Gran-V.CreSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-31	Abu Raguan	N	Silt	24	V.CreSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-17	Samannud	N	Silt	25	Cre&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			x		high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-62	Minouf	N	Silt	30	Cre&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-08	Samannud	N	Mud	36	V.Cre&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
5.04	Cairo	N	Silty Mud	37	Cre-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
W-03	Samannud	N	Silt	38	V.Cre&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
W-07	Samannud	N	Silt	40	V.Cre-CreSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-19	Minya	N	Mud	40	V.Cre&MedSand		x	x				x		xx	xx Powder		x	x		med
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
16.01	Badrashein	N	Silt	40	Gran-V.CreSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-01	Samannud	N	Silt	43	Cre-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-20	Minya	N	Silt	43	Gran-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-10	Samannud	N	Silt	46	CreSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
5.10	Cairo	N	Silt	51	V.Cre-CreSand	xx		R		M	A	x			x	x	x			high
W-21	Minya	N	Silt	55	CreSand	xx		x				R	x	x	xx	x	x	x		med
W-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-29	Abu Raguan	N	Silt	61	V.CreSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-14	Samannud	N	Sandy Silt	65	V.CreSand	xx	x	x		M	A	xx	R		x	x	x	x		low
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high

TABLE 10.10 EMPP Summary Petrographic Analysis by Fabric Type and Percent Inclusions con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.088	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.087	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low

TABLE 10.10 EMPP Summary Petrographic Analysis by Fabric Type and Percent Inclusions con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.026	Sinai	SX	Silt	15	MedSand	xx						x			xx	x				med
13.006	Sinai	SX	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.086	Sinai	SX	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.022	Sinai	SX	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.031	Sinai	SX	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.094	Sinai	SX	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
13.088	Sinai	SX	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.027	Sinai	SX	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.075	Sinai	SX	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.017	Sinai	SX	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.080	Sinai	SX	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

TABLE 10.11 Percent Inclusion Groupings and Fabric Types by Number of Samples and Percentage of Types

% Inclusions	M	NS	SS	NM	SM	SX
≥10%	-	10 (18.9%)	-	-	-	-
11%-24%	-	14 (26.4%)	4 (11.4%)	3 (12%)	-	-
25%-33%	-	9 (17.0%)	5 (14.3%)	8 (32%)	-	4 (36.4%)
33%-49%	3	15 (28.3%)	17 (48.6%)	7 (28%)	-	4 (36.4%)
≤50%	2	5 (9.4%)	9 (25.7%)	7 (28%)	7	3 (27.3%)
TOTAL	5	53 (100%)	35 (100%)	25 (100%)	7	11 (100.1%)

Key:
M = Marl clay fabrics
NS = Nile Silt
SS = Sinai Silt
NM = Mixed Nile silt and marl clay
SM = Mixed Sinai silt and marl clay
SX = Sinai anomalous fabricx

Percentages totalling more than 100% are due to rounding
Percentages were only calculated on groups with more than 10 samples

TABLE 10.12 Grain Size Divisions

% Inclusions	M	NS	SS	NM	SM	SX
≥10%	-	10 (18.9%)	-	-	-	-
11%-24%	-	14 (26.4%)	4 (11.4%)	3 (12%)	-	-
25%-33%	-	9 (17.0%)	5 (14.3%)	8 (32%)	-	4 (36.4%)
33%-49%	3	15 (28.3%)	17 (48.6%)	7 (28%)	-	4 (36.4%)
≤50%	2	5 (9.4%)	9 (25.7%)	7 (28%)	7	3 (27.3%)
TOTAL	5	53 (100%)	35 (100%)	25 (100%)	7	11 (100.1%)

Key:
M = Marl clay fabrics
NS = Nile Silt
SS = Sinai Silt
NM = Mixed Nile silt and marl clay
SM = Mixed Sinai silt and marl clay
SX = Sinai anomalous fabricx

Percentages totalling more than 100% are due to rounding
Percentages were only calculated on groups with more than 10 samples

normal grain size population (which may, however, be skewed towards the coarse size fraction or the fine size fraction) and generally reflects a straightforward depositional environment or a single clay source. Such a pattern is less likely to be associated with purposely added temper. A bimodal grain size distribution may represent two different environments contributing to the same clay deposit, two different clay sources, two different added tempers, or any combination thereof, such as one clay source and one added temper. Similarly, a trimodal grain size distribution may reflect a complex depositional or source environment for a particular clay, or two or three different clay sources to which tempers of varying sizes may or may not have been added by the potter.

Table 10.13 lists modal grain size distribution groups and basic fabric types for the 136 EMPP samples. The majority (104 or 76.5%) are unimodal. The marl clay and Sinai anomalous fabric categories are entirely unimodal. The great majority of the Nile and Sinai silts (44 samples or 83% and 32 samples or 91.4%, respectively) also fall into the unimodal classification. In the mixed clay groups, however, the majority of the samples—13 or 52% of the mixed marl clay and Nile silt fabrics, and five of the seven mixed marl clay and Sinai silt samples—are bimodal. Two additional mixed Nile silt and marl clay samples are trimodal. Indeed, of the total 32 samples of mixed marl clay and silt fabrics, almost two-thirds (20 samples or 62.5%) have bimodal or trimodal grain size distributions. Since the mixed fabric categories represent combinations of two different clay types and sources, such grain size distributions are logical and easily explained. Modality thus becomes one important potential means of differentiating the mixed marl clay and silt fabrics. Why nine (17%) of the Nile silt samples and three (8.6%) of the Sinai silt samples fall into the bimodal classification is less clear; however, this may reflect additions of temper by the potter. The Nile silts with bimodal grain size distributions come from a range of locations (4 from Samannûd, 3 from Minouf, 1 from Minya, 1 from Fayum) and a range of forms (different bowl types, a brazier, a pitcher, a drum, a pipehead). The Sinai silt samples come from a flowerpot, a possible *ballās* jar, and an *abrī'*.

Some interesting patterns also emerge when comparing the different modal grain sizes of the samples. For the Nile silts, modal grain sizes totally or partly in the coarse grain size fraction (defined here as granular, very coarse, and coarse) predominate (37 samples or 69.8%), while the medium-fine size fraction accounts for less than one third (16 samples or 30.2%) of the fabric group. A bare majority of the Sinai silts are characterized by a coarse grain size fraction (19 examples or 54.2%), and a large number of samples contain only a medium-fine grain size fraction (16 examples or 45.7%). The five marl clay samples are all distinguished by the presence, sometimes exclusively, of a granular grain size fraction. The Sinai anomalous fabric category has seven samples that contain a coarse grain size fraction and four with only a medium-fine size fraction. The mixed marl clay and silt fabric category is again distinctive: all seven of the mixed Sinai silt and marl clay samples have a medium-fine grain size fraction, as do a majority (14 samples, 56%) of the mixed Nile silt and marl fabrics. On the whole, results of the modal grain size analysis confirm the impression that the EMPP corpus is comprised predominantly of coarse wares.

The presence, absence, shape, and combinations of particular inclusions in a given ceramic paste, whether natural to the clay or added by the potter as temper, provide an important means of characterizing and distinguishing pottery fabrics both individually and as groups. Identification of mineral and rock inclusions in particular

TABLE 10.13 Modal Grain Size Modes and Number of Samples from Basic Fabric Types

	Nile Silt	Sinai Silt	Marl Clays	Mixed Nile Silt/ Marl Clay	Mixed Sinai Silt/ Marl Clay	Sinai Anomalous	TOTAL
UNIMODAL	44	32	5	10	2	11	104
Granular Fraction	5	0	5	0	0	4	14
Coarse Fraction	24	16	0	2	0	3	45
Medium Fraction	10	15	0	8	1	3	37
Fine Fraction	5	1	0	0	1	1	8
BIMODAL	9	3	0	13	5	0	30
Granular and Fine	2	0		0	0		2
Coarse and Medium	1	0		0	0		1
Coarse and Fine	5	2		7	0		14
Coarse and Coarse Silt	0	1		0	0		1
Medium and Fine	1	0		6	5		12
TRIMODAL	0	0	0	2	0	0	2
Granular and Med and Fine				1			1
Coarse and Med and Fine				1			1
TOTAL	53	35	5	25	7	11	136

can help identify potential source areas for clays and inclusions. Quartz (SiO_2) occurs in most rocks and unconsolidated sediments and is found naturally in varying amounts in many clay deposits. In addition, quartz sand is often used as temper (Rye 1981, p. 34). Quartz can be considered a stable inclusion under traditional Egyptian firing methods.[80] Although the mere presence of quartz sand in a fabric is generally unhelpful for characterization, the amount may be significant and the shape and texture of the quartz grains can help define source locations and transportation environments for the clays and inclusions. Combinations of surface textures can indicate differing combinations of depositional and transport environments. Rounded quartz sand grains, for example, are clastic (transported; color plate section 10.19a). If these quartz grains are frosted as well as rounded, then they likely originated in dune sands. If the grains are rounded and have surfaces with heavy impact scars then they probably have an alluvial origin. If the quartz grains are rounded, frosted, and pitted (color plate section 10.19b,c), they reflect multi-environment activity: in this case water-washed dune sand.

Of the total 136 EMPP samples analyzed petrographically, 118, or 86.8%, contained abundant quantities of rounded quartz (table 10.8). These 118 samples include all of the Sinai fabrics, all but 10 of the Nile silts, and all but three of the mixed Nile silts and marl clay fabrics. Of the 10 Nile silts without abundant rounded quartz, seven contained common quantities, two had rare amounts, and only one sample included no rounded quartz at all. The three mixed Nile silt and marl clay fabrics without abundant rounded quartz all contained common amounts. For the marl clay fabrics, however, the presence of rounded quartz was unusual: three samples had none, and two samples contained only rare quantities. In sum, rounded quartz was ubiquitous or close to ubiquitous in all of the EMPP fabric categories except for that of the marl clays.

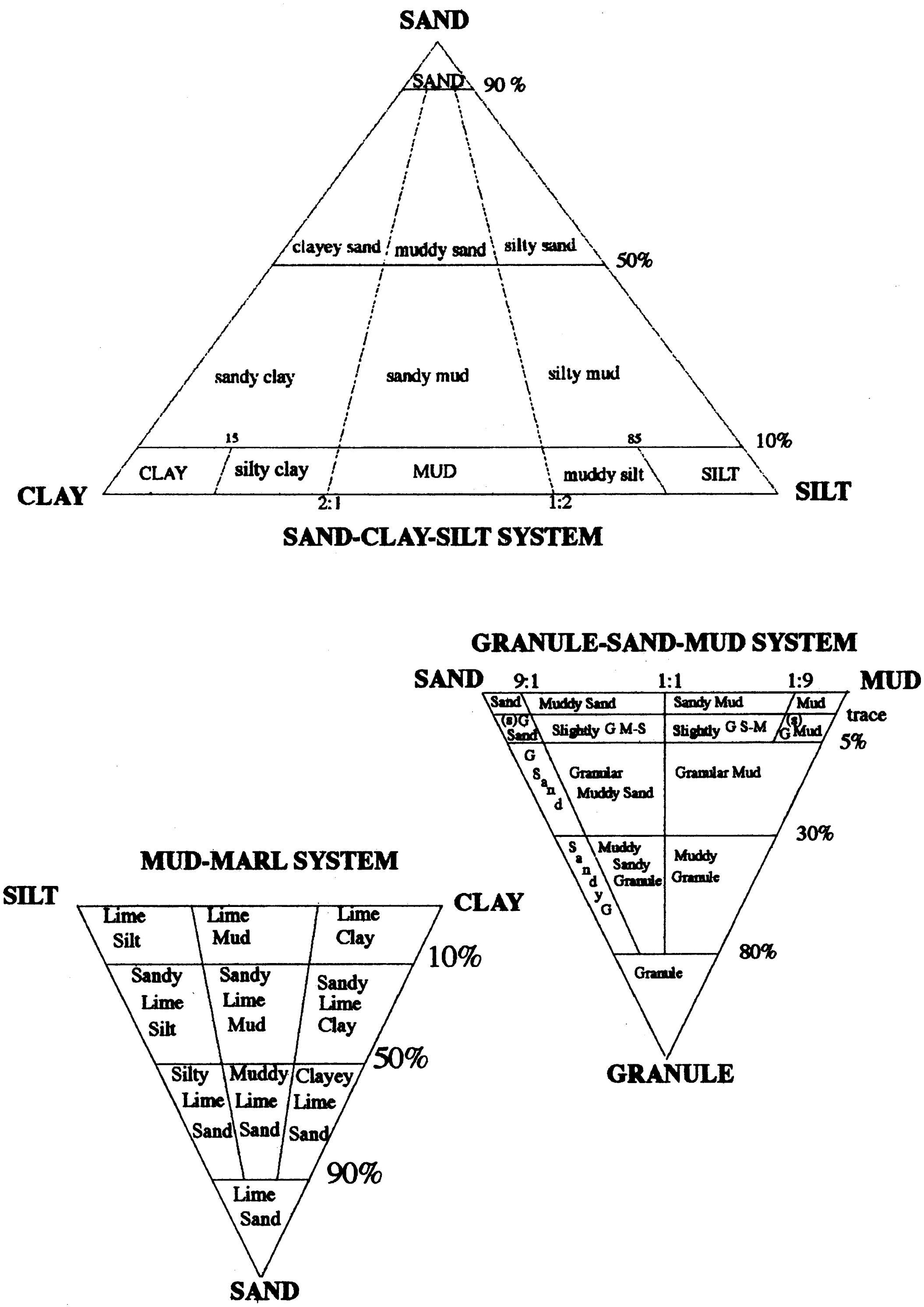
The presence of angular mineral or rock grains in a clay body often indicates a nearby clay or rock source, since the grain edges have not been blunted by extensive transportation or weathering. Alternatively, angular grains in a ceramic paste may reflect the addition of crushed temper by the potter. In this study, the presence of angular grains of quartz or feldspar or both has been noted (table 10.14). Feldspars also are stable at temperatures achieved by traditional Egyptian potters.[81] Of the total 136 EMPP samples, slightly more than one third (51, or 37.5%) contained angular grains of quartz/feldspar. All but one of these samples contained common amounts of the angular grains; one had only a rare amount. More than half of the Nile silt fabrics (29 samples, or 54.7%) contained angular grains of quartz/feldspar, in contrast to comparatively few (4 samples, or 11.4%) of the Sinai silt fabrics. Interestingly, 12 of the 15 Nile silt samples (80%) from Samannûd contained the angular grains. Of the 25 total mixed Nile silt and marl clay fabrics, 15 (60%), included angular quartz and feldspar grains. Only two of the seven mixed Sinai silt and marl clay fabrics, and one of the Sinai anomalous wares had such grains. None were present in the marl clay fabrics. Angular quartz and feldspar grains thus are found primarily in Nile silt wares, and fabrics made from Nile silts mixed with marl clays. As it is unlikely that such angular grains would occur naturally in the Nile silts or marl clays used for manufacturing the EMPP samples, they probably represent temper added by the potter to form the clay body (see also below, man-made fragments). Since the raw material sources for the Sinai pottery are unknown, however, it is possible that the angular grains found in the Sinai ceramics are natural to the clay source materials.

Micas occur naturally in many clay deposits and are far more likely to be present in a given clay body as a natural inclusion than as added temper. The presence of mica in a ceramic sample can provide additional information about clay transport and source environments. Because of its flat shape and low weight, mica requires a lower energy environment for transport, and it is therefore typically disseminated widely throughout fluvial alluvial environments, such as the Nile River valley and the Nile delta. Egyptian micas had their ultimate origins in igneous rocks such as granites and metamorphic rocks such as schists and gneiss.[82] Mica is present in common or rare amounts in 55 (40.4%) of the EMPP samples (table 10.15). Breaking this down further, 39 (76%) of the 53 Nile silt samples (coming from all the different locations where Nile silt fabrics were collected), eight (32%) of the 25 mixed marl clay and Nile silt fabrics, four of the seven mixed Sinai silt and marl clay samples, one (9.1%) of the 11 Sinai anomalous fabrics, and three (8.6%) of the 35 Sinai silt samples contained mica. Significantly, of the total 53 pottery samples from Sinai, only eight (15%) included mica. No mica was found in the five marl clay fabrics. Mica thus can be considered characteristic only of the Nile silts in the EMPP ceramic corpus.

A total of 50 EMPP samples contained rock fragment inclusions derived from either igneous or sedimentary rocks (table 10.16). Rock fragments, by definition, consist of one or more minerals; they too can aid in sourcing clays and tempers. Sedimentary rock fragments occurred most frequently in the EMPP corpus (46 of the 50 samples) and were present in all of the marl clay and all of the mixed marl clay and silt (Nile and Sinai) fabrics. Specifically, the marl clay fabrics contained abundant amounts of either lime mudstone (1 sample) or mud limestone (4 samples). The mixed Nile silt and marl clay wares exhibited common (2 examples) or abundant (8 examples) amounts of mudstone, or abundant quantities of either mud limestone (11

Figure 10.19

GRAIN-SIZE NOMENCLATURE FOR CERAMIC TEXTURES



Modified from Folk (1968, p. 28). The mud-marl system should use carbonate nomenclature for the textural attributes of the carbonate micrite and sparite grains following Folk (1968, p. 165).

samples) or lime mudstone (4 samples). The mixed Sinai silt and marl clay fabrics also contained abundant amounts of mud limestone (5 samples), lime mudstone (1 sample) or mudstone (1 sample). Mudstones, lime mudstones, and mud limestones thus account for 74% of the rock fragments found in the EMPP corpus; all are associated with pottery pastes containing marl clay. Mudstone is a fine-grained sedimentary rock dominated by clays and silts in about equal proportions; lime mudstone is a mudstone containing (usually micritic) calcium carbonate; and mud limestone is a 'very dirty' limestone containing mud. All three could be different facies of the same formation; alternatively, each could come from a different formation (M. Morgenstein, personal communication). It is significant that fragments of these three sedimentary rocks were found *only* in the marl clay and mixed marl clay and silt fabrics. They probably were introduced into these fabrics as natural inclusions of the marl clays, rather than as intentional temper.

Four other types of sedimentary rock fragments also were present in the EMPP sample corpus: siltstone (2 examples); quartz sandstone (1 example); limestone (3 examples) and caliche (2 examples). Siltstone was present in varying quantities in two of the Sinai samples, either as a natural inclusion or as temper. One Sinai silt sherd contained a rare amount of siltstone; one anomalous Sinai fabric contained an abundant quantity. Quartz sandstone fragments, probably temper, were common in one of the Sinai silt samples. Interestingly, and probably significantly, abundant amounts of caliche, which comes from a desert environment (K soil horizon material), occurred in two Nile silt fabrics from the Fayum. It is unclear at present whether this caliche was introduced into the clay body as temper or whether it was present naturally in the clay source deposit (see below). Limestone, probably temper, was present in common quantities in three Nile silt samples. Finally, rare amounts of granite and other igneous rock fragments, also likely temper, were found in three Nile silt and two Sinai silt samples.

Four heavy mineral inclusions—magnetite, hematite, amphibole and pyroxine—were identified in the petrographic study (table 10.8). Heavy minerals can provide clues regarding both the ultimate rock and the sedimentary sources of the clay deposits used in pottery manufacture.[83] They also can help classify tempers and clay pastes. One or more of these four heavy minerals is present in 78 (57.4%) of the total 136 EMPP samples. Four-fifths (43 samples or 81.1%) of the Nile silt and an even higher percentage (24 samples or 96%) of the mixed Nile silt and marl clay fabrics contained at least one of the heavy minerals. Conversely, none of the four heavy minerals appeared in any of the mixed Sinai silt and marl clay fabrics, in 71.4% (25 samples) of the Sinai silts, and in 79.2% (42 samples) of the 53 total samples from Sinai. The five marl clay fabrics also contained no heavy minerals. The presence of magnetite, hematite, amphibole or pyroxine, or some combination thereof, is thus most characteristic of fabrics consisting entirely or partly of Nile silt.

Ash and grog are two ceramic inclusions that can always be identified as man-made temper. Ash is particularly common in the EMPP ceramic corpus and occurs in differing quantities in all but 12 (8.8%) of the total 136 samples (table 10.8). The ash may come from different sources and generally is sifted prior to use.[84] Ash was present in 46 (86.8%) of the 53 Nile silt fabric samples; 23 (92%) of the 25 mixed Nile silt and marl clay fabrics; 34 (97.1%) of the 35 Sinai silt fabrics; six of the seven mixed Sinai silt and marl clay samples; 10 of the 11 Sinai anomalous fabrics; and all five of the marl clay fabrics. In seven of these samples (1 marl clay and 6 Nile silt), the ash content was rare. In all other cases, ash quantities were common (93 samples) or abundant (24 samples). Of the total 53 samples from Sinai, 50 (94.3%) contained common or abundant amounts of ash. The use of ash temper in the EMPP corpus is almost universal.

Grog (crushed potsherd) temper, on the other hand, is not nearly as common in the EMPP ceramics as ash temper. Grog is generally stable within the temperature range of traditional Egyptian firing methods.[85] Of the total 136 EMPP pottery samples, only 49 (36%) contained grog (table 10.17). Grog was present in varying quantities in 37 (69.8%) of the Nile silt fabrics; eight (22.9%) of the Sinai silt fabrics; and four (36.4%) of the Sinai anomalous fabrics. It did not occur in any of the marl clay or mixed marl clay and silt (Nile or Sinai) fabrics. Grog was common or abundant in 25 (47.2%) of the Nile silt samples, seven (20%) of the Sinai silt fabrics, and the four Sinai anomalous samples. Interestingly, varying amounts of grog occurred in all seven of the Nile silt samples from Abu Raguan, both of the Nile silt samples from Badrashein, and all but three of the 15 Nile silt fabrics from Samannûd. This suggests that the use of grog temper may be closely associated with particular manufacturing locations and traditions.

Organic debris may occur naturally in clays or it may be added as temper. Rye (1981, 33-34) divides organics into two categories: fine and coarse. Fine organics, which include both plant remains and organisms such as algae and bacteria, help improve clay plasticity and potentially can decrease vessel permeability if not fully burned out during firing. Coarse organics may consist of plant fragments naturally present in clays or of chopped plants added by the potter. Coarse organics reduce clay shrinkage and improve the workability of overly plastic clays. Naturally occurring plant inclusions are usually of variable size and irregular shape; chopped plant temper is typically more regular in both size and shape. Animal dung can improve clay plasticity, and, because it is consumed during firing, can increase vessel permeability. During firing, some or all of the organic debris will burn out of the clay leaving voids of varying sizes.[86] The presence of a dark core in a fired pot usually indicates that the clay contained a significant quantity of organic material. This core may range in size and color from a thin grey streak confined to the center of the fabric to a large black band occupying most of the vessel wall (Rice 1987, 334).

Ceramic pastes containing organic debris were comparatively uncommon in the EMPP sample corpus (table 10.18; color plate section 10.7b).[87] Rare amounts of organics may have occurred naturally in or been added accidentally to the clay; common or abundant quantities of organic debris most likely were mixed purposely into the clay as temper. A total of 39 (28.7%) EMPP samples had varying quantities of organic material; of this number, only 26 samples (19.1%) contained common to abundant amounts. Organics were most often present in the Nile silt fabrics (34 of the 53 samples or 64.2%). A few of the mixed Nile silt and marl clay (3 of the 25 samples or 12%) and Sinai anomalous (2 of the 11 samples or 18.2%) fabrics also contained varying amounts of organic detritus. EMPP samples with common to abundant quantities of organics comprised two Sinai anomalous samples, one (4%) of the mixed Nile silt and marl clay fabrics, and 21 (39.6%) of the Nile silt fabrics. None of the marl clay, Sinai silt, or mixed Sinai silt and marl clay samples contained organic debris. Breaking down the Nile silt fabrics containing organics by manufacturing location, it is probably significant that all of the samples from Abu Raguan and Minya, and five of the six Fayum samples, included some amount of organic temper. Again it may be suggested that the presence or absence of organic temper, like grog temper, correlates in many cases with particular production locations and manufacturing techniques.

Calcium carbonate ($CaCO_3$, the mineral calcite) is another inclusion that may occur naturally in clays (e.g., marl clays by definition) or may be added deliberately as temper by the potter. Calcium carbonate is found in nature in a number of different forms such as limestone rocks, crystalline calcite in sedimentary formations, caliche, and marine and freshwater shell. All calcium carbonates act as non-plastics when mixed with clay (Rye 1981, 32). Calcium carbonate is inert up to a temperature somewhere between 650°C and 900°C. Above this,[88] the $CaCO_3$ begins to decompose into CaO (calcium oxide) and CO_2 (carbon dioxide) gas. As the firing temperature increases, decomposition occurs more rapidly. In addition, the smaller the calcium carbonate grains, the faster the rate of decomposition. The degassing of the CO_2 from the $CaCO_3$ may result in pore creation; such pores are typically coated with CaO (e.g., color plate section10.3). At temperatures above approximately 950-1000°C, sintering and vitrification normally begin and the CaO reacts with silicates to from stable calcium silicate compounds. At even higher temperatures, the calcium combines with silica and other fluxes to form glass (Rye 1981, 33; Rice 1987, 98). Under certain conditions, however, the $CaCO_3$ acts as a flux and lowers the temperature at which sintering begins.[89] Finely powdered calcium carbonate seems to function in this manner.[90]

Pottery containing calcium carbonate fired in the temperature range between about 650-1000°C is often subject to cracking, spalling, or even, in extreme cases, disintegration. This is because the CaO created by the decomposition of the $CaCO_3$ is unstable. It absorbs moisture from the air and forms calcium hydroxide ($Ca(OH)_2$), which is larger in size than the calcium oxide. The resulting volume expansion stresses the fired clay body and causes "lime popping" (Rice 1987, 98). The larger and more numerous the hydrated CaO particles, the more severe the effects. The presence of CaO coated pores, however, will alleviate the problem, since the pores contain abundant void space to accommodate the volume expansion. CaO hydration problems can be resolved in several different ways (ibid.); in particular, the addition of sodium chloride and possibly other salts to the clay, or the use of raw materials with a natural salt content, will prevent the problem from occurring at all (Rye 1981, 36; Rice, 1987, 119).[91]

It is striking that all but one of the 136 EMPP ceramic samples contain some quantity of calcium carbonate (table 10.19). In only two instances is the amount classified as rare. In all other cases, 133 samples or 98.8% of the total EMPP corpus, the calcium carbonate quantities are common or abundant; and 113 (83.1%) of the samples contain abundant amounts of $CaCO_3$. Sometimes the presence of the calcium carbonate can be attributed to the use of marl clays in the manufacturing process. In most other instances, however, it is probable or certain (see below) that the calcium carbonate was introduced purposely into the clay body by the potter as temper. Nile silts generally do not contain natural calcium carbonate,[92] and the same is likely true for the Sinai silts, although their exact origin(s) are unknown. There are, however, possibly four exceptional Nile silt fabrics in the EMPP ceramic corpus, all from the Fayum, that may contain naturally occurring calcium carbonate: the two straw/chaff tempered samples with abundant caliche fragments (W-69, W-66); a third straw/chaff tempered sample (W-71); and the coarse *zīr* fabric (W-64). Atypically, all four had Nile silt pastes that reacted with HCl (see appendix 10.B). The presence of caliche, calcium carbonate that has formed naturally in desert soils, in two of these Fayum pottery samples, and the positive reaction of all four to HCl, possibly indicate that the source materials for these four vessels came from local clay sediment deposits containing natural evaporites.[93]

Where possible, the petrographic analysis characterized the calcium carbonate in the EMPP samples by type (table 10.19). Sparite, or large-grained $CaC0_3$, consists of large, non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and recrystallized limestone. Micrite denotes fine-grained calcium carbonate (small crystals) such as caliche or marly limestone. Powdered calcium carbonate refers to man-made silt or smaller sized $CaCO_3$ grains derived from undetermined sources. Bio-$CaCO_3$ (bio-carbonate) consists of shell fragments and may be characterized as bio-sparite or bio-micrite. Where the type of calcium carbonate is not specified in the petrographic table, it could not be determined.

Significantly, different varieties of calcium carbonate are associated with different fabric groups. Combined sparite and micrite occur only in marl clay fabrics and some of the mixed marl clay and silt fabrics, and is likely typical of marl clays. Specifically, the sparite-micrite combination is present in the following EMPP samples: all 5 marl clay fabrics, 11 (44%) of the 25 mixed Nile silt and marl clay fabrics, and 1 of the 7 Sinai silt and marl clay mixtures. Sparite by itself is rare and is found only in one mixed Nile silt and marl clay fabric, where it occurs with calcium carbonate powder, and two Sinai silt fabrics. Micrite occurs in 12 (48%) of the mixed Nile silt and marl clay wares, in 2 cases with powdered $CaCO_3$, and in 6 of the 7 mixed Sinai silt and marl clay fabrics. Micrite was also present in 2 (5.7%) of the 35 Sinai silt fabrics (in both cases together with shell), as well as in 3 (5.7%) of the 53 Nile silt samples (in one case together with shell). Shell, probably a natural inclusion, is found in a total of only six EMPP samples: two Sinai silt fabrics and four Nile silt fabrics. Four of these (2 Sinai and 2 Nile silts) also contain other forms of calcium carbonate. $CaCo_3$ powder is found predominantly in Nile silt pottery, where it occurs in 33 (62.3%) of the 53 samples. The only other EMPP samples with powdered $CaCO_3$ are four (16%) mixed Nile silt and marl clay samples, three of which also contain other forms of calcium carbonate (2 have micrite, 1 has sparite); and one (2.9%) of the thirty-five Sinai silt wares. Unspecified calcium carbonate was present in 13 (24.5%) of the Nile silt fabrics, 30 (85.7%) Sinai silt fabrics, and 10 of the 11 anomalous Sinai fabrics. Finally, in a miscellaneous grouping, one Nile silt sample contained no calcium carbonate; one Nile silt fabric included limestone; and one Sinai anomalous fabric contained $CaCO_3$ together with CaO.

Given the overwhelming percentage of EMPP samples containing calcium carbonate, it is clear that the presence of $CaCO_3$ in a clay fabric was considered desirable by the potters. If the calcium carbonate was not present naturally in a clay source deposit, it was added as a temper to the clay body. The parameters of this desirability, particularly as they relate to different clay types or combinations of clay types, different kinds and amounts of calcium carbonate, and different firing temperatures and atmospheres, require further investigation.

Three additional fabric attributes distinguished in the petrographic tables relate directly to the presence of calcium carbonate in the clay body: calcium oxide coated pores; burned carbonates; and "man-made fragments." As noted above, CaO coated pores (table 10.19) result from the decomposition of $CaCO_3$ during firing.

There appears to be no or only a limited relationship between the presence of such pores and carbonate source: CaO coated pores occurred both when the calcium carbonate was natural to the clay deposit and when it was added as temper. Not all samples containing calcium carbonate inclusions also exhibited calcium oxide coated pores, however. Only in the case of the marl clay fabric group did all of the examples contain both $CaCO_3$ and CaO coated pores. The presence or absence of calcium oxide coated pores therefore is likely a result of the manufacturing process. Of the total 136 EMPP samples, 83 (61%) exhibited such pores, broken down as follows: 25 (47.2%) of the 53 Nile silt samples; 25 (71.4%) of the 35 Sinai silt samples; 17 (68%) of the 25 mixed Nile silt and marl clay fabrics; 3 of the 7 Sinai silt and marl clay fabrics; 8 (72.7%) of the 11 anomalous Sinai fabrics; and all 5 of the marl clay fabrics.

Burned carbonates (table 10.19) comprise carbonate material exhibiting marked, heat-derived color variations (grey to black and brown instead of or along with the usual white or yellow or light buff). Such material was found in only 29 (21.3%) of the EMPP samples. Except for three cases of burned pores[94] from unknown causes (2 marl clay and 1 mixed marl clay and Nile silt examples), the burned carbonate matter appears to be residue from the manufacturing process that created the powdered calcium carbonate. Alternatively or additionally, the color variation could result from the presence of reduced organic material within the calcium carbonate (M. Morgenstein, personal communication). The distribution of the burned carbonates suggests that the material is associated specifically with temper introduced by the potter. Excluding the three samples with burned pores, 25 of the 26 EMPP samples containing burned carbonates are made of silt fabrics: 21 samples are composed of Nile silt, 4 of Sinai silt. The one remaining sample belongs to an anomalous Sinai fabric.

Man-made fragments denote distinctive and varying combinations of natural (mostly quartz sand) and man-made (mostly ash and powdered calcium carbonate) materials occurring together in a cement-like agglomeration. Such agglomerations represent materials that would have been mixed together by the potter and then added to the clay body as temper. The most common composition of the man-made fragments was quartz sand, ash, and calcium carbonate powder, although other combinations also occurred. One man-made fragment from Badrashein (W-75) contained melted aluminum. Man-made fragments were present in 60 (44.1%) EMPP samples (table 10.20). They occurred in 29 (54.7%) of the 53 Nile silt fabrics, 20 (57.1%) of the 35 Sinai silt fabrics; 8 (72.7%) of the 11 Sinai anomalous fabrics, and only 3 (12%) of the 25 mixed Nile silt and marl clay fabrics. None of the marl clay samples and none of the Sinai silt/marl clay combination fabrics contained man-made fragments.

The presence of man-made fragments in the ceramic paste seems to reflect the potter's use of a composite temper containing calcium carbonate. The presence of burned carbonate matter in a sample also seems to derive primarily from use of a calcium carbonate temper. It is not surprising, therefore, that both these inclusions occur most commonly in silt fabrics. This association with silt wares becomes even stronger if one combines the evidence of the two inclusion types. Man-made fragments or burned carbonates (excluding burned pores) or both occurred in the following: 34 (64.1%) of the 53 Nile silts; 21 (60%) of the 35 Sinai silts; 3 (12%) of the 25 mixed Nile silts and marl clays; and 8 (72.7%) of the 11 anomalous Sinai fabrics.[95] It is also important to note, however, that the following 30 EMPP samples containing

TABLE 10.14 Angular Quartz and Feldspar in EMPP Summary Petrographic Analysis

Sample	Manufacture	Fabric	Paste Type	Inclusions	Inclusions:	Quartz	Qtz&Feld	Mica	Rock	Magnetite	Pyroxene	Ash	Grog	Organic	Carbonate	Ca-Oxide	Burned	Man-Made*	Over	Magnetic
Number	Location	Type		%	Modal Grain Size	Rounded	Angular		Fragments	Hematite	Amphibole			Debris	Type	Coated Pores	Carbonate	Fragments	Fired	Sed. Type
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low

TABLE 10.15 Mica in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
5.10	Cairo	N	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			high
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.027	Sinai	SX	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low

TABLE 10.16 Rock Fragments in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	x Limestone		A	x	xx	xx	xx Bio-Sparite					med
W-22	Minya	N	Mud	30	MedSand	x			x Limestone			R		xx	xx Limestone					med
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	x Limestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	x Mudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	x Mudstone	M	A	xx			xx Micrite					low
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			x Quartz Sandstone	H	P	x			xx Sparite	x				med
W-66	Fayum	N	Mud	27	V.FineSand	x			xx Caliche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xx Caliche					xx	xx Micrite					med
W-65	Qena	M	Mud-Marl	62	Gran	R			xx LimeMudstone			R			xx Sparite,Micrite	x				low
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xx LimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xx LimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xx LimeMudstone	M	A				xx Sparite,Micrite					low
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xx LimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xx LimeMudstone	M,H	A	x			xx Micrite	R				med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xx MudLimestone	M	A	xx			xx Sparite,Micrite	x				med
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xx MudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xx MudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xx MudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xx MudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xx MudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xx MudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xx MudLimestone	M	A	x			xx Micrite	R				low
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xx MudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xx MudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xx MudLimestone	M,H		x			xx Sparite,Micrite	R				med
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xx MudLimestone	M		x			xx Sparite,Micrite					high
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xx MudLimestone	M,H	A,P				xx Micrite					low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xx MudLimestone			x			xx Micrite	x				med
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xx MudLimestone	M		x		R	xx Sparite,Powder			x		high
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xx MudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xx MudLimestone	M	A,P	x			xx Micrite***	x				low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xx MudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xx MudLimestone	M	A	x			xx Micrite***					low
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xx MudLimestone	M	P	x			xx Micrite					low
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xx Mudstone	M,H		x			x Marl Micrite	x				low
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xx Mudstone	M		x			xx Sparite,Micrite	R				high
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xx Mudstone	M	A,P	xx			xx Micrite	x				med
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xx Mudstone	M	A	x			xx Micrite					high
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xx Mudstone	M,H	A	xx			xx Micrite	x				med
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xx Mudstone	M		x			xx Micrite					low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xx Mudstone	M,H	A	xx			xx Micrite	x				low
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xx Mudstone	M		x		x	xx Powder	x		x		high
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xx Mudstone***	M,H	A,P	x			x Micrite					low
13.027	Sinai	SX	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low

TABLE 10.17 Grog in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-10	Samannud	N	Silt	46	CreSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-14	Samannud	N	Sandy Silt	65	V.CreSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-28	Samannud	N	Silt	15	CreSand	xx				M		xx	R	R	xx Powder		x			med
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-73	Cairo	N	Silt	18	Cre-FineSand	R		x		M	P	x	R		xx Powder			x		med
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	x			high
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
13.037	Sinai	SS	Silt	38	Cre&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
W-03	Samannud	N	Silt	38	V.Cre&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Cre-CreSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-16	Samannud	N	Silt	11	V.Cre-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Cre&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-20	Minya	N	Silt	43	Gran-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CreSand	xx		x				R	x	x	xx	x	x	x		med
W-29	Abu Raguan	N	Silt	61	V.CreSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
5.04	Cairo	N	Silty Mud	37	Cre-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			x		high
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
16.01	Badrashein	N	Silt	40	Gran-V.CreSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Cre&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.010	Sinai	SS	Clay-Silt	65	Cre-MedSand	xx				H		x	x		xx	R		x		high
13.019	Sinai	SS	Silt	33	V.Cre-CreSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.047	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x	x		xx	x				med
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
W-09	Samannud	N	Silt	18	V.CreSand	xx	x	x		M	A	x	xx		x					low
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	x Limestone		A	x	xx	xx	xx Bio-Sparite					med
W-31	Abu Raguan	N	Silt	24	V.CreSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-52	Minouf	N	Silt	20	Gran-V.CreSand	xx		x	x Limestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
14.06	Abu Ragúan	N	Silt	10	V.CreSand	xx		x		M	A	xx	xx	x						high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low

TABLE 10.18 Organic Debris in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-28	Samannud	N	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				low

TABLE 10.19 Calcium Carbonate Type in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.10	Cairo	N	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			high
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				low
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low

TABLE 10.19 Calcium Carbonate Type in EMPP Summary Petrographic Analysis con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.026	Sinai	SK	Silt	15	MedSand	xx						x			xx	x				med
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	x Limestone		A	x	xx	xx	xx Bio-Sparite					med
W-22	Minya	N	Mud	30	MedSand	x			x Limestone			R		xx	xx Limestone					med
W-66	Fayum	N	Mud	27	V.FineSand	x			xx Caliche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xx Caliche					xx	xx Micrite					med
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xx MudLimestone	M	A	x			xx Micrite	R				low
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xx Mudstone	M	A,P	xx			xx Micrite	x				med
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xx Mudstone	M	A	x			xx Micrite					high
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	x Mudstone	M	A	xx			xx Micrite					low
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xx Mudstone	M,H	A	xx			xx Micrite	x				med
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xx MudLimestone	M,H	A,P				xx Micrite					low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xx LimeMudstone	M,H	A	x			xx Micrite	R				med
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xx MudLimestone	M	P	x			xx Micrite					low
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xx Mudstone	M		x			xx Micrite					low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xx Mudstone	M,H	A	xx			xx Micrite	x				low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xx MudLimestone			x			xx Micrite	x				med
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xx MudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xx MudLimestone	M	A,P	x			xx Micrite***	x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xx MudLimestone	M	A	x			xx Micrite***					low
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xx LimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xx LimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-28	Samannud	N	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xx Mudstone	M		x		x	xx Powder	x		x		high
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			x Quartz Sandstone	H	P	x			xx Sparite	x				med
W-65	Qena	M	Mud-Marl	62	Gran	R			xx LimeMudstone			R			xx Sparite,Micrite	x				low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xx MudLimestone			x			xx Sparite,Micrite	R				med

TABLE 10.19 Calcium Carbonate Type in EMPP Summary Petrographic Analysis con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

some form of calcium carbonate also contained no burned carbonates, no man-made fragments, and no CaO coated pores: 15 (28.3%) of the Nile silt fabrics, 4 (11.4%) of the Sinai silt fabrics, 8 (32%) of the mixed Nile silt and marl clay fabrics, and 4 of the mixed Sinai silt and marl clay fabrics.

Lastly, the magnetic sediment type, or magnetic susceptibility (table 10.21), was recorded for each sample.[96] This was characterized as low (0-2.5 SI), medium (2.6-4.8 SI), or high (5.0-17.1 SI). Low values reflect calcareous sediments or sediments derived from reducing environments. High values indicate sediments derived from oxidizing terrigenous environments or a combination of highly magnetic inclusions with varying sediment types. Medium values derive from some combination of reduced or calcareous sediments with highly magnetic inclusions. Firing temperatures also can affect magnetic value readings: higher temperatures generally result in higher readings. Table 10.21 lists the range of magnetic values for the various fabric types. As expected, the five marl fabric samples fall into the low (4 samples) or medium (1 sample) range. Mixed Sinai silt and marl clay fabrics also had low (6 samples) or medium (1 sample) readings. Mixed Nile silt and marl clay fabric readings were more variable, however: seven (28%) samples were in the high, ten (40%) in the medium, and eight (32%) in the low range. The Nile silt fabrics were also quite variable, ranging again from high (16 samples or 30.2%) to medium (24 samples or 45.3%) to low (13 samples or 24.5%). The Sinai silts were equally unpredictable, with nine (25.7%) samples falling into the high range of values, thirteen (37.1%) into the medium range and thirteen (37.1%) into the low range. Finally, of the 11 anomalous Sinai fabrics, 3 had high readings, 2 had medium readings, and a majority of 6 had low readings. The Sinai values as a whole fall dominantly into the medium and low categories: of the total 53 samples from Sinai, 16 (30.2%) had magnetic susceptibility readings in the medium range and almost half, 25 (47.2%), had readings in the low range. Given the unpredictable and wide range of readings especially among the silts, it is clear that additional work is needed to determine which specific ceramic variables influence magnetic readings, to what extent, and under what conditions. In particular, the definitions of high, medium, and low values may need to be reworked as the technique is refined and tested further.

Discussion

The findings of the petrographic study suggest that a number of significant similarities and differences exist among the various elements of the EMPP ceramic corpus. Before considering these in greater detail, however, it is important also to recognize the limitations of the study. First, the petrographic review itself was designed specifically to provide a rapid, summary evaluation of the ceramic assemblage. Grain frequency counts and grain size statistics were therefore not incorporated into the analysis. Second, and far more seriously, the assemblage itself is both limited in size and highly biased. Samples come predominantly from northern locations. Other areas of Egypt are poorly represented or not represented at all; consequently, various fabric types and manufacturing traditions are mostly or entirely missing from the collection. Within the EMPP sample population, individual ceramic subgroups are seriously underrepresented. In particular, the five marl clay specimens (only 3.7% of the total 136 EMPP samples) cannot by themselves produce meaningful results about marl clay fabrics.[97] Similarly, the seven mixed Sinai silt and marl clay samples (5.1% of the corpus) alone are not significant; these may, however, be combined where appropriate with either the 35 Sinai silt (25.7% of the assemblage) and 11 anomalous Sinai

TABLE 10.20 Man-Made Fragments in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRP**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high

TABLE 10.21 Fabric and Magnetic Susceptibility in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
5.10	Cairo	N	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			high
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		high
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					high
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						high
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-28	Samannud	N	Silt	16	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					med
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					med
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				med
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high

TABLE 10.21 **Fabric and Magnetic Susceptibility in EMPP Summary Petrographic Analysis con't.**

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.006	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	-x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med

TABLE 10.21 Fabric and Magnetic Susceptibility in EMPP Summary Petrographic Analysis con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.006	Sinai	SX	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SX	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.094	Sinai	SX	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high
13.022	Sinai	SX	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.027	Sinai	SX	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.031	Sinai	SX	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.075	Sinai	SX	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.080	Sinai	SX	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.086	Sinai	SX	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.026	Sinai	SX	Silt	15	MedSand	xx						x			xx	x				med
13.088	Sinai	SX	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
\# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

samples (8.1% of the corpus) to produce a larger and more significant Sinai sample group (53 samples or 39% of the corpus), or with the mixed Nile silt and marl clay group to produce a larger mixed clay group (23.5% of the corpus). The anomalous Sinai fabric group is a miscellaneous, non-homogeneous category; as such the number of samples involved is largely irrelevant to issues of fabric characterization. The other fabric categories are larger: the 53 Nile silt samples constitute 39% of the EMPP pilot phase assemblage; the 25 mixed Nile silt and marl clay fabrics are 18.4% of the total corpus, and, as noted above, the 35 Sinai silt samples represent 25.7% of the assemblage. For these more extensive sample groups, fabric characterizations may be regarded as preliminary and suggestive, provided that the geographic bias of the samples is recognized.

Several striking similarities occur among all the fabrics included in the EMPP pilot phase assemblage, whether originating in Egypt or in the Sinai. As discussed above, virtually all of the samples contained rounded quartz inclusions, calcium carbonate inclusions, and ash temper. These similarities seem to reflect both common characteristics of raw material sources and related general manufacturing techniques. Without additional information it is difficult to say more. It is the differences among the samples, and especially among the various sample groups, however, that are most useful in developing preliminary characterizations of the modern ceramic fabric types.

Three basic fabric types employed by modern traditional Egyptian potters are included in the EMPP assemblage: marl clays, Nile silts, and mixtures of marl clays and Nile silts. Also represented are two additional primary fabric types: Sinai silt and mixed Sinai silt and marl clay. Each of these five main fabric types, or, on occasion, combined groups of types (such as Sinai fabrics or mixed clay fabrics) displays a distinctive attribute profile that distinguishes it from the other types.

The five marl clay samples in the EMPP corpus are characterized by large amounts (39%-62%) of inclusions in the groundmass, a granular modal grain size, a unimodal grain size distribution, and the presence of sedimentary rock fragments. Sparite and micrite occur together in all samples along with CaO coated pores. Rounded quartz and mica, so common in other fabric categories, were absent or rare. The magnetic susceptibility readings for the marl clay group ranged from low to medium.

The fifty-three Nile silt ceramic samples were characterized by greatly variable inclusion amounts, ranging from only 3% to as much as 65% of the fabric paste. Modal grain size was equally variable, although the coarse grain size fraction predominated in 69.8% of the samples. Grain size distribution, however, was overwhelmingly (83%) unimodal. Abundant quantities of rounded quartz occurred in all but ten of the Nile silt samples; only one specimen contained no rounded quartz at all. One or more of the four heavy minerals examined in this study also occurred in the vast majority (81.1%) of the Nile silt fabrics, as did ash temper (86.8% of samples). Three-quarters (76%) of the samples contained mica, and slightly more than half (54.7%) included angular quartz and feldspar grains. Grog was present in more than two-thirds (69.8%) of the Nile silts; just under half (47.2%) had common or abundant amounts. Similarly, almost two-thirds (64.2%) of the Nile silt fabrics included some organic material; in 39.6% of the samples the organics occurred in common to abundant quantities. Calcium carbonates were present in all but one of the Nile silt samples; just under two-thirds (66%) contained abundant amounts. Where the type of $CaCO_3$ could be identified (39 samples), the calcium carbonate was predominantly (33 samples) powdered; this almost definitely represents temper. Just under half (47.2%

in both cases) of the Nile silt samples had CaO pores and burned carbonates, and almost two-thirds (64.1%) contained man-made fragments, reflecting, as noted above, the purposeful addition of a mixed composition temper. Magnetic susceptibility for the Nile silts was completely variable and ranged from low to high.

The thirty-seven mixed marl clay and silt fabrics (Nile silt and Sinai silt) exhibited a number of features in common. Almost two-thirds (65.6%) were characterized by a medium to fine modal grain size fraction; just under this amount (62.5%) had a bimodal, or occasionally (2 examples) even trimodal, grain size distribution. All contained sedimentary rock fragments, rounded quartz, and calcium carbonate. Almost all (92%) contained ash; but very few (only 12%) included organics. In 81.1% of the fabrics the calcium carbonate included micrite; in almost one-third (19.7%) of the samples it consisted of sparite and micrite. Most (62.5%) of the samples had CaO coated pores, but very few (9.4%) contained man-made fragments.

Some apparent differences did exist between the marl clay mixtures made from Nile silt and those from Sinai silt, although the small size especially of the Sinai silt mixed sample group makes the findings suspect without additional corroboration. The 25 mixed Nile silt and marl clay fabrics had highly variable percentages of inclusions in the groundmass (18%-73%). The 7 mixed Sinai silt and marl clay samples were more consistent; all contained 50% to 65% inclusions. A bare majority (56%) of the Nile silt mixes exhibited a medium to fine modal grain size fraction, as opposed to all of the Sinai silt mixed samples. Almost all (96%) of the Nile silt mixtures contained one or more heavy minerals; 60% included angular quartz and feldspar grains; and about one-third (32%) had mica. None of the Sinai silt mixes included a heavy mineral, only two samples contained angular quartz and feldspar grains, and four contained mica. The Nile silt and marl clay fabrics had a magnetic susceptibility ranging from low to high; six of seven mixed Sinai silt and marl clay samples gave low magnetic readings and the other value was medium.

The thirty-five Sinai silt samples were characterized by a wide range (15%-68%) of inclusion amounts in the ceramic paste; however, just under half (48.6%) had groundmasses with one-third to one-half (33-49%) inclusions. The Sinai silts were split almost evenly between coarse (54.2%) and medium-fine (45.7%) modal grain size fractions, but 91.4% of the samples exhibited a unimodal grain size distribution. All included abundant rounded quartz and almost all (97.1%) had ash. Few contained angular quartz and feldspar grains (11.4%), mica (15.1%), grog (22.9%), or heavy minerals (28.5%); none had organic material. All of the Sinai silt samples contained calcium carbonate, in all but one case in abundant amounts; but in only five samples (14.3%) could the type, which varied, be distinguished. CaO coated pores were present in 71.4% of the samples; man-made fragments occurred in 57.1%. Only 11.4% of the Sinai silt fabrics exhibited burned pores. The magnetic susceptibility readings were unpredictable and ranged from low to high.

The combined Sinai group of 53 samples also exhibited a number of characteristic features in common. Three-quarters (75.5%) contained 33% or more inclusions in the groundmass. Half (49.1%) exhibited a coarse modal grain size fraction, and half (50.9%) had a medium-fine modal grain size fraction. All included abundant amounts of rounded quartz; almost all (92.4%) had ash. Few (13.2%) contained angular quartz and feldspar grains, heavy minerals (20.2%), or grog (22.6%). Only two anomalous samples included organics. All had abundant (50 samples) or common (3 samples) amounts of calcium carbonate; except for the mixed marl and silt category discussed above, the type of $CaCO_3$ generally could not be distinguished. More than two-thirds (67.9%) of the Sinai samples exhibited CaO coated pores. The magnetic susceptibility readings ranged from low to high, but almost half (47.2%) of the Sinai fabrics were in the low range and another 30.2% had medium readings.

Table 10.22 organizes the 136 EMPP samples analyzed petrographically by manufacturing location, known or surmised,[98] and fabric type. Manufacturing location is another potentially important variable that may influence ceramic appearance and paste characteristics. Unfortunately, the number of specimens available in the EMPP pilot phase assemblage for each of the sampled production locations is very limited; and a number of the attributions are not even secure. Until a larger, more reliable sample set becomes available, therefore, the following brief discussion should be regarded only as possibly suggestive of general trends. For those production sites represented in the EMPP corpus by four or more examples, the number and type of possible associations between manufacturing location and fabric attributes varied considerably. The seven samples from Abu Raguan showed the greatest internal consistency, with some degree of correlation in seven of the fifteen main attribute categories addressed in the summary petrographic study: the modal grain size fraction of all samples was very coarse or/to coarse; all had abundant rounded quartz; all but one sample contained heavy minerals (magnetite and amphibole); all contained ash, grog and organic debris; and all samples had medium or high magnetic susceptibility readings. The fourteen samples from Samannûd were consistent in five analytical categories: all had abundant rounded quartz; all contained one or more heavy minerals; all but one included ash; all but three contained grog; and all but four incorporated man-made fragments. The eight samples from Minouf exhibited correlations in four different analytical categories: all had comparatively low percentages of inclusions; all contained one or more heavy minerals; all but one included ash; and all but one was tempered with calcium carbonate in powdered form. Similarly, the four samples from El Qanatar were consistent in four areas: all contained comparatively low percentages of inclusions; all had abundant rounded quartz; all included one or more heavy minerals; and all contained common amounts of ash.

The remaining manufacturing locations exhibited internal correlations in two or fewer analytical categories. The group of nine samples from Minya had comparatively high inclusion percentages and all the samples contained ash.[99] Of the seven samples from the Gerzeh region, all but one contained ash and all but one had CaO coated pores. All five of the Fayum samples contained organic debris and gave medium or high magnetic susceptibility readings. Lastly, the twelve samples identified as originating in Cairo formed the least consistent grouping. The only attribute category these samples had in common was heavy minerals: all but one sample contained one or more heavy minerals.

Interestingly, the group of eight mixed marl clay and silt samples found in Sinai but attributed somewhat generically to Egypt also had associations in five different petrographic attribute categories: all contained rounded quartz; all included one or more heavy minerals; all contained calcium carbonate in the form of micrite; and all gave medium or low magnetic susceptibility readings. Similarly, the seven mixed silt and marl clay fabrics ascribed to the Sinai had associations in five different analytical categories: the percentage of inclusions in all samples varied only between 50-65%; five samples had modal grain sizes of medium and very fine sand (the remaining two were medium to very fine sand, and fine to very fine sand); all samples contained abundant rounded quartz; all had two or more heavy minerals; all but one sample included ash; and six samples had a low magnetic susceptibility reading (the other was in the medium range). Characteristics of the other Sinai fabrics have been reviewed above.

What is perhaps significant in the above account is the apparently considerable range in the number and type of attributes affected by manufacturing location. This may be the result of the very inadeqate sample. However, it also may be suggested, very tentatively at this point, that manufacturing location by itself is not as dominating or consistent an influence on paste attributes as other factors. Another potential variable influencing fabric attributes, not considered in this study due to insufficient data, is vessel form. It would be interesting to investigate whether identical forms produced at the same manufacturing site have similar or differing clay body attributes and to what degree; and, alternatively, whether the same form manufactured in different locations exhibits similar or different attributes. Far more data are needed, however, before such issues can be addressed adequately.

Finally, the findings of the petrographic study can be used to assess and refine the still evolving ware classification categories of the EMPP assemblage (tables 10.5A,B,E).[100] A similar procedure was followed initially to evaluate the basic fabric typology for the corpus; this resulted in an expansion of the initial field classification groupings (from table 10.5C to table 10.5D; see above). The revised basic fabric typology, derived from the different clay source material(s) used to create the clay body, now forms the primary fabric classification system of the EMPP ceramic assemblage. The more detailed ware typologies under discussion here represent secondary fabric subdivisions within the primary fabric categories.[101] Ultimately, however, both classifications are grounded in the pioneering research undertaken in recent years on ancient Egyptian fabric types and typologies by a number of scholars (e.g., Nordström and Bourriau 1993 and bibliography there).

The three alternative ware classification arrangements developed to date for the EMPP ceramic assemblage (tables 10.5A,B,E) represent variations of an "intuitive typology" (Sinopoli 1991, pp. 49-52): they were constructed by applying a combination of "pottery sense" (Shepard 1956, pp. 97-100) and more objective criteria (such as color or type of inclusions) to the assemblage. A certain amount of interpretation, of deciding which attributes or combinations of attributes are more important than others for categorization, is inherent and inevitable in this approach and generally accounts for the different groupings. In addition, there is invariably one and usually a whole series of samples that do not fit comfortably into any one category; these tend to migrate easily (with repeated viewing) from division to division even within a single typology. One consistent problem with the ware categories in all three arrangements is the limited sample size of the groups.

A few of the ware groupings appeared remarkably distinctive and coherent visually: these remained the same or nearly the same in all three classification arrangements. The two small groups of marl clays fall into this category (most likely because of their small sample size); they already have been discussed in detail and are not considered further here. Two Nile silt samples, W-21 and W-64 stood out as particularly coarse in all three ware systems; and five Nile silt samples (W-19, W-22, W-66, W-69, W-71) always clustered together in the Chaff-Tempered Nile Silt ware group. One Sinai ware type, the Orange-Brown Sandy ware, consistently incorporated the same twelve samples (13.1, 13.8, 13.10, 13.59-61, 13-67-72). The other ware groupings, however, with the exception of the inescapable anomalous category, were far more variable among the three typologies.

Table 10.5E represents the most recent revision of the EMPP ware typology, based on the petrographic study results as well as on several visual reviews of the fabric chips themselves. It is therefore discussed in detail. Table 10.23 organizes the summary petrographic analysis according to the ware classifications of table 10.5E.[102] In this arrangment of the data, several of the ware types stand out as especially homogeneous groupings. In particular, the Hard Buff Sinai ware and the Orange-Brown Sandy Sinai ware are notably consistent across the various attribute categories. The four examples of Hard Buff Sinai ware had virtually identical or identical paste types, inclusion percentages, and modal grain size categories (although two exhibited unimodal grain size distribution and two were bimodal); all contained abundant rounded quartz, sedimentary rock fragments, three or four of the heavy minerals, common amounts of ash, and calcium carbonate in the form of micrite; and all produced very low magnetic susceptibility readings (1 SI or less). The Orange-Brown Sandy Sinai ware category was not quite as consistent but still fairly uniform: all the samples had a clay-silt paste type, unimodal grain size distribution and coarse to/or medium modal grain size; all contained abundant rounded quartz; about half included one or two heavy minerals; all contained common amounts of ash and abundant amounts of calcium carbonates (identifiable only in one case); all but one had CaO coated pores; and most contained man-made fragments.

Other ware groupings were neither as distinctive nor as coherent. When compared by their various petrographic attributes, the different black Sinai ware groups were in reality not so different. Indeed, the four groups—Black Fine Sinai ware, Mixed Inclusion Black Sinai ware, Black Sandy Sinai ware and Black Fine Dense Sinai ware—corresponded quite closely with each other with three exceptions: the Fine group, represented unfortunately by only three samples, had a much lower percentage of groundmass inclusions (15%-18% vs. 25%-68% for the other groups) and a modal grain size fraction of fine or medium to fine (as opposed to coarse to/or medium); and the Fine Dense category had only one sample with calcium oxide coated pores. On the whole, however, it appears that the various Sinai Black ware categories should be collapsed together.

The Black Nile Silt ware group did differ significantly from the Sinai Black ware group, with one exception. Like the Sinai Black ware group, the Black Nile Silt ware group was fairly consistent internally. The exception, sample 13.121, had attributes more closely resembling those of the Sinai Black ware group with which it clearly belongs. Unlike the black Sinai group, all or almost all of the Black Nile Silt group contained angular quartz and feldspar, mica, two or three heavy minerals and grog. These correspondences suggest that the two other Sinai silt examples (13.37 and 13.40) placed in this category may, perhaps, be composed of Nile silt. Alternatively, however, it should be noted that unlike the other examples in the group, the two Sinai samples have a bimodal grain size distribution and contain no calcium carbonate powder or man-made fragments. This could indicate that they belong in a different category altogether. Unfortunately, without additional data, this question cannot be resolved at present.

The Sinai anomalous fabric category has been expanded in table 10.5E into a general anomalous ware category. All samples that do not fit into one of the other ware groupings found a home here, by definition.

TABLE 10.22 Manufacture Location and Fabric Type in EMPP Summary Petrographic Analysis

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
W-29	Abu Raguan	N	Silt	61	V.CreSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		high
W-31	Abu Raguan	N	Silt	24	V.CreSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					med
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
14.06	Abu Raguan	N	Silt	10	V.CreSand	xx		x		M	A	xx	xx	x						high
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		med
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
16.01	Badrashein	N	Silt	40	Gran-V.CreSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-73	Cairo	N	Silt	18	Cre-FineSand	R		x		M	P	x	R		xx Powder			x		med
5.04	Cairo	N	Silty Mud	37	Cre-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				med
5.10	Cairo	N	Silt	51	V.Cre-CreSand	xx		R		M	A	x			x	x	x			high
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			x		high
5.15	Cairo	N	Silt	10	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					high
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
W-50	Cairo	NM	Silt75 Marl25	46	Cre&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		med
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					low
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					high
5.08	Cairo	NM	Silt10 Marl90	30	Cre&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
5.09	Cairo	NM	Silt80 Marl20	25	V.Cre-Cre&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				med
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					low
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				med
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					low
13.050	Egypt	NM	Silt10 Marl90	70	V.Cre&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					low
W-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		x		med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
9.03	Gerzeh	NM	Silt75 Marl25	30	Cre-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					high
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CreSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			low
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
W-52	Minouf	N	Silt	20	Gran-V.CreSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		med
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		low
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					high
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				low
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
W-62	Minouf	N	Silt	30	Cre&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
W-19	Minya	N	Mud	40	V.Cre&MedSand		x	x				x		xx	xx Powder		x	x		med
W-20	Minya	N	Silt	43	Gran-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		med
W-21	Minya	N	Silt	55	CreSand	xx		x				R	x	x	xx	x	x	x		med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				high
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				med
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				high
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				low
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt80 Marl20	33	Cre-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high

TABLE 10.22 Manufacture Location and Fabric Type in EMPP Summary Petrographic Analysis con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		low
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				low
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	high
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	high
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			low
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					low
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		med
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		med
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		low
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		low
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		high
W-28	Samannud	N	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			med
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		high
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			high
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		low
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		low
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				low
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				med
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					low
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				low
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				low
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					low
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		high
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				med
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		high
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				low
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				med
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				low
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					low
13.059	Sinai	SS	Silt	58	Crs-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	x		x		high
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		high
13.061	Sinai	SS	Clay-Silt	27	Med-FineSand	xx		x				x			xx	R	x	x		high
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		high
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		high
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		low
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				med
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		low
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		med
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				med

TABLE 10.22 Manufacture Location and Fabric Type in EMPP Summary Petrographic Analysis con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				med
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		low
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		med
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		high
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		low
13.026	Sinai	SK	Silt	15	MedSand	xx						x			xx	x				med
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				low
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				low
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		low
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		low
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		med
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		high

R=Rare
x=Common
xx=Major Concentration
* Man-Made Fragments are carbonate with ash and/or quartz, among other items.
**Igneous Rock Fragment (IRF) with quartz and pyroxene.
*** The paste is a clay-mud due to finely ground mudstone.
Note: Bio-CaCO3=biocarbonate as a variety of shell fragments.
Note: Inclusions include temper and grains natural to the paste.
Magnetic Sediment Type: Low=carbonate or reducing mud; High=oxidizing terrigenous sediment or high magnetic temper; Medium = reducing sediment + high magnetic temper.
Note: Bio-Sparite=Large crystals of calcium carbonate shell material.
# Igneous Rock Fragment (IRF) with quartz and amphibole.
V.=Very
Gran=Granule
Crs=Coarse
Med=Medium

Note: Clay is both a mineral and a grain size of 3.9 microns and smaller.
Mud=A 50/50% mixture of clay and silt.
Mud-Marl=A lime-mud ("marl clay")
Micrite=fine grained calcium carbonate.
Sparite=large non-organic sourced crystals of calcium carbonate such as 'Egyptian alabaster' and limestone.
Muddy Silt=A silt with a clay content between 0-25%.
Silty Mud=A mud with a silt content greater than 50%.
Clay-Silt=A silt with a clay content from 26-49%.
Clay-Mud=A mud with greater than 50% clay content.
M = Marl clay fabric
N = Nile silt fabric
NM = Mixed Nile silt - Marl clay fabric
SM = Mixed 'Sinai' silt - Marl clay fabric
SS = 'Sinai' silt fabric
SX = Anomalous 'Sinai' silt fabric

The mixed Nile silt and marl clay fabrics have been divided into two different ware categories based dominantly on texture: Mixed Smooth and Mixed Grainy. Comparison of the two groups in table 10.23, however, indicates that they resemble each other closely.[103] Only two attribute categories stand out as potential sources of difference: fewer than one-quarter of the Mixed Smooth category contained mudstone rock fragments as opposed to almost two-thirds of the Mixed Grainy group; and almost two-thirds of the Mixed Smooth wares contained calcium carbonate in the form of both sparite and micrite as opposed to one-sixth of the Mixed Grainy types. Certainly on the basis of the present corpus, it seems advisable to collapse these two ware categories into one.

The Nile silt category was the most difficult primary fabric type to subdivide into ware groups. Not coincidentally, it also contained the largest number of samples. Amount and type of inclusions and texture were used as the dominant sorting criteria for the Nile alluvial fabrics in table 10.5E. Apart from two extremely coarse fabric samples and a core group of straw/chaff-tempered pieces, discussed above, the ware group boundaries were mostly vague and represent somewhat arbitrary cutoff points along what is essentially a continuum. This is reflected in the lack of distinctive attribute clustering for the Sinai silt ware groupings in table 10.23. Similar problems were encountered in earlier attempts to organize the Nile silts according to related or additional classification criteria (tables 10.5A and 5B).[104] Apart from the chaff-tempered[105] and very coarse groups, only one Nile silt ware category from table 5E, Fine-grained Grainy, demonstrated unusually consistent petrographic attributes.[106] All of the samples in this group had a silt paste with an unusally low (10% or less) percentage of inclusions; all included rounded quartz and mica but no angular quartz and feldspar; all contained both magnetite and amphibole and powdered calcium carbonate; and none contained grog or burned carbonate or man-made fragments. It is also notable, however, that this category is the second smallest of all the Nile silt ware groupings, and it is therefore highly likely that the attribute consistency results from the small sample size.

The ware classification system of the EMPP assemblage remains dynamic, and the above discussion represents more of a work in progress than a final product. Further data manipulation and tinkering with various ware categories, especially among the Nile silts, may succeed in establishing additional, more satisfactory groupings. Future work will supplement the current limited sample collection and should help resolve a number of the issues under consideration. One generalized finding does seem to emerge, however, from the present study. For the most part, lumping appears to be a more effective strategy in creating usable typological categories for ceramic analysis than splitting.[107]

CHEMICAL ANALYSES

Chemical analyses were undertaken on 22 of the EMPP ceramic samples (table 10.24) in an effort to decipher their major and trace element signatures.[108] To provide a representative sample of the EMPP assemblage, specimens were chosen for analysis according to the following three major variables, listed in order of importance for selection: 1) basic fabric type (known or surmised); 2) manufacturing location (known or surmised); and 3) form and function of the pots.

Two examples (one each) from the two different marl clay fabrics in the EMPP pilot phase assemblage were included in the test group, along with 13 Nile silt samples.

TABLE 10.23 Summary Petrographic Analysis Organized by Final Revised Fabric Groupings

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic in SI
5e: Nile Silt Very Coarse																				
W-21	Minya	N	Silt	55	CrsSand	xx		x				R	x	x	xx	x	x	x		4.8
W-64	Fayum	N	Silt	60	V.CrsSand	xx		R		M	A	x	xx	xx	xx	x	x	x		6.6
5e: Nile Silt Chaff																				
14.06	Abu Raguan	N	Silt	10	V.CrsSand	xx		x		M	A	xx	xx	x						5.3
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					3.1
W-66	Fayum	N	Mud	27	V.FineSand	x			xxCaliche					xx	xx Micrite					3.2
W-71	Fayum	N	Mud	38	Crs&FineSand	xx	x					x		xx	xx Powder					3.4
W-19	Minya	N	Mud	40	V.Crs&MedSand		x	x				x		xx	xx Powder		x	x		2.9
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					3.6
W-13	Samannud	N	Mud	45	Med-FineSand	xx	x	x	xLimestone		A	x	xx	xx	xx Bio-Sparite					3.8
5e: Nile Silt Coarse																				
14.05	Abu Raguan	N	Silt	12	V.CrsSand	xx	x	x		M	A	R	R	R	R	x				2.9
14.02	Abu Raguan	N	Silt	20	CrsSand	xx		x				x	x	xx	xx					2.9
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Crs-CrsSand	xx	x			M	A	x	xx	xx	x Powder	R		x		2.9
W-31	Abu Raguan	N	Silt	24	V.CrsSand	xx		x	R Granite(white)	M	A,P: Rare	x	xx	x	x Bio-CaCO3,some					3.8
14.03	Abu Raguan	N	Silty Mud	26	V.CrsSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					7.7
W-29	Abu Raguan	N	Silt	61	V.CrsSand	xx	x	x		M	A	xx	x	R	xx	x	x	x		14.4
W-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		2.8
5.04	Cairo	N	Silty Mud	37	Crs-V.FineSand	xx	x	x		M,H	A,P	R	x	R	x Bio-CaCO3,Powder	x				3.5
5.13	Cairo	N	Silt	28	Crs-MedSand	xx	x					x	x	R	xx Powder			x		5.0
5.10	Cairo	N	Silt	51	V.Crs-CrsSand	xx		R		M	A	x			x	x	x			12.4
W-68	Fayum	N	Silt	18	V.CrsSand	xx	R	x		M	A		x	R	xx Powder	x		x		3.5
W-70	Fayum	N	Silt	40	CrsSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		5.2
W-62	Minouf	N	Silt	30	Crs&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		1.4
W-52	Minouf	N	Silt	20	Gran-V.CrsSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					3.0
W-55	Minouf	N	Muddy Silt	35	Gran&V.FineSand	xx	x			M,H	A	xx			xx Powder	R	x	x		3.5
W-20	Minya	N	Silt	43	Gran-CrsSand	xx		x		M,H	A	x	x	R	xx	R	x	x		3.4
W-14	Samannud	N	Sandy Silt	65	V.CrsSand	xx	x	x		M	A	xx	R		x	x	x	x		1.6
W-16	Samannud	N	Silt	11	V.Crs-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		1.6
W-09	Samannud	N	Silt	18	V.CrsSand	xx	x	x		M	A	x	xx		x					2.1
W-06	Samannud	N	Silt	30	MedSand	xx	x	x		M	A		x	x	x	x	x			2.1
W-07	Samannud	N	Silt	40	V.Crs-CrsSand	xx	x	x		M		xx	x		x Powder	R		x		2.3
W-10	Samannud	N	Silt	46	CrsSand	xx	x			M,H	A	x	R		xx Powder	x		x		2.8
W-12	Samannud	N	Silt	41	Gran-MedSand	xx	x			M,H		xx	x	x	xx Powder	x	x	x		4.4
W-28	Samannud	N	Silt	15	CrsSand	xx				M		xx	R	R	xx Powder		x			4.8
4.01	Samannud	N	Silt	15	Crs-FineSand	xx	x					R	R		xx Powder	R	x			6.2
W-17	Samannud	N	Silt	25	Crs&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		10.9
W-03	Samannud	N	Silt	38	V.Crs&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	17.0
W-01	Samannud	N	Silt	43	Crs-MedSand	xx		R		M	A	x			xx Powder	x		x	x	17.1
13.003	Sinai	SS	Silt	23	V.Crs&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	9.8
5e: Nile Silt Fine-grain smooth																				
W-18	Alexandria	N	Silt	18	FineSand	xx	x	x		M	A	x	R	R	x		x	R		4.7
W-57	Minouf	N	Silt	05	FineSand	xx				M,H	A,P	xx			xx Powder	x		x		1.7
W-61	Minouf	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					1.7
W-54	Minouf	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		2.6
W-58	Minouf	N	Muddy Silt	20	Med&V.FineSand	x	x			M		xx	R	x	xx Powder					5.8
15.04	Qanatar	N	Silt	09	MedSand	xx		x		M,H	A,P	x	R		xx Powder		x	x		1.6
W-30	Samannud	N	Muddy Silt	30	Gran&V.FineSand	xx	x	x		M,H	A,P	xx		R	xx Powder		x	x		5.1
W-08	Samannud	N	Mud	36	V.Crs&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		7.3
5e: Nile Silt Fine-grain grainy																				
5.15	Cairo	N	Silt	10	CrsSand	xx		x	R Granite(red)	M	A			x	x Powder					6.5
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				2.1
W-59	Minouf	N	Silt	03	MedSand	R		x		M	A	x		x	xx Powder	x				1.7
15.03	Qanatar	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					2.8
13.019	Sinai	SS	Silt	33	V.Crs-CrsSand	xx	x			M	A	xx	x		xx	x	x		x	1.1

TABLE 10.23 Summary Petrographic Analysis Organized by Final Revised Fabric Groupings con't.

Sample	Manufacture	Fabric	Paste Type	Inclusions	Inclusions:	Quartz	Qtz&Feld	Mica	Rock	Magnetite	Pyroxene	Ash	Grog	Organic	Carbonate	Ca-Oxide	Burned	Man-Made"	Over	Magnetic
Number	Location	Type		%	Modal Grain Size	Rounded	Angular		Fragments	Hematite	Amphibole			Debris	Type	Coated Pores	Carbonate	Fragments	Fired	in SI
5e: Marl Clay Orange																				
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoresCaCO3			0.8
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoresCaCO3			0.9
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CrsSand				xxMudLimestone			x			xx Sparite,Micrite	x				1.3
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CrsSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				3.4
5e: Marl Clay Grey																				
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				2.5
5e: Mixed Smooth																				
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,Micrite					0.6
5.06	Cairo	NM	Silt10 Marl90	30	Crs&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				3.5
5.09	Cairo	NM	Silt80 Marl20	25	V.Crs-Crs&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				3.7
W-51	Cairo	NM	Silt75 Marl25	31	Crs-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoresCaCO3	x		4.4
5.01	Cairo	NM	Silt55 Marl45	40	Med-V.FineSand	xx	x		xxMudLimestone	M,H	A	xx			xx Sparite,Micrite					5.3
9.03	Gerzeh	NM	Silt75 Marl25	30	Crs-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				2.7
10.08	Gerzeh	NM	Silt65 Marl35	20	MedSand	xx			xxMudstone	M	A	x			xx Micrite					5.4
7.12	Hurghada	NM	Silt85 Marl15	35	Crs-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					5.3
2.01	Minya	NM	Silt40 Marl60	65	Med&V.FineSand	x	x	x	xxMudLimestone	M	A	x			xx Micrite	R				1.4
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				3.1
1.10	Minya	NM	Silt50 Marl50	73	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	x				3.1
1.12	Minya	NM	Silt45 Marl55	65	Med&V.FineSand	xx	x		xxMudLimestone	M,H	A	x			xx Sparite,Micrite	R				8.9
13.200	Sinai	NM	Silt80 Marl20	35	Med-FineSand	xx			xxMudstone	M,H	A	xx			xx Micrite	x				1.4
5e: Mixed Grainy																				
W-39	Cairo	NM	Silt95 Marl05	25	V.Crs-CrsSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				1.0
W-50	Cairo	NM	Silt75 Marl25	46	Crs&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				3.5
13.034	Egypt	NM	Silt70 Marl30	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P				xx Micrite					0.1
13.013	Egypt	NM	Silt70 Marl30	25	MedSand	xx	x	x	xMudstone	M	A	xx			xx Micrite					1.1
13.081	Egypt	NM	Silt80 Marl20	18	Med-FineSand	xx			xxMudstone	M		x			xx Micrite					2.1
13.050	Egypt	NM	Silt10 Marl90	70	V.Crs&Med&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				2.7
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx Micrite	x				3.4
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				6.2
15.02	Qanatar	NM	Silt80 Marl20	33	Crs-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		6.3
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		13.0
13.011	Sinai	NM	Silt98 Marl02	26	Crs-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					1.0
13.204	Sinai	NM	Silt10 Marl90	60	Med-FineSand	xx			xxMudLimestone			x			xx Micrite	x				2.9
5e: Sinai, Orange Brown Sandy																				
13.069	Sinai	SS	Clay-Silt	53	CrsSand	xx						x			xx			x		2.8
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				4.2
13.070	Sinai	SS	Clay-Silt	60	CrsSand	xx						x			xx	R				4.4
13.068	Sinai	SS	Clay-Silt	34	CrsSand	xx				H	P	x	x		xx	x		x		4.6
13.067	Sinai	SS	Clay-Silt	46	Crs-MedSand	xx					P	x			xx	x				6.1
13.072	Sinai	SS	Clay-Silt	49	MedSand	xx						x			xx	R	x	x		6.2
13.010	Sinai	SS	Clay-Silt	65	Crs-MedSand	xx				H		x	x		xx	R		x		7.0
13.060	Sinai	SS	Clay-Silt	48	MedSand	xx						x			xx	x		x		8.4
13.071	Sinai	SS	Clay-Silt	52	CrsSand	xx				M	A	x			xx	x		x		9.6
13.001	Sinai	SS	Clay-Silt	47	MedSand	xx				H		x	x		xx	x		x		10.3
5e: Sinai, Hard Buff																				
13.021	Sinai	SM	Silt50 Marl50	50	Med-V.FineSand	xx		R	xxMudLimestone	M	A,P	x			xx Micrite***	x				0.4
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					0.8
13.005	Sinai	SM	Silt50 Marl50	55	Med&V.FineSand	xx		R	xxMudLimestone	M,H	A,P	x			xx Micrite***					1.0
13.030	Sinai	SM	Silt50 Marl50	55	Fine-V.FineSand	xx			xxMudLimestone	M	A	x			xx Micrite***					1.0
5e: Sinai Black Fine																				
13.115	Sinai	SS	Clay-Silt	16	Med-FineSand	xx						x			xx	x		x		3.4
13.116	Sinai	SS	Clay-Silt	18	FineSand	xx						x			xx	x				3.9
13.117	Sinai	SS	Clay-Silt	15	Med-FineSand	xx						x			xx	x				3.8
5e: Black, Mixed Inc.																				
13.106	Sinai	SS	Clay-Silt	40	CrsSand	xx						x			xx			x		2.2
13.039	Sinai	SS	Clay-Silt	38	Crs-MedSand	xx						x			xx	x				2.3
13.109	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x				3.9
13.100	Sinai	SS	Clay-Silt	45	CrsSand	xx						x			xx	x		x		4.1

TABLE 10.23 Summary Petrographic Analysis Organized by Final Revised Fabric Groupings con't.

Sample Number	Manufacture Location	Fabric Type	Paste Type	Inclusions %	Inclusions: Modal Grain Size	Quartz Rounded	Qtz&Feld Angular	Mica	Rock Fragments	Magnetite Hematite	Pyroxene Amphibole	Ash	Grog	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic in SI
5c: Sinai , Black Sandy																				
13.112	Sinai	SS	Clay-Silt	45	Crs-MedSand	xx						x			xx	x		x		0.9
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		1.2
13.042	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x			xx	x				1.6
13.122	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx	x		x		2.0
13.047	Sinai	SS	Clay-Silt	40	Crs-MedSand	xx						x	x		xx	x				3.1
5c: Black, Black Fine Dense																				
13.059	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					0.4
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		1.5
13.107	Sinai	SS	Clay-Silt	42	Crs-MedSand	xx						x			xx			x		2.2
13.049	Sinai	SS	Clay-Silt	48	MedSand	xx			R Granite		P	x			xx	x				2.2
13.119	Sinai	SS	Clay-Silt	55	MedSand	xx						x			xx			x		2.4
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					3.5
5c: Black Nile Silt																				
W-73	Cairo	N	Silt	18	Crs-FineSand	R		x		M	P	x	R		xx Powder			x		4.3
W-43	Sharqiya	N	Silty Mud	30	Med-FineSand	xx	x	R		M	A	x	x		xx Powder			x		2.3
W-47	Sharqiya	N	Silt	20	Fine-V.FineSand	x	x	x		M,H	P	xx	R		xx Powder			x		2.4
13.037	Sinai	SS	Silt	38	Crs&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					2.4
13.121	Sinai	SS	Clay-Silt	25	MedSand	xx						x			xx	x		x		2.7
13.040	Sinai	SS	Silt	45	Crs-MedSand&CrsSilt	xx	x	R		M	A	xx			xx Micrite					3.0
5c: Anom																				
16.01	Badrashein	N	Silt	40	Gran-V.CrsSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			8.4
13.058	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					0.4
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					1.0
13.080	Sinai	SK	Clay-Silt	65	CrsSand	xx						x			xx	x		x		1.1
13.028	Sinai	SM	Silt30 Marl70	55	Med&V.FineSand	xx			xxMudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				1.4
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		2.2
13.022	Sinai	SK	Sandy Silt	33	Gran-MedSand	xx						x	xx		xx			x		2.2
13.075	Sinai	SK	Silty Sand	52	Gran	xx							xx	xx	x	x				2.3
13.031	Sinai	SK	Clay-Silt	40	MedSand	xx						x			xx	x				2.3
13.086	Sinai	SK	Sandy Silt	30	Gran-MedSand	xx						x	xx		xx	x		x		2.4
13.088	Sinai	SK	Clay-Silt	47	Med-FineSand	xx						x			xx	R		x		2.9
13.026	Sinai	SK	Silt	15	MedSand	xx						x			xx	x				3.5
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				3.6
13.094	Sinai	SK	Clay-Silt	45	FineSand	xx						x	x		xx	R		x		8.4
13.006	Sinai	SK	Clay-Silt	30	Gran-CrsSand	xx						x		xx	xx	x	x	x		8.8
13.017	Sinai	SK	Clay-Silt	65	V.Crs-CrsSand	xx						x			xx			x		9.8

The latter incorporated two specimens each from the manufacturing locations of Samannûd, Minouf, Abu Raguan, and the Fayum. Additionally, three black fabrics, two from Sharqiya province and one from Cairo, all tentatively identified as Nile silt, were sent for analysis. Two further Nile silt samples of known composition from the Cairo region were tested: a specimen from El Qanatar composed only of Nile silt; and a coarse sample from Badrashein composed of Nile silt to which a bagged, powdered calcium carbonate had been added (see below). From the category of mixed Nile silts and marl clays came four samples: three provisionally identified as mixed fabrics from Cairo; and a fourth, from El Qanatar, with a known composition of two-thirds *tebbīn* clay and one-third Nile silt.[109] Lastly, three distinctive Sinai silt fabric samples from the Bedouin camp in Sinai were investigated: one each of the black fabric belonging to the large bowls and of the orange-brown sandy ware; and the very coarse *tab n* oven fragment. The manufacturing and clay source locations for these Sinai samples were unknown. It was assumed, however, that at least the *tab n* fragment was made of local material, given the comparatively large size and immobility of the oven and the coarseness of the clay body.

Within the two other parameters, comparability of form and function was chosen as a selection criteria on the assumption that similar concerns might influence the manufacture of vessels with identical forms or functions or both. The following vessels therefore were included in the study: four *azyār* water jars of Nile silt; three *ballās* jars, two of marl clay and one of Nile silt; four *'olall*, two of Nile silt, and two of mixed Nile silt and marl clay fabrics; three flowerpots (*'asāri*), one made of Nile silt, one of mixed Nile silt and marl clay, and one of orange-brown sandy Sinai silt fabric; two *abāri'* pitchers, one of mixed Nile silt and marl clay, one of black Nile silt; one cookpot (*b šа*) and one pipehead (*hağar*), both of black Nile silt; three different bowl types, two (a *tāğen* and *sahfa*) of Nile silt, and one of Sinai silt (large black bowl); and, finally, the *tab n* oven fragment from Sinai.

Certified chemical analyses of these 22 samples were carried out at XRAL laboratories in Don Mills, Ontario, Canada using neutron activation analysis (INAA), inductively coupled plasma analysis (ICP), and x-ray fluorescence spectrometry (XRF). In all, 50 elements were investigated for each sample. Of the 50 elements, nine (Be, Ge, As, Se, Mo, Ag, Cd, W, Ir) provided little information as the concentrations were at or below detection limits. The remaining 41 elements provided important information that permitted the geochemical fingerprinting of the samples. Complete findings are published in Redmount and Morgenstein (1996; results are summarized below).

The following questions were addressed in the chemical study:

(1) How accurate were the field assessments of basic fabric composition (e.g., Nile silt, marl clay, and so forth) inferred dominantly or completely from macroscopic visual analysis?

(2) Would the Sinai material, which was visually distinctive, also stand out chemically from the other samples?

(3) Was it possible to distinguish consistently among Nile silt fabrics, marl clay fabrics, and mixed Nile silt and marl clay fabrics?

(4) Could chemical distinctions be made between the mixed Nile silt and marl clay fabrics, and Nile silt fabrics with calcium carbonate inclusions?

(5) Was it at all possible to distinguish among the different Nile silt sources/manufacturing locations?

TABLE 10.24 EMPP Samples Sent for Chemical Analysis

Sample	Figure	Type	Source	Fabric	Comments
W-10	10.4.1	*ballāṣ*	Samannûd	Nile silt	Very hard/dense
W-12	10.8.3	*'olla*	Samannûd	Nile silt	Well-fired, hard, dense
W-31	10.12.4	*tāğen*	Abu Raguan	Nile silt	Canal muck, straw/chaff, mixed w/ash
W-39	10.8.6	*'olla*	Cairo	Mixed?	Light yellow/buff
W-43	10.9.1	*abrī'*	Sharqiya	Nile silt?	Hard, black, ribbed
W-47	10.9.2	*būša*	Sharqiya	Nile silt?	Black, ribbed
W-50	10.8.5	*abrī'*	Cairo	Mixed	Tan buff
W-51	10.8.4	*'olla*	Cairo	Mixed?	Fine, pink/buff
W-52	10.3.2	*zīr*	Minouf	Nile silt	Coarse, ext slip pre-firing
W-61	10.8.2	*'olla*	Minouf	Nile silt	Fine, few organics
W-64	10.2.1	*zīr*	Fayûm	Nile silt	Very coarse; pink wash inside
W-65	10.4.2	*ballāṣ*	Ballāš	Marl clay	Ochre wash interior; removed
W-71	10.7.2	*sahfa*	Fayûm	Nile silt?	Heavy chaff temper
W-73	10.9.7	*hağar*	Cairo	Nile silt?	Black, soft
11.3	10.5.3	*ballāṣ*	?	Marl clay	From road side near Gerzeh
13.75	not drawn	*tabūn*	Sinai	?	Presumably local clay, Bedouin oven
13.68	10.17.8	*'asreyya*	Sinai	?	Local? orange-brown sandy
13.115	10.13.1	bowl	Sinai	?	Large black bowl, v. hard/dense
14.9	10.3.3	*zīr*	Abu Raguan	Nile silt	Coarse
15.2	not drawn	*'asreyya*	Qanatar	Mixed	2/3 *tebbīn* clay, 1/3 Nile silt
15.4	10.16.8	*'asreyya*	Qanatar	Nile silt	Silt, no temper; from fields
16.1	10.3.1	*zīr*	Badrashein	Nile silt	Very coarse

The results of the chemical analyses, especially given the small sample size tested, were remarkably encouraging. The answer to questions (2) and (3) was a clear yes. Indeed, it is striking that some of the simplest, most straightforward chemical elements, reflecting some of the most fundamental chemistry ratios of clay minerals, functioned very successfully as discriminators for the four primary fabric paste types (Nile silt, marl clay, mixed Nile silt and marl clay, and Sinai silt) included in the chemical study. Two very basic scattergram plots successfully distinguished among the four fabric groups: a) major rock-forming mineral oxide formers (% silicon dioxide plus % aluminum oxide) plotted against total phosphorous pentoxide; and b) silicon dioxide/aluminum oxide ratio plotted against the ratio of transition metal oxides/ alkali metal oxides (Redmount and Morgenstein 1996, figs. 2-4).

The answers to questions (1) and (4) were related and more involved. All of the visual assessments of the sample sherds of unverified composition proved consistent with the chemical results with three exceptions, two from the Fayum and one from Badrashein. Visually, the two Fayum samples, W-64 and W-71, unquestionably resembled Nile silt. Yet both fabric pastes reacted to a dilute solution of hydrochloric acid and both usually clustered with the mixed rather than the Nile silt group in the chemical analyses. The petrographic analysis confirmed the visual classification of the two sherds as Nile silt fabrics, but also noted the presence of calcium carbonate inclusions. The anomalous silt sample from Badrashein (16.1) was known to have been produced from a mixture of Nile silt and a bagged calcareous powder that was almost certainly composed predominantly or entirely of calcium carbonate.[110] Although the main chemical characteristics of sample 16.1 matched those associated with the other Nile silts, the distributions of a small group of elements, including calcium, clustered instead with those of the three Sinai silt samples. More striking was the unique phosphorous content of the sample: it contained by far the highest phosphorous concentration of any of the samples investigated.

The summary petrographic study of the entire EMPP assemblage indicated, somewhat unexpectedly, that all of the ceramic samples except for one Nile silt specimen contained some quantity of calcium carbonate, and 133 of the 136 total samples contained common or abundant amounts of calcium carbonate. Apart from the two Fayum and one Badrashein samples, the Nile silt fabrics in the chemical analyses clustered together as a group in the key discriminator and many of the other scattergram plots. They, as well as the Badrashein sample, were easily distinguished from the mixed Nile silt and marl clay sample group.

The Fayum and Badrashein samples clearly contained particular ingredients or combinations of ingredients that produced unusual chemical signatures. The possibly anomalous natural composition of the Fayum samples has been discussed above, and it is perhaps the presence of evaporites in the two samples that accounts for their chemical clustering with the mixed fabrics. The reason(s) for the singular chemical behavior of the Badrashein sample are less clear. The calcium carbonate content of the clay body evidently is greater than that characteristic for the other Nile silt fabrics and closer to that of the Sinai silt samples. The high phosphorous content is certainly odd and it may be suggested, tentatively, that perhaps the Nile silt from which the pot was manufactured came from a source contaminated with fertilizer—possibly dredgings from a drainage canal? A more detailed understanding of the specific factors influencing the chemical behavior of these anomalous fabrics would require additional analyses. In the mean time, however, it is important to remember that both visually and petrographically the three chemically anomalous fabrics all would be classified with the Nile silt fabrics.

The answer to question (5) required additional in-depth evaluation of the analytical data, but in the end the response was a guarded yes. In this case distinguishing among the various Nile silt fabrics meant discriminating among the various manufacturing source locations. Specific analyses did indeed seem to do this, not only for the Nile silt fabrics but for all the other fabrics as well. The particular diagnostic analyses that functioned as "fingerprints" for each of the tested samples are summarized in table 10.25.

Discussion

The purpose of the chemical study of selected samples from the EMPP assemblage was to determine whether major and trace element signatures could be established for particular groups of ceramic samples. The study successfully achieved this aim: it proved possible to characterize chemically the basic fabric types of the EMPP corpus and even to discriminate among individual source locations, as well as to clarify details of manufacturing technology. Given the small sample size, however, the results can be regarded only as preliminary. Once sufficient geochemical data are available from both ancient and modern sources, and once it is established securely that ancient and modern ceramics from the same locations produce comparable chemical signatures, it should be possible to utilize the chemical fingerprints of modern Egyptian material to help source ancient ceramics. Known data can be used to establish chemical boundaries and fence plots that will discriminate specific fabric compositions and source locations. Effective application of the fingerprinting technique to the archaeological record, therefore, will require a comprehensive sampling of the geochemistry of ceramics from a wide variety of spatial and temporal contexts.

TABLE 10.25 Summary of Chemical Fingerprinting Techniques

SAMPLES	LOCATION	SOURCE MATERIAL	GEOCHEMICAL PLOTS USED FOR FINGERPRINTING										
			Sc to:	Hf to:	Rb to:	Th to	P2O5 to:	Ni to:	CaO to:	Ratio A*	Sr to:	Fe2O3 to:	Ratio B***
W10; W12	Samannud	Nile Silt	Co, B, Cs										
W31; 14.9	Abu Raguan	Nile Silt	Co, B, Cs	Co		Zn	SiO2 + Al2O3						
W43; W47	Zagazig	Nile Silt	Cs										
W52; W61	Minouf	Nile Silt	Co, B, Cs										
15.4	Qanatar	Nile Silt	Cs, Fe2O3									TiO2, Th	
W73	Cairo	Nile Silt	Cs, B										
13.68; 13.75; 13.115	Sinai	Sinai Silt			Mn, U				Ni, Sr	yes			
16.1	Badrashein	Mixed Nile Silt + Bagged CaCO3 or CaSO4	Fe2O3		U		SiO2+ Al2O3		Ni, Sr B, Th			TiO2	
W64; W71	Fayum	Mixed Nile Silt + CaCO3									Br	LOI**	
W50; W51; W39	Cairo	Mixed Nile Silt and Marl Clay	Fe2O3				SiO2 + Al2O3		Ni, Sr B, Th		Br		
15.2	Qanatar	Mixed Nile Silt and Marl Clay		Co		B		U, Cu					
W65; 11.3	Ballas/Qena; Gerzeh	Marl Clay	Th	Co	Mn, U Zn	B, Zn U,Cs Zr	SiO2 + Al2O3	Th, U Cu	Th	yes		Th	yes

These data are modified from Redmount and Morgenstein 1996, Table 7, p. 760.

The geochemical scattergram plots are used both to discriminate among basic fabric types (Nile silt, marl clay, and so forth) and to fingerprint manufacturing/source locations.

* Ratio A = SiO2/Al2O3 to [Fe2O3+MnO2+TiO2]/Alkali Metal Oxides

** LOI = loss of volatiles

*** Ratio B = Fe2O3/Al2O3 to CaO/Al2O3

5. Major Findings and Future Research Directions

The results of the pilot phase research of the Egyptian Modern Pottery Project have been most encouraging and provide convincing support for the usefulness of a ceramic ethnoarchaeological approach to ancient Egyptian pottery. The integrated methodology adopted by the project, which combines archaeological ceramic collection and analysis techniques with ethnographic fieldwork involving potters and pottery retailers, seems to have worked well and holds considerable promise for future inquiries. Discussions with and observations of potters and retailers, although limited in number, have helped to underscore the diverse data available from such sources. Fieldwork with modern traditional potters in Egypt can provide a mine of invaluable information on ceramic raw materials and production processes. Clay and temper types and sources can be examined and sampled; differing manufacturing techniques can be studied; and the results of the entire production process can be seen in the finished end products, which can in turn be sampled and analyzed and related back to their constituent raw materials and the manufacturing process. Interactions with potters and retailers have underscored both the existence of strong regional and local ceramic traditions and the need for further research into those traditions. The character and causes of local, regional, and national differences and similarities in ceramic manufacturing, distribution and usage patterns should be investigated in far more detail; results of such work have potential implications for our understanding of ancient Egyptian ceramics as well.

The EMPP pilot phase ceramic assemblage, collected from a variety of available sources ranging from refuse collections to potters themselves, has provided a preliminary basis for discussions of form, function and fabric in modern Egyptian ceramics. The refuse material collected from the Sinai Bedouin camp has provided useful material for comparison with Nile delta, Fayum and Nile valley pottery. Other discarded pots have provided evidence for fabric types no longer in use. The pilot phase EMPP ceramic assemblage has been analyzed and published as if it were an archaeological ceramic corpus. Drawings and descriptions have been provided; forms and fabrics have been discussed; and the greatest possible amount of raw data accompanies the presentation and analysis of the material.

Despite the limited sample size and geographical bias of the assemblage, technical analyses of the EMPP ceramic corpus have produced valuable insights into modern traditional Egyptian pottery fabrics. A number of these insights have potential applications to research into ancient Egyptian pottery. The summary petrographic analysis in particular has proved a useful analytical tool. It successfully discriminated among the different main fabric types of the EMPP assemblage: marl clay, Nile silt, mixed marl clay and Nile silt, Sinai silt, and mixed Sinai silt and marl clay. It also functioned as an effective means of evaluating the various ware sub-group categories for consistency and coherence. It provided some interesting insights into the common as well as the distinguishing characteristics of the pottery corpus, and was able to identify a number of materials commonly used as temper. Finally, the petrographic analysis served on occasion as a useful check on the relationship between what the potter said was the composition of a given clay body and the actual composition of the pot's fabric. Chemical analysis of selected EMPP samples also produced significant results: it succeeded both in characterizing the basic fabric types of the EMPP corpus and in fingerprinting individual source locations. In future, such chemical analyses may be able to establish chemical boundaries that discriminate among many different fabric compositions and source locations throughout the country.

Several findings highlighted by the above analysis of modern pottery may reward additional investigation in ancient ceramics. In particular, the visual, petrographic, and chemical analyses of the EMPP pilot phase sample assemblage all confirmed the existence of a well defined and recognizable fabric category of mixed marl clay and Nile silt. On this basis, it can be suggested that a similar category should be sought along comparable lines among ancient Egyptian ceramics. Although the general existence of such mixed fabrics has been acknowledged (Nordström and Bourriau 1993, pp. 166-67), little success has been achieved thus far in their recognition. The virtually ubiquitous presence of ash and especially calcium carbonate in the modern assemblage is notable, and the presence of comparable material in ancient pottery also should be investigated. The role of calcium carbonate (and calcium sulphate) in traditional ceramic production in Egypt in general needs to be investigated in much more detail; analysis thus far suggests that these substances played a more significant role in pottery manufacturing than previously recognized.

Future phases of EMPP activity are being planned that build upon the foundations established by the pilot phase research. Additional fieldwork will be organized geographically, in order to begin to assess the dynamics of national, regional, and local ceramic traditions. Potters and ceramic retailers will be sampled and visited throughout specific areas, and their inventories (raw materials and finished products) will be catalogued and sampled as well. The entire ceramic production and distribution process will be observed and recorded. Wherever possible, clay and temper types and source locations will be identified and sampled. Further technical analyses also will be performed on the new sample material that will provide a more extensive data base for study. Wherever possible and appropriate, findings will be related back to archaeological research into ancient Egyptian ceramics. In order to maximize expertise and data recovery, it is anticipated that future fieldwork will incorporate a research team that includes an archaeologist, a cultural anthropologist and a geologist. By following that hallowed archaeological principle of working from the known to the unknown, ethnoarchaeological investigations into modern ceramics can provide important insights into ancient pottery of unknown provenience or composition or both. Ceramic ethnoarchaeology of modern traditional Egyptian pottery thus has much to contribute to our interpretation and understanding of ancient Egyptian ceramic practices and traditions.

Acknowledgements: This work is a much longer and more finalized version of the preliminary paper I presented at the 1990 pottery colloquium at Berkeley. Field research was carried out in Egypt under the auspices of the American Research Center in Egypt. Much of the fieldwork was undertaken in 1989 and 1990 with funding from an American Research Center in Egypt Fellowship; additional fieldwork took place in 1992 and 1995. Invaluable assistance was provided by a number of individuals in Egypt, especially Mrs. Amira Khattab, Terry Walz, and Bob Betts of the American Research Center in Egypt. I also would like to thank Mrs. Roxie Walker and the Bioanthropology Foundation for permission to use the Foundation's flat in Cairo. Dr. Hany Hamroush kindly gave me access to a binocular microscope and generously shared with me his extensive knowledge of Egyptian geology and pottery in many wide-ranging discussions. He also served as translator during several field visits with potters. Innumerable lengthy and profitable sessions dealing with Egyptian pottery in general were undertaken with Renée Friedman, who also took part in several visits to potters. Jeff Kemprecos acquired a number of pottery samples from workshops in Dakhla and Kharga Oases. Linda Oldham collected ceramic samples from Beni Suef and a village near Kafr esh-Sheikh, and also served as translator during several field trips. The superb inkings of the pottery profiles were completed in Jordan by Mr. Samir Schraedeh. Chérie Lenzen assisted with Arabic translation at the Fayum potters' market and helped supervise the pottery inking process; she also provided invaluable logistical and moral support as well as additional ceramic insights. In addition, great appreciation and thanks are due to our resourceful and reliable taxi driver in Egypt, 'Ezzat Iman, who has been our patient companion and guide and friend for many years of journeys in Egypt and who introduced us to his friend, Rayiss Abdullah Mahmoud Megahit, a master potter of Old Cairo.

I would also like to acknowledge gratefully the support of a number of individuals and organizations in North America. The pottery plates could not have been completed without the generous support of the Wadi Tumilat Project Lab in Toronto; I especially would like to thank Loretta James for patiently assisting me with plate preparation. The Irving and Gladis Stahl Foundation of the University of California at Berkeley provided the necessary funds for the chemical analyses. Brian Muhs meticulously reviewed various versions of the manuscript and made valuable comments. Candy Keller provided unflagging support and encouragement. Above all, this work could not have been completed in its present form without the invaluable support and assistance, and the encyclopedic knowledge, of two individuals: Linda Oldham and Maury Morgenstein. Linda Oldham generously shared her keen insights into and exhaustive knowledge of Egyptian customs developed over many years of diverse anthropological work in the country. She also brought to bear her impressive editorial skills on the manuscript, which is greatly improved as a result. Maury Morgenstein spent long hours completing the petrographic study of the samples and patiently discussed with me at very great length many different aspects of geology and geochemistry as these related to ceramics in general and Egyptian pottery in particular. As always, any errors of fact or interpretation are my responsibility.

Appendix 10.A Arabic Glossary

abrī', pl. *abāri* (*abrīq*)	pitcher
aramīt (pl.)	roof tiles
'ārsa	central baking griddle/tray of bread oven
'asal iswid	molasses (literally black honey)
'asreyya, pl. *'asāri*	flowerpot
bahūr	brazier
balata (s.)	central baking griddle/tray of bread oven
ballās, pl. *balālīs*	jar
berām, pl. *ebrema*	casserole
bokla, pl. *baklāyāt*	globular jar
ba'oša (s.)	jug with strainer and two handles
būša (s.)	cookpot
'edra (*'idra*; *qedra*, *qidra*) (s.)	jar
'edra ğazzāwī	cookpot, storejar'
fūl	fava beans
gadūs, pl. *gawādīs*	jar
(*'adūs*, *'awādīs*; *qadūs*, *qawādīs*)	
'adūs hamām	jar used for pigeon nest
'adūs laban	milking jar
gibna adīma	old cheese
ğibs	plaster of Paris ($CaSO_4$)
ğir	powdered $CaCO_3$ and/or lime
ğoza	waterpipe
hağar, pl. *heğāra* (*hağar šīša*)	pipehead (bowl of waterpipe)
halla	milking vessel
hanāb, pl. *ehneba*	globular jar
hīb	type of marl clay used in Luxor area
hōd (s.)	bowl for milk or milk products
mabhara, pl. *mabāher*	brazier
māğūr, pl. *mawāğīr*	large bowl
mahlaba	cookpot
man'ad, pl. *manā'ed*	brazier

mašrabeyya, pl. *mašrabeyyāt*	jug
mazbad gerēsī, pl. *mazābed gerēsī*	cookpot, storejar
megōza (s.)	storejar
misa'a (s.)	bird/small animal feeder
narğīla (s.)	waterpipe
'olla, pl. *'olall* (*'ulla*, *'ulall*; *qo/ulla*, *qo/ulall*)	handleless jug with strainer
qādūs (s.), pl. *qawādis*	*saqiyah* jar for drawing water; see *gadūs*
qist (s.)	globular pitcher
ramla tabbīnī	calcareous clay from Tebbīn new Helwan; *tebbīn clay*
semna	clarified butter
sahfa (s.)	bowl
šalya (s.)	bowl
šama'dani	flower vase / candle holder
saqiyah	waterwheel used for irrigation
šīša (s.)	waterpipe
taba' (s.)	dish
tabla, pl. *tabl/tobūl*	drum
tabūn, pl. *tawabīn*	traditional Levantine bread oven
tafla	marl clay used in Luxor area
tāğen, pl. *tawāğen*	bowl
tāğen halīb, tawāğen halīb	milking bowl
tīn	clayey soil
tīn bahrī	Nile silt
tīn gebelī	desert (calcareous) sand
tīn Aswanī	red clay from Aswan
tīn Aswanī bukla	white clay from Aswan
zarawiyya (s.)	storejar
zīr, pl. *azyār/ mazāyer*	large water storejar

Appendix 10.B

Preliminary Field Fabric Groupings and Descriptions[111]

I. SILT

A. Soft-Fired Fabrics (fabrics do not react to HCl) (20 total)
14 total fine: Minouf 5; Samannûd 5; Cairo 1; Abu Raguan 1; Sinai 1; Qanatar 1
6 total coarse: Minouf 1; Abu Raguan 3; Badrashein 1; Fayum 1

1. Fine-grained, medium brown silt (probably from fields); comparatively few inclusions (i.e., mostly pure silt); occasional reddish core; usually fairly thin-walled vessel
   a. Very few inclusions, softest (Minouf 3, Sinai 1, Qanatar 1)
      W-57 W-59 W-61
      13.58 15.3
   b. As (1A) but with scattered largish rounded quartz grains (Minouf 1, Samannûd 5)
      W-6 W-7 W-9
      W-14 W-16 W-62
   c. Better-fired, more large pores, scattered miscellaneous large grain/cm inclusions (Minouf 1, Cairo 1, Abu Raguan 1)
2. Coarser fabric of fine-grained, medium brown silt; numerous large pores, many organic inclusions (straw; usually phytoliths), scattered large and very large grain/cm inclusions; uniform color; usually fairly thick-walled vessels (Minouf 1, Abu Raguan 2, Badrashein 1)
      W-31 W-52 W-75
      14.2
3. "Rainbow-ware;" medium brown, fine-grained silt, soft, with red, pink and/or purplish core; coarse; many large pores, numerous scattered large grain/cm inclusions; numerous small straw (Abu Raguan 1, Fayum 1)
      W-68 14.9

B. Hard-Fired Fabrics (fabrics do not react to HCl) (17 total)
Total Group 1: 10; Group 2: 4; Group 3: 2; Group 4: 1)

1. Hard-fired, orange-brown silt (probably from fields); very fine-grained with occasional large grain/cm inclusions; often with light orange core (Minouf 2, Cairo 2, Gerzeh 1, Qanatar 1, Alexandria 1, Samannûd 3)
   a. Orange, with scattered large pores and few inclusions
      W-55 W-58 5.15
      10.35
   b. As (a) but browner in color, no core, and coarser in texture
      15.4
   c. Two-toned (purplish/orange or pink/orange); very fine-grained, few inclusions
      W-18 W-28
   d. Multi-colored (orange to light orange/orange-pink with grey core); very fine-grained, occasional scattered large grain/cm inclusions
      W-8 W-30 5.13
2. Hard-fired, orange-pink silt; slightly coarser than the other two groups but still fine-grained; usually brown crust on exterior/interior fabric surface; scattered large buff/white/grey inclusions, grain or cm. (Samannûd 2, Abu Raguan 1, Cairo 1)
      W-3 W-17 W-29
      5.10

3. "Rainbow-ware;" brown and red with purplish core; not as hard-fired as other groups in this category; fine to medium-grained; scattered large buff/white/grey/black inclusions, mostly grain/cm, but some straw (Samannûd 2)
   W-10 W-12
4. Hard-fired, fine-grained brown fabric, large black core with slight orange rim (Samannûd 1)
   W-13

C. **Coarse Fabrics** (fabrics do not react to HCl except as noted) (12 total)
[Coarse + Chaff-tempered in table 10.5A]
Total Group 1: 3; Group 2: 2; Group 3: 5; Group 4: 2]

1. "Kitchen-sink" ware; very coarse; very porous with many large pores; many large and very large inclusions of all kinds; probably canal muck; usually multi-colored with thick core (Fayum 2; Minya 1)
   a) Very coarse and crumbly; soft brown fabric with some red and large black core; innumerable inclusions
   W-64 (reacts with HCl)
   b) Soft and crumbly, brown fabric; two-tone core of red/pink and dark grey/black
   W-21
   c) Soft but less coarse (fewer inclusions); color as above (b)
   W-70
2. Orange-pink (with purple overtones), hard-fired, multi-colored, coarse fabric; no to slight core; crust on surfaces (Abu Raguan 2)
   a) Very porous fabric; many large pores; lots of large chaff; only occasional other inclusions
   14.6
   b) Denser fabric (but still very coarse) with mixed large inclusions
   14.3
3. Heavy chaff-tempered fabric; fine, medium brown silt (probably from fields); soft but shatters rather than crumbles; thick black core, very many chaff inclusions and not much else (Fayum 3, Minya 2; oddly the fabrics of the three Fayum examples react strongly to HCl)
   W-19 W-22 W-66
   W-69 W-71
4. Miscellaneous coarse fabrics (Minya 1, Badrashein 1)
   a) Soft, brown with very faint small pink core; many large pores, many large inclusions of all types
   W-20
   b) soft dark brown-grey fabric with pink-brown core; many and varied sizes (from very large to very small) and type white to buff inclusions, which do not react to HCl
   16.1

D. **Miscellaneous** (do not react to HCl) (3 total)

1. Burned or over-fired silt (Samannûd 1; Sinai 2)
   W-1 13.3 13.19

II. **MARL**

A. **Pink-orange and Grey-green Marl** (1 total)
Hard, fine-grained, may yellow speckles of all sizes; white self-slip; does not react to HCl (Qena 1)
W-65

B. **Orange Marl** (4 total)
White self-slip exterior; sometimes grey zone below slip; orange mudstone, few obvious inclusions; hard; no obvious yellow speckles although sometimes is a general yellow

mottling; no reaction to HCl (4 Gerzeh)

11.2	11.3	11.6
11.9		

III. MIXED MARL AND SILT

A. "Babypowder" Fabrics (13 total)

Coloring of mottled speckles, as if different colored baby powders were mixed together. Usually self-slip; no core except for transition zone(s) near surface (get bicolored fabric sometimes); hard, uniform in texture, apart from mottling usually not a lot of obviousin clusions

1) Greenish to pinkish yellow in color. Very few obvious quartz inclusions; generally does not react to HCl (1 Cairo, 6 Sinai)

W-39	13.11	13.13
13.14	13.81	13.200
13.204		

2) Orange-pinkish yellow in color. Under 20X binocular microscope can see some scattered quartz inclusions. Some react to HCl, some do not. (1 Cairo, 3 Sinai)

W-51 (no reaction HCl)	13.26 (reacts HCl)
13.28 (mild reaction HCl)	13.77 (mild reaction HCl)

3) Orange in color; probably variant of (2); reacts to HCl (1 Minya, 1 Sinai)

B. Fine-grained, various shades of buff (11 total)

Sometimes self-slip or transition zone near surface; typically uniform texture and color; no core; few obvious inclusions; does not react to HCl (4 Cairo, 4 Minya, 1 Sinai, 2 Qanatar)

W-50	1.4?	1.7
1.10	1.12	5.1
5.9	7.12	13.27
15.1	15.2	

C. Fine-grained, light brown orange (1 total)

As above (B) but reacts to HCl (1 Cairo)

W-72

IV. SINAI FABRICS

A. Orange-Brown Sandy (9 total)

Grainy with many quartz sand inclusions; hard to very hard orange fabric, sometimes with surface crust, sometimes with large brown-grey core; no reaction to HCl (9 Sinai)

13.1	13.10	13.59
13.60	13.67	13.68
13.69	13.72	13.70+73

B. Orange-Brown Sandy Variants (5 total) [incorporated with Orange-Brown Sandy in table 10.5A]. As above (A) but with slight color/core variations (5 Sinai)

13.8	13.61	13.70
13.71	13.88	

C. Dense Hard Buff Sandy (6 total)

Hard to very hard, dense fabric with numerous quartz inclusions and very little else; uniform fabric, occasional slight color variations within fabric, usually with orange tones, generally reacts to HCl

1. Orange (2 Sinai)
   13.2 (no reaction to HCl) 13.5 (reacts HCl)
2. Dark buff-orange (reacts HCL) (3 Sinai)
   13.21 13.30 13.34
3. Buff-grey (reacts HCl) (1 Sinai)
   13.40

D. Handmade Bedu Cookpots (4 total)

1. Fine-grained, grey black fabric (orange surface); numerous incompletely oxidized chaff; very little else; does not react to HCl (1 Sinai)
   13.31
2. Very coarse and rough brown fabric with orange and black core; porous; many grain andchaff inclusions; does not react to HCl (1 Sinai)
   13.6
3. Coarse, grainy, grog-tempered fabric; both pieces probably from the same vessel; reacts to HCl (2 Sinai)
   13.22 13.86

V. BLACK/GREY FABRICS

A. Fine Shiny (17 total)

1. Very fine-grained, shiny, uniform fabric; no color variation except for occasional crust at surface; few obvious inclusions; hard; does not react to HCl (1 Sharqiya; 4 Sinai)
   W-43 13.115 13.116
   13.117 13.119
2. Similar to (1) except coarser; quartz inclusions, occasional scattered large white bits and sometimes light grey mottling in fabric; does not react to HCl (12 Sinai)
   13.39 13.42 13.49A
   13.100 13.106 13.107
   13.109 13.110 13.11
   13.112 13.121 13.122

B. Miscellaneous (7 total) [Fine Silt in table 10.51]

Miscellaneous fabrics with black to dark grey surfaces and brown or grey fabrics.

1. Very fine-grained, few obvious inclusions; large core ranging in color from buff to grey to brown; does not react to HCl; silt? (1 Sharqiya, 1 Cairo, 1 Sinai)
   W-47 W-73 13.49
2. Grey-brown to grey buff sandy fabrics; do not react to HCl; miscellaneous category (4 Sinai)
   13.37 13.38 13.47
   13.118

VI. ANOMALOUS (3 total; 3 Sinai)

13.63 13.80 13.94

Appendix 10.C

Complete Descriptions of Illustrated Pottery

Key to Pottery Descriptions

Abbreviations:

approx	approximate/approximately
betw	between
brwn	brown
diag	diagonal
diam	diameter
diff	diffuse
dk	dark
dker	darker
ext	exterior
fab	fabric
frag	fragment
gry	grey
HCl	hydrochloric acid (dilute solution)
horiz	horizontal
int	interior
lg	large
lt	light
lter	lighter
occ	occasional, occasionally
orig	original, originally
poss	possible, possibly
prob	probably
Mahalla	Mahalla el Kubra
Muns	Munsell
n/a	not applicable
occ	occasional
sl	slightly
surf	surface
v	very
vdk	very dark
w/	with
yllw	yellow

Notes:

Number: Figure Number

Field Number: W designates a complete pot, followed by arbitrary registration number (e.g., W-50); or first number designates sample bag number, second is an arbitrary registration number (e.g., 13.1); Origin of sample bags included in the study is as follows:

1	Minya, collected from walkway along edge of Nile River
2	Minya, discarded pots on balcony
4	Mahalla el Kobra, near railroad tracks
5	Balcony and roof of apartment building in Zamalek, Cairo
7	Hurghada
9	Gerzeh area
10	Near tarmac road, Gerzeh area
11	Edge of tarmac road near Gerzeh
13	Sinai Bedouin camp near El Arish
14	Abu Raguan retail stand and potter's workshop
15	Government flowerpot workshop at El Qanatar
16	Badrashein, from potter

Core codes:

0 - no core
1 - 1% - 20% core
2 - 20% - 40% core
3 - 41% - 60% core
4 - 61% - 80% core
5 - greater than 80% core
6 - crust of color at exterior and interior surface
7 - crust of color at exterior surface
8 - crust of color at interior surface
single core: central core area with fabric color on both sides
split core: outer part of fabric section adjacent to exterior wall one color (considered fabric color), inner part of fabric section adjacent to interior wall second color (considered core color) very diffuse, diffuse, slightly diffuse: character of transition between colors of core zone and between core and fabric; munsell colors of core zones given in order from center moving outward; different zones separated by semi-colon.

Comments:

Miscellaneous comments; where preserved rim or base diameter is less than 50%, estimated diameter and percent of preserved diameter are given; includes brief visual description of fabric; dominant pore shape and percent porosity by volume were determined as part of the petrographic study by M. Morgenstein; note that the mixed silt and marl fabrics generally have low porosity by volume.

Descriptions and porosity data for undrawn samples:

Sample 13.75 *tabūn* (traditional Levantine clay bread oven); point of manufacture unknown; collected at Sinai Bedouin camp; handmade of Sinai silt; no core; ext surface betw 5y46/6 red yllw and 5/6 yllw red; int surface 7.5yr 6/4 lt brwn (but brwner); fabric 5yr6/6 red yllw to 7.5yr6/4 lt brwn to 6/6 red yllw; porous, extremely coarse fabric, w/numerous extremely large to large different colored grog inclusions; under 10X loupe, numerous quartz sand inclusions, scattered calcium carbonate and ash; reacts HCl; dominant pore shape elongated, porosity by volume 35%

Sample 14.6: *balata* (baking tray or griddle in traditional Egyptian clay bread oven); point of manufacture unknown; collected at Sinai Bedouin camp; handmade of Sinai silt 5/6 red; munsell exterior 10yr7/3 v pale brown; munsell interior n/a; munsell fabric crust 1.5yr4/6 to 4/8 red; fabric light, brittle, and well-fired (possible incipient sintering); also extremely porous w/occasional scattered inclusions of varying size; dominant pore shape elongated, porosity by volume 40%

Sample 15.2: *'asreyya* (flowerpot); point of manufacture and collection El Qanatar workshop; wheelmade of mixed Nile silt and marl clay; munsell ext/int betw 10yr8/4 and 7/4 pale brwn; no core; munsell fabric 10yr6/4 lt yllw); mottled and speckled muted light brown grey, fine-grained fabric w/scattered pores and rare lg red brwn grog or mudstone inclusion; under 10X loupe, scattered calcium carbonate, scattered occ quartz sand and scattered occ red brown grog or mudstone inclusions; reacts HCl; dominant pore shape elongated and rounded, porosity by volume 3% to 8%

Sample 15.3: *'asreyya* (flowerpot); point of manufacture and collection El Qanatar workshop; wheelmade of Nile silt; munsell ext and int 7.5yr4/4 brwn/dk brwn; no core; munsell fabric 5yr4/6 yllw red; fine-grained, fairly uniform, fairly soft, dense medium brown (with red tinge) fabric w/scattered pores; under 10X loupe, rare calcium carbonate, rare ash, and rare quartz sand inclusions; slight reaction to HCl; dominant pore shape elongated and rounded, porosity by volume 3% to 5%

Figure Descriptions:

Figure 10.2

Number: 1 **Field Number**: W-64* **Form English**: storejar/water jar **Form Arabic**: *zīr*
Made: Fayum **Obtained**: Fayum potter's market **Technique**: wheelmade **Fabric**: coarse Nile silt
Dec: horiz combing ext shoulder; int wash 5yr8/3 pink **Core**: 2 to 3; single, diffuse to v diffuse
MunsExt: 7.5yr6/6 red yllw to 5y8/6 yllw but ltr and brwner **MunsInt**: 5y6/4 lt red brwn (but dkr) to 10yr4/2 dk brwn gry
MunsFab: closest to 5yr5/6 (yllw red) and 5/4 (red brwn) **MunsCore**: 10yr3/1 vdk gry to 4/1 dk gry to 4/3 brwn/dk brwn; 2.5yr5/6 red
Comments: *analyzed chemically; remnants of numerous rope marks around body, partially obliterated; clear manufacturing join in body where two large pieces joined together just above widest part of body; 2 bands horizontal combing at shoulder with incised tree design; exterior rough and coarse; exterior color varies from light buff to orange; four small kiln clouds on exterior, one with gry core, others buff with red halo; rose pink wash on interior except for base; relatively soft, very coarse, very porous brwn fabric w/dk gry core and numerous large calcium carbonate (including snail and clam shells) and ash inclusions and occ lrge quartz sand and possible grog inclusions; reacts HCL; dominant pore shape elongated, porosity by volume 45%

Figure 10.3

Number: 1 **Field Number**: 16.1* **Form English**: storejar/water jar **Form Arabic**: *zīr*
Made: Badrashein **Obtained**: Badrashein potter **Technique**: wheelmade **Fabric**: coarse Nile silt
Dec: horiz band combing; slip ext; horiz band paint upper shoulder **Core**: 0 to 3; single; defined
MunsExt: slip betw 5yr8/2 white (but dkr and brwner) **MunsInt**: ranges from 7.5yr5/4 brwn to betw 2.5y8/2 white + 2.4y7/4 pale yllw
MunsFab: 5yr4/2dk red gry to 4/3 rd brwn to 5yr4/6 yllw red **MunsCore**: btw 2.5yr5/6 and 4/6 red
Comments: *analyzed chemically; ext diam 32 cm at 4.5%; crude and carelessly made, surface more than usually irregular and uneven; self-slip (?) ext and int rim and neck that develops into scum on int neck; manufacturing join on body, indicated by marked thickening of body wall; incipient overfiring; coarse, brittle fabric has numerous calcium carbonate inclusions of varying sizes which give it a speckled appearance; scattered, occ large ash, quartz inclusions; fine-grained matrix w/number of lg pores; dominant pore shape elongated and rounded, porosity by volume 10%

Number: 2 **Field Number**: W-52* **Form English**: storejar/water jar **Form Arabic**: *zīr*
Made: Minouf **Obtained**: retailer at El Qanatar **Technique**: wheelmade **Fabric**: coarse Nile silt
Dec: 2 bands w/3 lines horiz combing; slip ext 10yr7/3 pale brwn **Core**: 0 to 2; single, v diffuse
MunsExt: closest to 7.5yr5/4brwn (but dkr and yllwer **MunsInt**: as ext but redder
MunsFab: closest to 5yr5/6 (yllw red) and 5/4 (red brwn) **MunsCore**: 10yr5/3 brwn to 5/2 gry brwn brwn/dk brwn; 2.5yr5/6 red
Comments: *analyzed chemically; clear manufacturing join marked by thickening of body wall; combing done on wheel in spirals; slip upper part of body above carination to just inside int rim, reacts to HCl; probable cord mark on carination and at least four more below, but bottom two mostly scraped away; well-fired, core only at thickest parts of body; bottom part of jar, below carination, scraped; fabric closely similar to W-16; fairly soft, porous, coarse, medium brwn fabric w/scattered pores, and calcium carbonate, quartz sand and ash inclusions; dominant pore shape elongated and rounded, porosity by volume 35%

Number: 3 **Field Number**: 14.9* **Form English**: storejar/water jar **Form Arabic**: *zīr*
Made: Abu Raguan **Obtained**: Abu Raguan potter **Technique**: wheelmade **Fabric**: coarse Nile silt
Dec: horiz combing on neck and shoulder **Core**: 2 to 5; single; diffuse to v diffuse
MunsExt: 5yr6/6 red yllw to occ almost 7.5yr7/4 pink **MunsInt**: 5yr5/6 yllw red (but pinker)
MunsFab: 5yr5/6 yllw red **MunsCore**: 2.5yr5/4 red brwn; thin band 2.5yr5/6 red
Comments: int diam 20cm at 35%; rainbow ware; numerous inclusions, many large; join of rim section to body part well done, only slight thickening of body wall and some dimpling in interior at transition; coarse, porous, fine-grained, medium brwn to pink fabric with numerous pores and large inclusions (calcium carbonate, grog, quartz sand); under 10X loupe, scattered pores, and calcium carbonate, quartz sand and ash inclusions; dominant pore shape elongated and rounded, porosity by volume 25%

Number: 4 **Field Number**: 14.3 **Form English**: storejar/water jar **Form Arabic**: *zīr*
Made: Abu Raguan **Obtained**: Abu Raguan potter **Technique**: wheelmade **Fabric**: coarse Nile silt
Dec: horiz combing on neck **Core**: 4; single; defined
MunsExt: 10yr7/4 pale brwn (but dker) to 5yr6/6 red yllw (but ltr) **MunsInt**: 2.5yr5/6 red (but dker, brwner)
MunsFab: 2.5yr4/4 red brwn and 2.5yr4/8 red **MunsCore**: 2.5yr5/6 red
Comments: ext diam 21cm at 25%; hard; poss incipient overfiring; porous and comparatively brittle, light weight, fine-grained medium brown fabric w/large pink core, scattered large inclusions (quartz sand and occ calcium carbonate) and scattered pores of different size; dominant pore shape elongated and rounded, porosity by volume 30%

Figure 10.4

Number: 1 **Field Number**: W-10* **Form English**: storejar **Form Arabic**: *ballās*
Made: Badrashein **Obtained**: Badrashein potter **Technique**: wheelmade **Fabric**: Nile silt
Dec: horiz band combing; slip ext; horiz band paint upper shoulder **Core**: 2 to 4; single; sl diffuse
MunsExt: slip betw 2.5yr5/6 red and 7.5yr4/6 strong brwn **MunsInt**: 5yr4/6 yllw red but slightly redder
MunsFab: 5yr4/2dk red gry to 4/3 rd brwn to 5yr4/6 yllw red **MunsCore**: 2.5yr5/4 red brwn; thin band 10yr5/8 red
Comments: *analyzed chemically; body one piece, neck/rim second piece joined to body; rainbow ware, with purplish-tinged inner core then zone of dark pin/red, then brwn; fabric virtually identical to W-12 except latter has split core in places; dense and fine-grained appearance but with many scattered large inclusions, especially ash and calcium carbonate; many small pores visible under 10X loupe, also occasional large pores, dominant pore shape rounded, porosity by volume 35%

Number: 2 **Field Number**: W-65* **Form English**: storejar **Form Arabic**: *ballās*
Made: Qena Region **Obtained**: Fayum potters' market **Technique**: wheelmade **Fabric**: marl clay
Dec: wash int betw 10yr6/6 and 2.5 6/6 (both lt red) **Core**: 3; split; diffuse
MunsExt: self slip betw 5yr8/1 white (but more yllw) and 8/2 white **MunsInt**: covered by wash
MunsFab: 10yr4/2 dk gryish brwn **MunsCore**: 2.5yr5/6 red or 10yr5/6 red
Comments: *analyzed chemically; rope impression at widest point of body (bottom carination); hard, metallic fabric; manufacture join about halfway down body marked on interior by cracking and surface irregularities in the clay; wash reacts HCl; many yllw/white speckles in fabric, mostly coated pores when seen with 10X loupe; occ large angular mud-stone inclusions but little else; fabric appears dense but w/scattered large pores; dominant pore shape elongated, porosity by volume 35% to 48%

Figure 10.5

Number: 1 **Field Number**: 11.6 **Form English**: storejar **Form Arabic**: *ballās*
Made: Gerzeh area **Obtained**: Gerzeh roadside **Technique**: wheelmade **Fabric**: orange marl clay
Dec: none **Core**: none
MunsExt: scum 10yr8/3 v pale brwn over 2.5yr5/6 red **MunsInt**: as ext
MunsFab: 2.4yr5/6 to 5/8 red **MunsCore**: n/a
Comments: ext diam 10cm at 27%; reacts HCl; 8 small pieces joined together; worn and chipped; ext and int have white yllw scum 10yr8/3 v pale brwn over surface 2.5yr5/6 red; uniform orange fabric, hard, appears dense w/occ large pores, but under 10X loupe see many small pores with white coating, v occ large, angular mudstone fragments; pore data n/a

Number: 2 **Field Number**: 11.2 **Form English**: storejar **Form Arabic**: *ballās*
Made: Gerzeh area? **Obtained**: Gerzeh roadside **Technique**: wheelmade **Fabric**: orange marl clay
Dec: 4 bands horiz combing (2 prongs/band), w/incised sm arcs betw **Core**: 3 to 4; split; diffuse
MunsExt: scum 10yr8/3 v pale brwn over 2.5yr5/6 red **MunsInt**: 2.5yr6/6 lt red (but sl brwner)
MunsFab: 2.4yr5/6 to 5/8 red **MunsCore**: btw 2.5yr6/6 lt red and 5/6 red
Comments: stance and diam approx; 2 horiz rows of cord marks around widest part of body; remains of grey plaster in one spot on shoulder and neck where vessel repaired, plaster reacts very strongly to HCl; hard fabric, reacts o HCl; appears dense w/occ large pores, but under 10X loupe see many small pores, some uncoated; scattered large buff to grey to white inclusions, some round, some angular, some oval; occ large angular mudstone inclusions; dominant pore shape elongated, porosity by volume 30%

Number: 3 **Field Number**: 11.3* **Form English**: storejar **Form Arabic**: *ballās*
Made: Gerzeh area? **Obtained**: Gerzeh roadside **Technique**: wheelmade **Fabric**: orange marl clay
Dec: 4 bands horiz combing (2/3 prongs/band), w/incised diag lines **Core**: none
MunsExt: thick self slip 5yr8/4 to 7/4 pale yellow **MunsInt**: 2.5yr6/6 lt red
MunsFab: 2.5yr6/6 red **MunsCore**: n/a
Comments: *analyzed chemically; stance and diam approx; possibly same jar as 11.9; bottom handle attachment on upper shoulder; fabric and self slip react HCl; body dented; transition zone betw exterior surface w/crust of self-slip and fabric below; orange fabric appears dense, w/occ large pores, but under 10X loupe see many small pores or incipient pores, latter filled with white to grey calcium carbonate matter; scattered frags angular red mudstone; porosity data n/a

Figure 10.6

Number: 1 **Field Number**: W-22 **Form English**: large bowl **Form Arabic**: *sahfa*
Made: Minya **Obtained**: Minya market **Technique**: handmade **Fabric**: coarse, chaff-tempered Nile silt
Dec: erratic pink wash ext and int 10yr6/6 lt red **Core**: 4; single; diffused to defined
MunsExt: as decoration **MunsInt**: as decoration
MunsFab: 7.5yr4/6 strong brwn **MunsCore**: mottled 7.5yrN2/ black, 2/3 dk brwn, and N3/ vdk gry
Comments: wash reacts to HCl; wash flaking off bottom and comes off easily on hands; v soft fabric, dents easily; heavy chaff temper; brwn fabric v/thick dark core; occ scattered quartz sand and v occ calcium carbonate inclusions (also under 10X loupe); dominant pore shape elongated, porosity by volume 28%

Number: 2 **Field Number**: W-72 **Form English**: small jar **Form Arabic**: *ballās*
Made: Minya **Obtained**: Minya market **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: betw 5yr5/4 (red brwn) and 5/6 (yllw red) **MunsInt**: betw 5yr6/4 (lt yllw brwn) and 6/6 (red yllw)
MunsFab: closest to 7.5yr6/6 reddish yllw but pinker **MunsCore**: n/a
Comments: exterior roughly finished, scraped; made in two main pieces, neck and shoulder attached to body; fine-grained, muted pink-brwn fabric, reacts strongly to HCl; occ scattered lg mudstone calcium carbonate inclusions; dominant pore shape rounded, porosity by volume 6% to 10%

Number: 3 **Field Number**: W-29 **Form English**: storejar **Form Arabic**: ?
Made: Abu Raguan **Obtained**: Abu Raguan potter **Technique**: wheelmade **Fabric**: Nile silt
Dec: white slip betw 5y8/3 pale yllw and 2.5y8/2 white **Core**: 0 to 3, 6; single; diffuse to defined
MunsExt: closest to 7.5yr4/2 brwn/dk brwn (but lter and brwner) **MunsInt**: 5yr5/4 red brwn
MunsFab: 2.5yr6/6 lt red, to 5yr4/4 red brwn (but sl gryer) **MunsCore**: 5yr4/1 dk gry to 5/1 gry, 2.5yr6/6 lt red
Comments: white slip decoration of horizontal bands, wavy lines, and solid ovals; exterior rim also slipped; rim and jar lopsided; made in at least three pieces; fairly hard, brittle, orange pink fabric w/occ lg calcium carbonate inclusions; incipient overfiring; under 10X loupe, numerous pores, scattered calcium carbonate and occ scattered quartz inclusions of different sizes, as well as small ash inclusions; dominant pore shape elongated and rounded, porosity by volume 30%

Number: 4 **Field Number**: W-13 **Form English**: storejar (semna pot) **Form Arabic**: *zarawiyya*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: white slip betw 5y8/3 pale yllw and 2.5y8/2 white **Core**: 2 to 3; single; slightly diffuse to diffuse
MunsExt: closest to 5yr4/6 yllw red(but ltr) & 4/4 red brwn **MunsInt**: 5yr5/6 yllw red mottled w/green
MunsFab: closest to 5yr4/6 yllw red but brwner **MunsCore**: 7.5yrN3 v dk gry and 2.5yr5/8 red
Comments: a pleasing vessel, reasonably well-made; incised mark (intentional?) next to left handle, on left side; finger impression at center top of handle, connecting it to rim; very hard, shattered when broken; interior glaze is very shiny (although a few spots were not glazed) while exterior is more matte, but still shiny; HCl turns glaze opaque white; fine-grained, fairly dense and hard medium brwn fabric w/large dk gry core containing darker areas of unoxidized organics; scattered pores and calcium carbonate inclusions; under 10X loupe, numerous scattered calcium carbonate and quartz sand inclusions; dominant pore shape elongated, porosity by volume 12% to 14%

Figure 10.7
Number: 1 **Field Number**: W-66 **Form English**: jar **Form Arabic**: *bokla*
Made: Fayum **Obtained**: Fayum potters' market **Technique**: see comments **Fabric**: chaff-tempered Nile silt
Dec: none **Core**: 7; diffuse
MunsExt: betw 5yr6/6 red yllw and 5yr5/6 yllw red **MunsInt**: closest to 7.5yr5/6 strong brwn
MunsFab: betw 7.5yr4/6 strong brwn **MunsCore**: 2.5yrN3/ v dk gry, and 7.5yrN2/ black
Comments: chips easily; large spall on surface and chipped rim when purchased; exterior wiped; manufacturing join visible just below neck; body hand formed, neck and rim wheel-turned; pot broke mostly at point where neck joined body; numerous chaff impressions on ext and int surfaces; large gry and black circular fire-cloud on ext surface; brittle, chaff-tempered, porous fabric with occ scattered white inclusions; reacts HCl; dominant pore shape elongated, porosity by volume 35% to 40%

Number: 2 **Field Number**: W-71* **Form English**: bowl **Form Arabic**: *sahfa*
Made: Fayum **Obtained**: Fayum potters' market **Technique**: handmade **Fabric**: chaff-tempered Nile silt
Dec: irregular wedge-incised marks on half of rim **Core**: 0 to 3; single; sl diffuse to diffuse
MunsExt: closest to betw 7.5yr6/4 lt brwn and 6/6 red yllw **MunsInt**: closest to 7.5yr5/6 strong brwn but lighter
MunsFab: 7.5yr5/6 strong brwn **MunsCore**: 7.5yrN2/ black and N3/ dk gry
Comments: *analyzed chemically; vessel slightly lopsided; numerous chaff impressions on ext and int surfaces; extremely porous, light, brittle fabric, brwn with dark gry core and a very heavy chaff temper and occ scattered small white inclusions; fabric reacts strongly to HCl; dominant pore shape elongated, porosity by volume 86%

Number: 3 **Field Number**: W-69 **Form English**: jar **Form Arabic**: *sahfa*
Made: Fayum **Obtained**: Fayum potters' market **Technique**: see comments **Fabric**: coarse, chaff-tempered Nile silt
Dec: none **Core**: 3; single; sl diffuse to defined
MunsExt: betw 7.5yr6/4 lt brwn and 5/4 brwn to 7.5yr5/4 brwn **MunsInt**: betw 7.5yr5/4 brwn and 5/6 strong brwn
MunsFab: 7.5yr4/6 strong brwn **MunsCore**: 25N4/ dk gry, N3/ v dk gry, and N2/ black
Comments: unlovely coarse ware with very rough and uneven exterior; smoothed near neck and rim, rest of body very rough; numerous chaff impressions of different sizes on ext and int; rim and neck wheel-turned, body handmade; reacts to HCl; porous, brittle brwn fabric with dk gry core and a heavy chaff temper and scattered small white inclusions; reacts HCl; oddly, and unlike the vast majority of the silts, fabric becomes shiny and polished when surface evened w/sandpaper; dominant pore shape elongated, porosity by volume 26%

Number: 4 **Field Number**: W-19 **Form English**: pitcher **Form Arabic**: *qist*
Made: Minya **Obtained**: Minya market **Technique**: see comments **Fabric**: coarse, chaff-tempered Nile silt
Dec: red wash ext 2.5yr4/4 red brwn **Core**: 2 to 3; single; diffuse
MunsExt: as decoration **MunsInt**: 7.5yr4/6 strong brwn
MunsFab: 7.5yr4/6 strong brwn **MunsCore**: 25y4/2 dk gry brwn to N3/ v dk gry to N2/ black
Comments: spout on lip; lip inturned slightly; handmade body, wheel-turned rim and neck; two small handles attached at top of shoulder and just below rim; heavy chaff temper, chaff apparently chopped since mostly the same size; abundant chaff on ext and int surfaces; red wash on exterior, flaked off in places, and inside rim and neck; thickness of body walls variable; interior dimpled; neck and rim joined to body; brwn fabric w/dk gry to black core, coarse and porous; dominant pore shape elongated, porosity by volume 35% to 40%

Figure 10.8

Number: 1 **Field Number**: W-28 **Form English**: jug **Form Arabic**: *ba'oša*
Made: Samannûd **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: : Nile silt
Dec: incised leaf on shoulder; slip 10yr7/4 v pale brwn (but lighter) **Core**: 3 to 7; split; sl diffuse to defined
MunsExt: 5yr4/6 yllw red **MunsInt**: betw 2.5yr5/4 red brwn and 5/6 red (but pinker and more muted)
MunsFab: 2.5yr4/8 red **MunsCore**: closest to 2.5yr5/6 red (but pinker and more muted)
Comments: ribbing around upper body, single grooves elsewhere; ribbed and grooved areas not slipped but slip slops over onto them in places; handles, which are angled slightly in opposite directions, applied after slip; incised decoration cut through slip; sieve at base of interior neck, holes poked downwards since clay blobs adhere to underside of holes; scummy horizontal slip remnants on interior neck above sieve; finger blobs and vertical finger smoothings visible in slip; on the whole a pleasing piece although a bit sloppy in execution; fine-grained, brittle, pink and orange-brwn fabric w/scattered occ large pores and large quartz sand and calcium carbonate inclusions; under 10X loupe, scattered occ pores, calcium carbonate, ash, quartz sand inclusions of different sizes; dominant pore shape rounded, porosity by volume 20%

Number: 2 **Field Number**: W-61* **Form English**: jug **Form Arabic**: *'olla*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: : Nile silt
Dec: 3 horiz bands white wash 5y8/1 white **Core**: none
MunsExt: closest to 5yr4/6 yllw red (but lter and more muted) **MunsInt**: as ext
MunsFab: closest to 5yr4/6 yllw red (but brwner) **MunsCore**: n/a
Comments: *analyzed chemically; sieve at interior base neck; sloppily made, exterior wet smoothed, uneven, with small gashes and clay blobs; uniform, somewhat soft, fine-grained, fairly dense, medium brwn fabric w/scattered pores and rare calcium carbonate inclusions; under 10X loupe, scattered pores and rare calcium carbonate inclusions; slight reaction to HCl; very similar to W-62 but brwner and softer, virtually identical to W-54 and W-59; dominant pore shape elongated and rounded, porosity by volume 10% to 12%

Number: 3 **Field Number**: W-12* **Form English**: jug **Form Arabic**: *'olla*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: applied band with thumb impressions, sloppily done **Core**: 0 to 3; single and split; diffuse
MunsExt: 5yr4/6 yllw red **MunsInt**: 2.5yr5/6 red; localized 2.5yr5/4 red brwn and 10r5/1 red gry
MunsFab: 2.5yr4/8 red **MunsCore**: betw 2.5yr4/8 red and 10r5/8 red; and 5yr5/3 red brwn
Comments: *analyzed chemically; sieve at interior base of neck; vessel lopsided; bottom exterior below applied band fairly smooth, above and on band sloppy with rough areas and small lumps; color variations; very sloppily made pot; fabric virtually identical to W-10 except latter has split core and brwner fabric in places; dense and fine-grained appearance but with many scattered large inclusions, especially ash and calcium carbonate; many small pores visible under 10X loupe, also occ large pores; dominant pore shape rounded, porosity by volume 35%

Number: 4 **Field Number**: W-51* **Form English**: jug **Form Arabic**: *'olla*
Made: Cairo **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 7; very diffuse
MunsExt: closest 2.5y8/2 white (but brwner); some 10yr8/3,4 pale brwn **MunsInt**: betw 5yr7/4 pink (but darker) and 7/6 red yllw (but lter)
MunsFab: 5y8/2 white to 10yr8/3,4 v pale brwn to 10yr7/4 pale brwn (crust below ext surface), merges into 5yr7/6 red yllw (but paler)
Comments: *analyzed chemically; some variation in surface color, fairly good quality; ridge at widest point of body; sieve at interior base of neck; ring base; speckled fabric, some reaction HCl; fabric hard, light and metallic, fine-grained, almost smooth, w/ scattered pores and numerous different colored small quartz sand inclusions; under 10X loupe, scattered pores, calcium carbonate, and numerous different size and colored quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 5% to 7%

Number: 5 **Field Number**: W-50* **Form English**: jug/pitcher **Form Arabic**: *abrī'*
Made: Cairo **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: very diffuse
MunsExt: closest 2.5y8/2 white (but brwner); some 10yr8/3,4 pale brwn **MunsInt**: betw 5yr7/4 pink (but darker) and 7/6 red yllw (but lter)
MunsFab: 5y8/2 white to 10yr8/3,4 v pale brwn to 10yr7/4 pale brwn (crust below ext surface), merges into 5yr7/6 red yllw (but paler)
Comments: *analyzed chemically; sieve at interior base of neck; no real core; reacts to HCl; made in several different pieces; 3 wide ribs or ridges at widest part of body; reacts HCl; relatively uniform, muted brwn buff, mottled, speckled, light, hard (almost metallic) fabric w/occ large pores; under 10X loupe, mottled white and brwn, scattered pores, grainy, scattered occ quartz, ash, calcium carbonate, dominant pore shape rounded, porosity by volume 8% to 12%

Number: 6 **Field Number**: W-39* **Form English**: jug **Form Arabic**: *'olla*
Made: Cairo **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 5y8/2 white **MunsInt**: 2.5yr8/2 white (but brwner)
MunsFab: betw 2.5y8/2 white and 7/4 pale yllw (but brwner) **MunsCore**: n/a
Comments: *analyzed chemically; strainer at interior base of neck, 4 holes poked downwards; fairly uniform fabric; made in several different pieces; 3 ridges/ribs at widest part of body; ring base; collar on neck; whitish green to buff, speckled, grainy fabric w/occ scattered pores, quartz sand, ash, and calcium carbonate; dominant pore shape rounded, porosity by volume 5% to 10%

Figure 10.9

Number: 1 **Field Number**: W-43* **Form English**: jug/pitcher **Form Arabic**: *abrī'*
Made: Sharqiya province? **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 7; defined
MunsExt: 2.5yr or 7.5yr N3/ vdk gry **MunsInt**: from 7.5yrN5/ red brwn and 5/6 red (but pinker and more muted)
MunsFab: 7.5yrN3/ vdk gry **MunsCore**: closest to 2.5yr5/6 red (but pinker and more muted)
Comments: *analyzed chemically; black Nile silt; ribbed body; fingermarks visible from attaching spout; 2 strap handles attached from base of neck to shoulder; shoulder has series of horizontal but erratic and inconsistent small cord marks; very smooth and shiny, especially body; neck not as smooth, but still a shiny matte dk gry; v hard, v fine-grained dense, dk gry fabric with blue tinge, sharp lt gry ext crust, and scattered calcium carbonate inclusions and pores; unlike most Nile silt fabrics, polishes with sandpaper; porosity data n/a

Number: 2 **Field Number**: W-47* **Form English**: cookpot **Form Arabic**: *būša*
Made: Sharqiya province? **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 3 and 5; single; diffuse
MunsExt: 2.5yN3/vdk gry (most), N4/dk gry, N5/gry, 6/2 brwn gry **MunsInt**: 7.5yrN3/ vdk gry; mottled 2.5yN3/vdk gry, N6/gry, 6/2 lt brwn gry
MunsFab: betw 10yr5/3 brwn and 5/4 yllw brwn **MunsCore**: 7.5yrN3/ vdk gry but slightly lighter)
Comments: *analyzed chemically; black Nile silt; exterior has metallic sheen; color blotchy from fire clouds; carelessly finished; v fine-grained, light brwn-gry, fairly dense fabric w/gry core, scattered lg pores, and occ scattered large calcium carbonate inclusions; under 10X loupe, scattered pores, occ calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 6% to 10%

Number: 3 **Field Number**: W-18 **Form English**: casserole **Form Arabic**: *berām*
Made: Alexandria? **Obtained**: Minya market **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 2, in places 6; split; very diffuse
MunsExt: 5yr4/3 red brwn but brwner and sometimes lighter **MunsInt**: betw 5yr3/3 dk red brwn and 2.5yr3/4 dk red brwn (no good match)
MunsFab: from 2.5yr5/2 weak red to 2.5yr5/4 red brwn **MunsCore**: 2.5yr4/6 to 4/8 red
Comments: two vestigial handles, fine-grained, v dense, fairly hard, uniform red brown fabric w/occ pores and v few inclusions; under 10X loupe, scattered fine calcium carbonate and occ quartz sand inclusions; dominant pore shape rounded, porosity by volume 3% to 5%

Number: 4 **Field Number**: W-62 **Form English**: drum **Form Arabic**: *tabla*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 3; single; diffuse
MunsExt: no good match, blend of 5yr5/4 red brwn and 4/6 yllw red **MunsInt**: as ext
MunsFab: 5yr4/6 yllw red **MunsCore**: 2.5yr4/6 to 4/8 red
Comments: some scraping marks on upper ext body; ridge near base; hollow cylinder; very similar to W-61 but pinker and a bit harder, virtually identical to W-57; uniform, fine-grained, dense, medium brwn fabric, fairly hard, w/scattered large calcium carbonate inclusions and occ pores; under 10X loupe, numerous calcium carbonate, occ ash, and rare quartz sand inclusions; dominant pore shape elongated, porosity by volume 3% to 8%

Number: 5 **Field Number**: W-30 **Form English**: brazier **Form Arabic**: *bahūr, man'ad*
Made: Samannûd **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: wash 10yr8/1 & 5y8/1 white (but whiter); wash 7.5r5/6 red **Core**: 2 to 3; diffuse within core; defined betw core and fabric
MunsExt: as red wash **MunsInt**: as white wash
MunsFab: 5yr4/6 shading to 5/6, yllw red **MunsCore**: 7.5yrN5/ shading to N4/ dk gry at center; 2.5yr6/6 lt red
Comments: white wash int and ext rim; red wash ext and int base; both washes applied unevenly and thickness variable; wash applied with rag, comes off on hands, especially red; both red and white wash react strongly to HCl; int rough, not well smoothed; pot is heavy, solid, and very hard (shatters); small area of centermost part of interior base only part of vessel surface without wash; very fine-grained, fairly dense, hard, orange brwn fabric with pink and blue-grey core; occ large pores and calcium carbonate inclusions; under 10X loupe, scattered pores, and calcium carbonate and ash inclusions; unlike most of Nile silt fabrics, section polished by sandpaper; dominant pore shape elongated and rounded, porosity by volume 18%

Number: 6 **Field Number**: W-8 **Form English**: pipehead **Form Arabic**: *hağar*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 2; single, v diffuse w/in fabric, defined betw fabric and core
MunsExt: 7.5yr5/4 brwn but pinker **MunsInt**: betw 5yr6/4 (lt red brwn) and 5/4 (red brwn)
MunsFab: 5yr5/6 yllw red (lter, brwner); 2.5yr6/8 lt red (lter) **MunsCore**: 7.5yrN5/ shading to N4/ dk gry at center; 2.5yr6/6 lt red
Comments: slightly lopsided; hard, almost metallic, v fine-grained fabric, medium brwn in color w/orange pink core, colors more muted than usual, occ large pores

Number: 7 **Field Number**: W-73* **Form English**: pipehead **Form Arabic**: *hağar*
Made: Cairo **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 3; single; diffuse to v diffuse
MunsExt: 7.5yrN3/ v dark gry **MunsInt**: same as exterior
MunsFab: as exterior MunsCore: 25y5/2 gry brwn, but dker, gryer and brwner
Comments: *analyzed chemically; black Nile silt; seed impression exterior, fair amount of shell in fabric; v fine-grained, fairly dense, lt gry brwn to dk gry/black fabric w/occ pores and calcium carbonate inclusions; under 10X loupe, scattered pores, calcium carbonate inclusions and rare quartz sand; porosity data n/a

Number: 8 **Field Number**: W-9 **Form English**: pipehead **Form Arabic**: *hağar*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 2; single; diffuse
MunsExt: 5yr5/6 yllw red **MunsInt**: same as exterior
MunsFab: 7.5yr4/6 strong brwn, but lighter **MunsCore**: 25yr5/6 red
Comments:

Number: 9 **Field Number**: W-7 **Form English**: pipehead **Form Arabic**: *hağar*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 3; single; diffuse
MunsExt: 5yr5/6 yllwish red **MunsInt**: same as exterior
MunsFab: 7.5yr4/6 strong brwn **MunsCore**: zone 10r5/6 red to 5/4 wk red; zone 10r5/8 red
Comments: slightly lopsided; almost completely fired through, core only at thickest part of body; medium brwn fabric w/pink core, fairly dense and soft, w/scattered quartz sand and calcium carbonate inclusions; under 10X loupe, scattered pores, occ calcium carbonate inclusions and scattered quartz sand inclusions of different sizes; dominant pore shape elongated and rounded, porosity by volume 15%

Figure 10.10

Number: 1 **Field Number**: W-6 **Form English**: closed bowl **Form Arabic**: ?
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 2 to 3; single; diffuse
MunsExt: 2.5yr5/6 red (but brwner); or 5yr5/6 yllw red but redder **MunsInt**: same as exterior
MunsFab: closest to 2.5yr4/8 red but brwner **MunsCore**: no good match; betw 10r5/6 and 5/8 red
Comments: holes in vessel wall cut at leather-hard stage, no effort made to smooth edges of cuts; exterior sloppy; rim lopsided; scattered and inconsistent areas with white wash, including fingerprints, probably from handling by someone with wash on their hands since does not appear to be intentional; possibly made in two pieces; small area with cloth impression in interior

Number: 2 **Field Number**: W-14 **Form English**: jar/pigeon pot **Form Arabic**: *gadūs*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: white smeared wash, 10yr8/3 & 7/3 v pale brwn to 5y8/2 white **Core**: 0 to 2; single
MunsExt: 5yr4/6 yllw red **MunsInt**: 2.5yr5/6 red
MunsFab: betw 5yr4/6 yllw red and 7.5yr4/6 strong brwn **MunsCore**: 10r5/8 to 4/8 red
Comments: carelessly finished; irregular and inconsistent white smeary wash, probably not intentional, probably applied with rag but also can see finger marks where fingers drawn across pot to smear on both interior and exterior, especially around rim

Number: 3 **Field Number**: W-20 **Form English**: bowl **Form Arabic**: *taba'*
Made: Minya **Obtained**: Minya market **Technique**: handmade **Fabric**: Nile silt
Dec: thick pink wash exterior and interior, 10r6/6 light red **Core**: 0 to 3; single; diffuse
MunsExt: as decoration **MunsInt**: as decoration
MunsFab: 5yr4/6 yllw red **MunsCore**: 5yr 4/2 dark red gry and 10r5/6 red
Comments: base thickness varies from 10mm to 17mm; very lopsided; core variable; none to small in base and lower body; near rim in only some areas get purplish dark core; wash rubs off on hands; wash applied with cloth; sloppily made, carelessly finished, and slip carelessly applied; possible cord marks under rim but covered by wash; coarse, soft and porous fabric w/numerous, scattered, large, different colored inclusions (quartz sand, grog, calcium carbonate); dominant pore shape elongated, porosity by volume 15%

Number: 4 **Field Number**: 14.5 **Form English**: bowl **Form Arabic**: ?
Made: Abu Raguan? **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: thick wash ext and int 10r6/6 lt red and also sl lter **Core**: none
MunsExt: as decoration **MunsInt**: as decoration
MunsFab: 7.5yr5/6 strong brwn (but duller and brwner) **MunsCore**: very slight , diffuse pink tinge in middle of vessel wall
Comments: ext diam 20cm at 12.5%; wash reacts strongly to HCl; fabric almost identical to that of W-31; soft, coarse, porous uniform medium brwn fabric w/numerous pores, occ scattered quartz sand, some large to v large, scattered ash and occ calcium carbonate inclusions; dominant pore shape rounded, porosity by volume 20%

Number: 4 **Field Number**: 14.5 **Form English**: bowl **Form Arabic**: ?
Made: Abu Raguan? **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: thick wash ext and int 10r6/6 lt red and also sl lter **Core**: none
MunsExt: as decoration **MunsInt**: as decoration
MunsFab: 7.5yr5/6 strong brwn (but duller and brwner) **MunsCore**: very slight , diffuse pink tinge in middle of vessel wall
Comments: ext diam 20cm at 12.5%; wash reacts strongly to HCl; fabric almost identical to that of W-31; soft, coarse, porous uniform medium brwn fabric w/numerous pores, occ scattered quartz sand, some large to v large, scattered ash and occ calcium carbonate inclusions; dominant pore shape rounded, porosity by volume 20%

Number: 5 **Field Number**: W-3 **Form English**: carinated/closed bowl **Form Arabic**: *misa'a*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: scattered, erratic blobs thin buff wash int/ext **Core**: 3, 6; single; defined (crust) to v diffuse
MunsExt: 10yr4/1 dk gry but darker; kiln cloud 10r5/6 red **MunsInt**: 10yr4/1 dk gry
MunsFab: 10yr3/1 v dk gry to 5yr4/4 (red brwn) to 4/2 (dk red gry) **MunsCore**: 10yr5/2 (gryish brwn) or 5/3 (brwn); 2.5yr5/6 red
Comments: overfired, rim with number of small cracks, one large crack on body parallel to base; wash probably not intentional, has appearance of being remnants from potter's hands or cloth; potter's fingerprints (up to 2nd joint) preserved in int wash patch; color of wash ranges from 10yr8/2 white to 10yr8/3 v pale brwn, to 7.5yr7/4 pink; fabric closely similar to 5.10; fine-grained, dense brittle, pink orange fabric w/scattered large calcium carbonate and quartz sand inclusions; under 10X loupe, scattered pores and calcium carbonate and quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 8% to 10%

Number: 6 **Field Number**: W-1 **Form English**: closed bowl **Form Arabic**: *misa'a*
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: thin smeared wash ext 5y8/2 white **Core**: 0 to 3, 6; single; v diffuse but defined at crust
MunsExt: 7.5yr4/2 dk brwn **MunsInt**: 7.5yr4/2 dk brwn
MunsFab: 5yr4/2 dk reddish gry **MunsCore**: 2.5yr4/6 red
Comments: incipient overfiring, hard, brittle, gry-brwn to orange-brwn, fairly dense, coarse fabric w/numerous scattered large calcium carbonate inclusions and occ large pores; under 10X loupe, scattered pores, numerous calcium carbonate, occ quartz sand inclusions; dominant pore shape elongated, porosity by volume 10%

Number: 7 **Field Number**: W-58 **Form English**: hemispherical bowl **Form Arabic**: *misa'a*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: white wash exterior 5y8/1 white; dripped into interior **Core**: 2 to 3; single; diffuse
MunsExt: closest to 2.5yr4/4 red brwn but lter **MunsInt**: 2.5yr4/6 red
MunsFab: 5yr4/2 dk reddish gry **MunsCore**: closest to 5yr6/8 red yllw (but lter)
Comments: flat base, scattered accidental white wash on rim and interior from handling; fine-grained, fairly hard, orange brown fabric with very diffuse light to medium orange core, occ large pores, and scattered calcium carbonate inclusions; under 10X loupe, scattered pores and calcium carbonate and ash inclusions, rare quartz sand inclusions; closely similar in appearance to W-55 except latter has a defined core; dominant pore shape rounded, porosity 7% to 10%

Number: 8 **Field Number**: W-68 **Form English**: closed bowl **Form Arabic**: *misa'a*
Made: Fayum **Obtained**: Fayum potters' market **Technique**: wheelmade **Fabric**: Nile silt
Dec: white wash exterior 5y8/1 white; dripped into interior **Core**: 3 to 4; single; very diffuse
MunsExt: betw 7.5yr6/6 red yllw and 5/6 strong brwn **MunsInt**: 5yr5/6 yllw red
MunsFab: 7.5yr4/6 strong brwn (but bit lighter and yllwer) **MunsCore**: 10r6/3 to 6/4 pale red; 7.5r5/4 weak red to 10r5/4 weak red to 10r5/8 red
Comments: exterior base v rough and uneven, seems to have rested on ground; base and bottom part of body scraped; fabric very soft and coarse; top half of pot nicely finished, bottom half sloppy; "rainbow ware;" heavy, porous fine-grained fabric w/ scattered large inclusions of different types; dominant pore shape elongated and rounded, porosity by volume 25%

Number: 9 **Field Number**: W-16 **Form English**: bowl **Form Arabic**: ?
Made: Samannûd **Obtained**: Mahalla retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 2; single; diffuse
MunsExt: 7.5yr6/4 lt brwn; carination to base 5yr5/6 yllw red **MunsInt**: 5yr4/6 yllw red
MunsFab: 5yr4/6 yllw red **MunsCore**: 7.5r5/8 red and 7.5r5/4 weak red
Comments: core occurs only at thickest part of vessel, toward base; exterior lightly wet smoothed; parallel concentric grooves approximately 4mm apart on base; grooves are shallow, regular and even; exterior below carination smoother than above; reddish fire cloud on exterior

Number: 10 **Field Number**: W-59 **Form English**: bowl/fowl feeder **Form Arabic**: *misa'a*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: ext wash, 5y8/1 white (but whiter); int pink wash, 10r6/6 lt red **Core**: none
MunsExt: as dec **MunsInt**: as dec
MunsFab: 7.5yr4/6 strong brwn **MunsCore**: n/a

Comments: ext wash wiped on carelessly, uneven and drippy, reacts to HCl; int wash wiped on, strong reaction to HCl; pot not lopsided; usual careless finishing but not as poorly finished as some others; fabric closely similar to W-54, W-61, and W-57; uniform, fine-grained, fairly dense and fairly soft medium brwn fabric w/ v occ large pores, scattered small pores, and occ calcium carbonate inclusions; under 10X loupe, occ calcium carbonate and ash inclusions; dominant pore shape rounded, porosity by volume 10%

Figure 10.11

Number: 1 **Field Number**: W-55 **Form English**: bowl **Form Arabic**: *hod*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: white wash ext and rim 5yr8/1 white and 5y8/1 white **Core**: 0 to 3; defined
MunsExt: as dec **MunsInt**: betw 5yr5/4 red brwn and 5/6 yllw red
MunsFab: **MunsCore**: 5yr6/3 lt red brwn; ranges from 2.5yr6/6 to 8; 2.5yr5/4 red brwn
Comments: ext wash thick, but wiped on unevenly with cloth; wash has strong reaction wash to HCl; bottom not flat, almost convex and uneven, and bowl stands slightly lopsided; on ext base was thick layer of slip, as much as 2mm; large pebble embedded in base of vessel; white fingermarks and two areas with red wash, apparently accidental, visible on undecorated int; v fine-grained, fairly hard, orange brwn fabric with very defined light orange core, scattered pores, and occ large calcium carbonate inclusions; under 10X loupe, scattered pores and calcium carbonate and ash inclusions; virtually identical to W-58 except latter has a diffuse core; dominant pore shape elongated to rare rounded, porosity by volume 20% to 25%

Number: 2 **Field Number**: W-17 **Form English**: bowl **Form Arabic**: ?
Made: Samannûd **Obtained**: Mahalla vendor **Technique**: wheelmade **Fabric**: Nile silt
Dec: white wash ext and rim 5yr8/1 white and 5y8/1 white **Core**: 6; very diffuse
MunsExt: 7.5yr5/4 brwn **MunsInt**: 7.5yr5/4 brwn
MunsFab: 7.5yr5/4 brwn/dk brwn **MunsCore**: 10r5/6 red
Comments: milk processor for curdling milk; vessel slightly lopsided, does not rest flat on base; and rim is also somewhat lopsided; on bottom third of pot can see more or less horizontal lines of small cord marks, one about 1mm thick, then series about 1/2mm thick; wash does not react to HCl; wash applied heavily on bottom two-thirds of exterior, patchy and light on top third and on rim and hand marks on interior, appears intentionally applied to bottom part of vessel and accidental elsewhere; dense appearing, somewhat brittle, fine-grained orange pink fabric w/medium brwn crust, scattered pores, and occ large calcium carbonate and quartz sand inclusions; under 10X loupe, numerous small pores, occ grog?, and numerous scattered calcium carbonate and rare quartz sand inclusions; dominant pore shape rounded, porosity by volume 20% to 25%

Number: 3 **Field Number**: W-57 **Form English**: bowl **Form Arabic**: *berām*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 1; single; diffuse
MunsExt: 5yr4/6 yllw red **MunsInt**: 5yr4/6 yllw red
MunsFab: 5yr4/6 yllw red **MunsCore**: betw 5yr5/3, and 4 red brwn; betw 2.4yr5/6 and 8 red
Comments: core present only in thickest part of body; top lopsided, bottom convex; very similar to W-61 but pinker and a bit harder, virtually identical to W-62; uniform, fine-grained, dense, medium brwn fabric, fairly hard, w/occ large calcium carbonate inclusions and pores; under 10X loupe, scattered calcium carbonate and ash, and rare quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 10% to 15%

Number: 4 **Field Number**: W-70 **Form English**: bowl **Form Arabic**: *šalya*
Made: Fayum **Obtained**: Fayum potters' market **Technique**: wheelmade **Fabric**: Nile silt
Dec: white wash exterior 5y8/1 white; dripped into interior **Core**: 3 to 4; single; diffuse
MunsExt: 5yr6/6 red yllw and a bit darker than 7.5yr red yllw **MunsInt**: same as ext
MunsFab: 7.5yr4/6 strong brwn (but yllwer) **MunsCore**: 10yr3/1 v dk gry; thin band 7.5yr4/6 str brwn; 10r5/8 red
Comments: for milk; bottom third (approx) of ext scraped, rest and int wet smoothed; soft, thick, porous fabric with numerous large inclusions of different types; fabric brwn with center core of dk gry and outer core of pink/red; dominant pore shape elongated and rounded, porosity by volume 20%

Number: 5 **Field Number**: W-32 **Form English**: bowl **Form Arabic**: *hod*
Made: Abu Raguan? **Obtained**: Abu Raguan retailer **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 3; single; diffuse
MunsExt: closest to 5yr5/6yllw red but lighter and more muted **MunsInt**: as exterior
MunsFab: 7.5yr5/6 strong brwn (but duller and brwner) **MunsCore**: betw 7.5r5/4 wk red and 5/6,8 red; betw 10r5/3, 5/4 wk red
Comments: exterior scraped at carination, leaving deep drag marks; scraped after wet smoothed; sloppily produced; soft

Figure 10.12

Number: 1 **Field Number**: W-75 **Form English**: large bowl/basin **Form Arabic**: *māǧūr*
Made: Badrashein **Obtained**: Badrashein retailer **Technique**: handmade? **Fabric**: coarse Nile silt
Dec: 10yr8/3 pale brwn wash int base **Core**: 0 to 2; diffuse
MunsExt: 5yr5/6 yllw red to betw 7.5yr5/6 (str brwn), 5yr6/6 red yllw **MunsInt**: betw 5yr6/6 (red yllw) and 5/6 (yllw red)
MunsFab: betw 7.5yr5/6 and 4/6 (strong brwn) **MunsCore**: 7.5yrN2/black to N5/ v dk gry to N4/ dk gry to 10yr4/2 dk brwn gry
Comments: heavy, coarse vessel, with approximate bottom third of exterior pare cut/scraped; 6 lines of rope impressions on exterior body, one line on middle of rim; wash on interior is sloppy and random, evidently coated from the exterior surface wash of a similar bowl stacked inside; wash reacts to HCl; uniform, porous fine-grained brwn fabric w/scattered large and very large inclusions including quartz sand, grog, ash, glass and melted aluminum, v occ large straw casts; dominant pore shape elongated, porosity by volume 35%

Number: 2 **Field Number**: W-21 **Form English**: bowl **Form Arabic**: *māǧūr*
Made: Minya **Obtained**: Minya market **Technique**: wheelmade **Fabric**: Nile silt
Dec: thick pink wash ext and int, ranges 10r6/6 lt red to 7.5r5/6 red **Core**: 4 to 5; single; diffuse to v diffuse
MunsExt: as decoration **MunsInt**: as decoration
MunsFab: 7.5yr 4/6 strong brwn **MunsCore**: 10yr3/2 vdk gry brwn to 7.5yrN3/ vdk gry; 2.5yr5/4 red brwn & 5/6 red
Comments: heavy; thick wash wiped on with cloth, comes off easily on hands; appear to be cord marks on exterior vessel body below wash; wash not well mixed and color ranges from light to very dark rose to rose brwn interior and exterior; rainbow ware; very porous and extremely coarse fabric w/numerous scattered quartz sand inclusions and occ calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 30% to 35%

Number: 3 **Field Number**: W-54 **Form English**: bowl **Form Arabic**: *šalya*
Made: Minouf **Obtained**: El Qanatar retailer **Technique**: **Fabric**: Nile silt
Dec: white wash ext body below rim 5y8/1 white **Core**: 1 to 2; single; diffuse
MunsExt: betw 5yr5/6 and 4/6 yllw red **MunsInt**: 5yr4/6 yllw red
MunsFab: 5yr 4/6 yllw red **MunsCore**: 10yr3/2 vdk gry brwn, sometimes w/ 2.5yrN4/ dk gry; 10r5/8 red
Comments: two spiral grooves on exterior body without wash; wash carelessly applied with cloth; occ smears of wash on rim and interior; hard, some shattering when broken; fabric closely similar to W-56, W-57, W-61, except has pink core and is slightly more orange in color and a bit harder; fine-grained, fairly uniform medium brwn fabric w/scattered pores and occ large calcium carbonate inclusions; under 10X loupe, scattered pores, ash, and calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 10% to 15%

Number: 4 **Field Number**: W-31* **Form English**: bowl **Form Arabic**: *tāǧen*
Made: Abu Raguan **Obtained**: Abu Raguan potter **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 1; single; v diffuse to diffuse
MunsExt: betw 7.5yr4/6 red yllw and 5/6 strong brwn **MunsInt**: as ext, but lighter and more yllw
MunsFab: 7.5yr4/6 strong brwn (but bit lter and yllwer) **MunsCore**: 2.5yr5/6 red
Comments: *analyzed chemically; 3 rows of cord marks below rim (only top two drawn); rough exterior; bottom scraped/pare cut below cord marks; wet-smoothed interior, upper exterior; fabric virtually identical to that of 14.5; soft, coarse, porous uniform medium brwn fabric w/numerous pores, occ scattered quartz sand, some large to v large, v occ ash and calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 20%

Number: 5 **Field Number**: 14.2 **Form English**: large bowl **Form Arabic**: ?
Made: Abu Raguan **Obtained**: Abu Raguan potter **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 1; single; v diffuse to diffuse
MunsExt: 7.5yr5/6 strong brwn **MunsInt**: as ext, but lighter and more yllw
MunsFab: 7.5yr5/6 strong brwn **MunsCore**: 2.5yr5/6 red
Comments: int diam 30cm at 12.5%; 3 horiz rows cord marks beginning under rim; roughly wet smoothed; lumpy area one exterior; sloppily made; porous, soft, coarse ware, fine-grained but with numerous pores and inclusions of various kinds and sizes; dominant pore shape rounded, porosity by volume 15%

Figure 10.13

Number: 1 **Field Number**: 13.115* **Form English**: large bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: rilling from rim to carination **Core**: faint core visible in center of rim, diffuse edges, color all same as fabric
MunsExt: 7.5yrN4/ dk gry **MunsInt**: 2.5yrN4/ dk gry
MunsFab: betw 7..5yrN4/ dk gry and N/3 v dk gry **MunsCore**: n/a
Comments: *analyzed chemically; Black Sinai Silt ware; int diam 37cm at 17.5%; 2 pieces join, old break; sand polished, chipped, and some pitting; very hard; fairly uniform, fine-grained, dark gry, dense appearing fabric w/occ small white calcium carbonate inclusions; under 10X loupe, scattered pores and scattered opaque quartz sand and calcium carbonate inclusions; slight reaction to HCl; dominant pore shape elongated and rounded, porosity by volume 10%

Number: 2 **Field Number**: 13.117 **Form English**: large bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade ? **Fabric**: Sinai silt
Dec: rills above carination **Core**: none
MunsExt: 7.5yrN4/ dk gry **MunsInt**: same as ext but dker
MunsFab: betw 7.5yrN4/ dk gry and N/3 v dk gry **MunsCore**: n/a
Comments: Black Sinai Silt ware; ext diam 35cm at 25%; probably same vessel as 13.116; slightly weatherworn, some sand polishing; fairly uniform, fine-grained, dk gry, dense appearing fabric w/occ small white calcium carbonate inclusions; under 10X loupe, scattered pores and scattered opaque quartz sand and calcium carbonate inclusions; slight reaction to HCl; porosity data n/a

Number: 3 **Field Number**: 13.42 **Form English**: large bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**:? **Fabric**: Sinai silt
Dec: none **Core**: 3, 7; single
MunsExt: 7.5yrN4/ dk gry (but dker) **MunsInt**: 2.5yrN5/ gry
MunsFab: crust ext 7.5yrN4 dk gry and 10yr7/2 lt gry; 2.5yrN4/dk gry **MunsCore**: 2.5yrN5/ gry
Comments: Black Sinai Silt ware; int diam 42cm at 16%; sand polished; very hard fabric; coarse, porous grainy dk gry fabric w/occ scattered calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets—quartz sand; dominant pore shape elongated, rare rounded, porosity by volume 25%

Number: 4 **Field Number**: 13.112 **Form English**: large bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade? **Fabric**: Sinai silt
Dec: none **Core**:
MunsExt: 2.5yrN4/ dk gry to 7.5yrN4/ dk gry **MunsInt**: betw 5y5/1 gry and 4/1 dk gry
MunsFab: 7.5yrN4/ dk gry **MunsCore**:
Comments: Black Sinai Silt ware; ext diam 40cm at 7.5%; remains of 2 circular mendholes; rim folded over to ext to point of carination; coarse, porous, grainy dk gry fabric w/occ scattered calcium carbonate, some large, and numerous scattered opaque quartz sand; fresh break appears to have shiny facets –quartz sand; slight reaction to HCl; dominant pore shape elongated and rounded, porosity by volume 30%

Number: 5 **Field Number**: 13.111 **Form English**: large bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade? **Fabric**: Sinai silt
Dec: none **Core**: 6; diffuse
MunsExt: 2.5yrN4/ dk gry **MunsInt**: 7.5yrN4/ dk gry (sl lter)
MunsFab: core 2.5yrN4/ dk gry (but dker) **MunsCore**: 7.5yrN6/ lt gry/gry (but brwner)
Comments: Black Sinai Silt ware; int diam 36cm at 8%; int eroded; ext sand polished in places; occ post-depositional concretions on ext and int. react strongly to HCl; coarse, porous, grainy dk gry fabric w/occ scattered calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets—quartz sand; slight reaction to HCl; dominate pore shape elongated and rounded; porosity by volume 28%

Number: 6 **Field Number**: 13.122 **Form English**: ring base, bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade? **Fabric**: Sinai silt
Dec: none **Core**: 6; diffuse
MunsExt: 2.5yrN4/ dk gry **MunsInt**: betw 7.5yrN4/ dk gry and N5/ gry
MunsFab: 2.5yrN4/ dk gry **MunsCore**: n/a
Comments: Black Sinai Silt ware; ext diam 36cm at 11.5%; grey, plaster-like concretion (quartz sand in grey-white grainy matrix) on ext and int, reacts strongly to HCl; sand polished; int beginning to erode; coarse, porous, grainy dk grey fabric w/occ scattered calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets—quartz sand; dominant pore shape elongated, rare rounded, porosity by volume 25%

Number: 7 **Field Number**: 13.116 **Form English**: flat base, bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade? **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: 7.5yrN4/ dk gry **MunsInt**: 2.5yrN4/ dk gry
MunsFab: betw 2.5yrN4/ dk gry and N3/ vdk gry **MunsCore**: n/a
Comments: Black Sinai Silt ware; diam 14.5cm at 15%; probably base of 13.117; very hard; fairly uniform, fine-grained, dark gry, dense appearing fabric w/occ small white calcium carbonate inclusions; under 10X loupe, scattered pores and scattered small opaque quartz sand and calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 18%

Figure 10.14

Number: 1 **Field Number**: 13.49A **Form English**: jar?, jug?, bottle? **Form Arabic**: *ballās*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: shallow ribbing ext neck **Core**: 6; diffuse
MunsExt: 2.5yrN4/dk gry **MunsInt**: same as ext
MunsFab: 10yr4/1 dk gry (but dker) **MunsCore**: 2.5yr4/2 dk gry brwn (but dker)
Comments: Black Sinai Silt ware; int diam 9cm at 10%; grainy ware

Number: 2 **Field Number**: 13.40 **Form English**: jar?, jug?, bottle? **Form Arabic**: *ballās*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: ribbing on neck **Core**: 7; diffuse to defined
MunsExt: mottled 2.5yr6/2 lt brwn gry, 5/2 gry brwn, & 5y4/1 dk gry **MunsInt**: 10yr6/1 lt gry and 10yr7/4 pale brwn
MunsFab: 7.5yrN4/ dk gry and 10yr5/2 gry brwn **MunsCore**: varies from 10yr7/4 pale brwn to betw 10yr6/1 lt gry and 6/2 lt brwn gry
Comments: Black Sinai Silt ware; int diam 7.5cm at 20%; sand polished, esp ext; brittle, shatters when chipped; possible secondary burning, rim folded over to exterior; brittle, considerable variability in fabric color from brwn buff to light gry to gry; reacts to HCl; speckled, dense fabric; under 10X loupe scattered pores and different colored quartz sand; dominant pore shape elongated, porosity by volume 10%

Number: 3 **Field Number**: 13.107 **Form English**: jar?, jug?, bottle? **Form Arabic**: *ballās*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: ranges from 7. 5yrN5/ gry to N4 dk gry **MunsInt**: 5y5/1 gry to 6/2 lt olive gry
MunsFab: 10yr5/1 gry **MunsCore**: n/a
Comments: Black Sinai Silt ware; int diam 8cm at 22%; sand polished; fine-grained gry brwn, uniform fabric w/numerous opaque quartz sand inclusions, v occ dk gry to black ash or incompletely oxidized organic inclusion; under 10X loupe, numerous scattered pores and opaque quartz sand and occ calcium carbonate inclusions; reacts to HCl; dominant pore shape elongated and rare rounded, porosity by volume 35%

Number: 4 **Field Number**: 11.9 **Form English**: storejar **Form Arabic**: *ballās*
Made: Gerzeh area? **Obtained**: Gerzeh roadside **Technique**: wheelmade **Fabric**: orange marl clay
Dec: none **Core**: none
MunsExt: self slip 5y7/4 pale yllw **MunsInt**: self slip 5y8/3 white to 8/4 yllw to 7.5yr7/4 pink
MunsFab: betw 5yr6/8 red yllw and 2.5yr5/8 red **MunsCore**: n/a
Comments: ext diam 10 cm at 8%; diam and stance approx, rim surface worn; possibly same jar as 11.3; remains upper handle attachment at ridge on neck; fabric reacts HCl; substantial mottled lt yllw zone in fabric near top of rim; thick crust self slip ext surface, thicker at rim, int not as substantial self slip; reacts to HCl; incipient sintering; numerous light orange and buff mudstone inclusions; porous fabric near rim w/many large pores; under 10X loupe, many small pores mostly lined w/white to grey carbonate matter; porosity date n/a

Number: 5 **Field Number**: 13.17 **Form English**: jug?, bottle? **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: anomalous
Dec: none **Core**: none
MunsExt: 10yr7/3v pale brwn (poss orig surf) to 10yr5/1 gry **MunsInt**: 10yr5/1 l gry to 5/2 gry brwn
MunsFab: 10yr4/2 dk gry brwn (but gryer) **MunsCore**: n/a
Comments: int diam 7cm at 16%; diam and stance approx; original surfaces eroded; sand polished; strong reaction to HCl; large, rounded, buff inclusions visible on ext surface; fabric mottled gry brwn with numerous buff inclusions; porous

Number: 6 **Field Number**: 13.94 **Form English**: jug?, bottle? **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: anomalous
Dec: wide ribbing **Core**: 3; single; very diffuse and mottled
MunsExt: eroded **MunsInt**: 10yr5/1 lt gry to 5/2 gry brwn
MunsFab: 2.5yr4/8 red **MunsCore**: mottled 10yr4/2 dk brwn gry and 5yr4/3 red brwn
Comments: diam 6.5cm at 25%; ext badly eroded; v fine-grained (almost smooth), hard, dense, mottled orange and brwn fabric, w/occ scattered calcium carbonate inclusions; under 10X loupe, scattered calcium carbonate and quartz sand inclusions; porosity data n/a

Number: 7 **Field Number**: 13.39+13.103 **Form English**: jug?, bottle? **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: shallow ribbing ext neck **Core**: 7; defined
MunsExt: 7.5yrN4/ dk gry **MunsInt**: 10yr7/1 lt gry
MunsFab: 7.5yrN4/ dk gry **MunsCore**: 2.5y N5/ gry to 5y4/1 dk gry to 10yr7/2 lt gry
Comments: Black Sinai Silt ware; int diam 7.5cm at 40%; 2 joining sherds; possibly same vessel as 13.106; sand polished; numerous scattered white grits (calcium carbonate) ext, int and fabric; dense appearing dk gry fabric w/scattered small lt gry circular or oval zones of oxidation; under 10X loupe scattered pores and opaque quartz sand; slight reaction HCl; dominant pore shape elongated and rounded; porosity by volume 20%

Number: 8 **Field Number**: 13.88 **Form English**: bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: anomalous
Dec: possible remnants of slip 2.5yr7/2 lt gry ext/int?? **Core**: 0 to 2; split; very diffuse
MunsExt: betw 5yr6/4 lt red brwn and 6/6 red yllw **MunsInt**: as ext
MunsFab: 5yr5/6 yllw red (only small area at and below rim) **MunsCore**: 2.5yr3/2 dk gry brwn to 4/3 brwn/dk brwn (most of section)
Comments: ext diam 19cm at 4%; stance and diam approx; top of rim and surfaces weathered; slip (or post depositional accretion) remnants react HCl; v fine-grained to smooth, gry-brwn to orange, dense appearing fabric w/occ scattered pores; under 10X loupe fairly numerous scattered pores (esp in rim area) and inclusions, esp quartz sand; dominant pore shape elongated and rounded, porosity by volume 30%

Number: 9 **Field Number**: 13.63 **Form English**: deep bowl **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Sinai silt and marl clay
Dec: remnants self slip or scum ext 5y8/1 to 8/2 white **Core**: 2 to 3; single; sl diffuse to defined
MunsExt: 5yr7/6 red yllw **MunsInt**: 5yr6/6 red yllw
MunsFab: 2.5yr6/6 lt red (but darker) **MunsCore**: 2.5y6/4 gry brwn and 10yr5/2 gry brwn
Comments: int diam 32cm at 7.5%; badly worn, stance and diam approx; white encrustation ext below rim, reacts HCl; dense, fine-grained, dark pink orange fabric with lt brwn core; under 10X loupe, scattered pores, scattered calcium carbonate and mudstone, and scattered small, dark quartz sand; dominant pore shape rounded; porosity by volume 10% to 12%

Number: 10 **Field Number**: 13.38 **Form English**: jug? **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 7; diffuse
MunsExt: 2.5yN4/ dk gry **MunsInt**: 5yr6/6 red yllw
MunsFab: crust ext 2.5yN3/ v dk gry **MunsCore**: 2.5y6/4 gry brwn and 10yr5/2 gry brwn
Comments: Black Sinai Silt ware; int gutter rim; ext diam 13.5cm at 20%; sand polished; wet smoothed on rim; fine-grained, dense, gry brwn fabric w/numerous opaque quartz sand inclusions, v occ dk gry to black ash or incompletely oxidized organic inclusion; under 10X loupe, occ scattered pores and numerous opaque quartz sand and scattered calcium carbonate inclusions; reacts HCl; dominant pore shape elongated and rounded, porosity by volume 18%

Number: 11 **Field Number**: 13.22 **Form English**: cookpot **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: handmade **Fabric**: anomalous
Dec: none **Core**: split (int surface and adjacent fabric blackened/discolored); diffuse
MunsExt: 7.5yr7/4 pink at rim to 6/4 lt brwn to 4/4 brwn/dk brwn **MunsInt**: burned 7.5yrN3/ v dk gry to N2/ black
MunsFab: 7.5yr5/6 strong brwn to burning near int 7.5yrN2/ black **MunsCore**: see fabric color
Comments: three views of same rim; almost definitely same pot as 13.86 and 13.87; diam and stance approx; wet smoothed int and ext, int surface and associated fabric blackened; surfaces uneven, irregular and compacted; est surface has numerous scattered multi-colored inclusions, esp buff, pink, orange and red; strong reaction HCl; thick, heavy, soft, coarse, friable fabric w/ numerous multi-colored inclusions, esp grog, of varying size; series of large voids in center vessel wall from manufacturing; dominant pore shape rounded, porosity by volume 5% to 6%

Number: 12 **Field Number**: 13.86 **Form English**: cookpot **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: handmade **Fabric**: anomalous
Dec: none **Core**: 2 to 3, 6; split (irregular thickness); diffuse
MunsExt: 10yr7/3 v pale brwn, 10yr4/1 dk gry, 10yr4/2,3 and 3/3 **MunsInt**: ranges 7.5yrN3/ v dk gry to 10yr7/3 v pale brwn to 7.5yrN4/ dk gry
MunsFab: 2.5yrN2/ black to 10yr3/1 vdk gry and 3/2 vdk gry brwn **MunsCore**: 7.5yr5/6 strong brwn to 7.5yr6/ red yllw to 10yr4/3 and 4/4 dk yllwbrwn
Comments: almost definitely same pot as 13.22 and 13.87; diam and stance approx; surfaces compacted and coloring mottled; uneven, irregular surfaces; series of large manufacturing voids in center of vessel wall; int burned (mostly very black), and black/dk gry coloration extends through interior wall into vessel body; slight reaction HCl; very soft, friable, heavy, dense, coarse fabric, w/many different color inclusions; under 10X loupe, scattered grog (different colors), ash, calcium carbonate, and quartz sand inclusions, v occ pores; dominant pore shape rounded, porosity by volume 5%

Number: 13 **Field Number**: 13.87 **Form English**: cookpot **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: handmade **Fabric**: anomalous
Dec: none **Core**: split; diffuse; darkened near int wall
MunsExt: 10yr7/3 v pale brwn, 10yr4/1 dk gry, 10yr4/2,3 and 3/3 **MunsInt**: ranges 7.5yrN3/ v dk gry to 10yr7/3 v pale brwn to 7.5yrN4/ dk gry
MunsFab: 7.5yr5/6 strong brwn to burning near int 7.5yrN2/ black **MunsCore**: see fabric color
Comments: almost definitely same pot as 13.22 and 13.86; diam and stance approx; knobby handle; surfaces compacted and coloring mottled; uneven, irregular surfaces; series of large manufacturing voids in center of vessel wall; int burned (mostly very black), and black/dk gry coloration extends through interior wall into vessel body; slight reaction HCl; very soft, friable, heavy, dense, coarse fabric, w/many different color inclusions; under 10X loupe, scattered grog (different colors), ash, calcium carbonate, and quartz sand inclusions, v occ pores; porosity data n/a

Number: 14 **Field Number**: 13.6 **Form English**: cookpot **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: handmade **Fabric**: anomalous
Dec: none **Core**: 3; single; diffuse within core, defined betw core and fabric
MunsExt: 7.5yr6/4 lt brwn to 7.5yr4/2 brwn/dk brwn to 10yr4/3, 3/2 **MunsInt**: 7.5yr5/4, 5/2 brwn to 6/4 lt brwn to 10yr5/2 gry brwn and 4/2 dk gry brwn
MunsFab: 7.5yr5/6 strong brwn to 5yr4/2 dk red gry to 10yr4/3 **MunsCore**: 10yr4/2 dk gry brwn to 3/2 v dk gry brwn; 5yr6/6 red yllw
Comments: int diam 17cm at 17.5%; 2 joining pieces; smoked; color variations int and ext; extremely rough surface int/ext, w/ numerous chaff impressions ext, int surfaces; ext and int surface badly pitted; reacts HCl; heavy chaff temper; very coarse, uneven, handmade pot; friable, brittle, porous, very coarse fabric w/scattered large grog inclusions of different colors and rare large calcium carbonate inclusions; under 10X loupe, numerous pores, different colored grog of different sizes, scattered quartz sand and occ calcium carbonate and ash; dominant pore shape elongated and rare rounded, porosity by volume 45%

Number: 15 **Field Number**: 13.31 **Form English**: cookpot **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: handmade **Fabric**: anomalous
Dec: none **Core**: none
MunsExt: mottled 7.5yrN4/ dk gry, 5/2 brwn and 5/6 strong brwn **MunsInt**: 5yr4/6 yllw red, 7.5yr6/6 red yllw (but brwner)
MunsFab: 10yr4/1 dk gry and 3/1 v dk gry **MunsCore**: n/a
Comments: stance approx; remnants of stickhole just below rim; sand polished ext and int; surfaces uneven and rough; coarse pot; fabric shatters; scattered incompletely oxidized organics, mostly large, grey to black in color; v fine-grained, almost smooth, dense fabric w/scattered white quartz; scattered large pores, also area w/large voids in center of vessel wall; dominant pore shape elongated, porosity by volume 35%

Figure 10.15

Number: 1 **Field Number**: 13.109 **Form English**: pitcher ? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: Sinai silt
Dec: none **Core**: 3; single
MunsExt: 7.5yrN4/ dk gry **MunsInt**: as ext
MunsFab: 10yr5/2 gry brwn **MunsCore**: 7.5yr N4/ dk gry
Comments: Black Sinai Silt ware; strap handle; very hard; coarse, porous, grainy dk gry fabric w/occ scattered large calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets – quartz sand; slight reaction HCl; dominant pore shape elongated and rounded, porosity by volume 28%

Number: 2 **Field Number**: 13.100 **Form English**: pitcher ? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: from 7.5yrN4/ gry to N3/ v dk gry **MunsInt**: as ext
MunsFab: betw 10yr5/1 gry (but bluer and dker) **MunsCore**: n/a
Comments: Black Sinai Silt ware; strap handle; slight dark crust just under ext surface 7.5yrN3/ v dk gry; sand polished; coarse, somewhat porous, grainy dk gry fabric w/occ scattered large calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets—quartz sand; slight reaction HCl; dominant pore shape elongated and rounded, porosity by volume 20%

Number: 3 **Field Number**: 13.47 **Form English**: pitcher? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: Sinai silt
Dec: none **Core**: 3; single; v diffuse
MunsExt: 2.5y N4/ dk gry **MunsInt**: as ext; body wall 5yr4/3 dk red gry (but lter, brwner)
MunsFab: 5yr4/2 dk red gry to 4/3 red brwn **MunsCore**: n/a
Comments: Black Sinai Silt ware; strap handle; pinched together at base; coarse, porous grainy dk gry fabric w/occ scattered large calcium carbonate and numerous scattered opaque quartz sand; fresh break appears to have shiny facets—quartz sand; slight reaction HCl; dominant pore shape elongated and rounded, porosity by volume 25%

Number: 4 **Field Number**: 13.106 **Form English**: pitcher? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: Sinai silt
Dec: incised cross mark on ext **Core**: 6; sl diffuse to defined
MunsExt: 7.5yrN4/ v dk gry to 2.5yN4/ dk gry **MunsInt**: as ext
MunsFab: crust 7.5yrN4/ dk gry; below on ext only, 10yr7/1,2 lt gry **MunsCore**: n/a
Comments: Black Sinai Silt ware; strap handle; pinched together at base; int surface eroding; dense appearing gry fabric with numerous light gry spots and splotches (oxidation zones), and scattered white grits; under 10X loupe scattered pores and occ opaque quartz sand and calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 14%

Number: 5 **Field Number**: 13.26 **Form English**: pitcher? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: anomalous
Dec: incised cross mark on ext **Core**: none
MunsExt: 5yr6/6 red yllw (but pinker, lter) **MunsInt**: 10yr6/4 lt yllw brwn (prob post-depositional discoloration)
MunsFab: 5yr6/6 red yllw (sl lter and more yllw in center) **MunsCore**: n/a
Comments: Black Sinai Silt ware; strap handle; pinched together at base; reacts HCL; surface eroded in places; fine-grained, dense, speckled muted orange brwn buff fabric w/occ large calcium carbonate inclusions; under 10X loupe occ scattered quartz sand and calcium carbonate inclusions; dominant pore shape rounded, porosity by volume 5% to 10%

Number: 6 **Field Number**: 13.19 **Form English**: ? **Form Arabic**: *abrī*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: Sinai silt
Dec: none **Core**: n/a
MunsExt: 5yr4/3 to 4/4 red brwn to 5y3/1 v dk gry **MunsInt**: as ext; int body wall 2.5y3/2 dk gry brwn
MunsFab: 5yr4/6 yllw red (not burned) to 5yr3/4 to 3/3 dk red brwn **MunsCore**: n/a
Comments: handle w/ oval section; burned or overfired; surface sand polished; hard fabric w/numerous opaque quartz sand inclusions, scattered ash; slight reaction HCl; dominant pore shape elongated, porosity by volume 15%

Number: 7 **Field Number**: 13.77 **Form English**: jug? ? **Form Arabic**: ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: n/a **Fabric**: mixed Sinai silt and marl clay
Dec: none **Core**: 7; v diffuse
MunsExt: now 10yr8/3 and 8/4 v pale brwn to 2.5y8/4 and 7/4 pale yllw **MunsInt**: as ext
MunsFab: 2.5y8/2 white to 10yr8/3 v pale brwn **MunsCore**: ranges 10yr7/4 v pale brwn to 7.5yr7/6 red yllw to 7/4 pink
Comments: most likely same vessel as 13.28; double stranded handle; surface very badly eroded; speckled fabric; reacts HCl; very hard, fine-grained fabric, dense, weathers to glassy sheen; under 10X loupe, numerous scattered small pores, numerous scattered quartz sand inclusions of diff colors, giving fabric speckled appearance; dominant pore shape rounded, porosity by volume 10%

Number: 8 **Field Number**: 13.27 **Form English**: jug? bottle? **Form Arabic**: *'olla* ?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: anomalous
Dec: none **Core**: 0 to 4; diffuse; split
MunsExt: 2.5y7/4 pale yllw to 5y8/3 pale olive and 5y7/3 pale brwn **MunsInt**: 10yr7/4 v pale brwn to betw 2.5y6/2 lt brwn gry and 6/4 lt yllw brwn
MunsFab: 10yr6/4 lt yllw brwn (but lter, brwner) **MunsCore**: 2.5y6/4 lt yllw brwn (but greener)
Comments: stance and diam approx; sand polished; possible white slip ext and int, but badly discolored; ext and int surfaces react HCl; fairly hard; fine-grained fabric mottled w/yllw, split color zones, w/half pinkish and half yllwish in tone; numerous multicolored inclusions; under 10X loupe scattered pores, numerous scattered quartz sand inclusions, occ calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 10% to 12%

Number: 9 **Field Number**: 13.80 **Form English**: jug? ? **Form Arabic**:?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: anomalous
Dec: none **Core**: 0 to 1; single; diffuse to v diffuse
MunsExt: self slip betw 2.5y8/2 white and 8/4 pale yllw **MunsInt**: scum, color as ext, over 2.5yr6/6 lt red
MunsFab: betw 2.5yr6/6 lt red and 5/6 red **MunsCore**: 7.5y6/4 lt brwn
Comments: stance and diam approx; neck and top of shoulder; surfaces weathered, esp ext; dense, fine-grained, hard orange fabric w/yllw buff diffuse core and occ large calcium carbonate inclusions; under 10X loupe, occ pores, scattered calcium carbonate inclusions, and numerous quartz sand inclusions (dominantly opaque); pore data n/a

Number: 10 **Field Number**: 4.1 **Form English**: jug? **Form Arabic**:?
Made: Samannûd **Obtained**: Mahalla railroad tracks **Technique**: wheelmade **Fabric**: Nile silt
Dec: shallow, rounded ribbing on shoulder **Core**: 3; single; v diffuse
MunsExt: 5yr5/4 red brwn **MunsInt**: 5yr5/6 yllw red
MunsFab: 2.5yr5/6 red and 5/8 red **MunsCore**: 2.5yr6/4 v dk gry and N4/ dk gry
Comments: no sieve in neck; stance and diameter approx; poorly finished; well-defined v thin crust ext, int surface fabric, same color as ext/int surfaces; porous with gry core and pink fabric w/brwn-orange crust ext and int; light, brittle and almost metallic; v fine-grained, almost smooth fabric, w/occ ash, calcium carbonate, and quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 20%

Number: 11 **Field Number**: 13.204 **Form English**: jug **Form Arabic**: *'olla*
Made: Egypt? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 3; split
MunsExt: 5y8/3 pale yllw **MunsInt**: 10yr7/4 v pale brwn
MunsFab: 5y8/3 pale yllw **MunsCore**: 10yr7/4 v pale brwn
Comments: stance and diam approx; ext badly dented and scratched; sand polished; pink-orange and yllw fabric, speckled and mottled fabric, v fine-grained, dense, w/occ scattered pores and red mudstone inclusions; under 10X loupe, scattered calcium carbonate, quartz sand, and red mudstone inclusions; fabric closely similar in appearance to 13.200 and 13.81; porosity data n/a

Number: 12 **Field Number**: 13.200 **Form English**: jug **Form Arabic**: *'olla*
Made: Cairo? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 3; split
MunsExt: 5y7/4 pale yllw to 5y8/2 white **MunsInt**: 2.5y7/4 pale yllw but brwner/pinker
MunsFab: betw 5y8/2 white and 8/3 pale yllw **MunsCore**: 2.5y7/4 pale yllw, or 10yr7/4 v pale brwn (but lter, more yllw)
Comments: ext badly eroded, dented and scratched; int mostly intact; sand polished; pink-orange and yllw fabric, speckled and mottled fabric, v fine-grained, dense, w/occ scattered pores and red mudstone inclusions; under 10X loupe, scattered calcium carbonate, quartz sand, and red mudstone inclusions; fabric closely similar in appearance to 13.204 and 13.81; dominant pore shape round, porosity by volume 3% to 5%

Number: 13 **Field Number**: 10.8 **Form English**: jug ? **Form Arabic**: *'olla*
Made: Gerzeh area? **Obtained**: Gerzeh area **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 3; split
MunsExt: betw 5y8/3 nd 7/3 pale yellow **MunsInt**: 10yr6/4 lt yllw brwn
MunsFab: 2.5y7/4 pale yllw **MunsCore**: n/a
Comments: stance and diam approximate; ext sand polished; ext and int sandblasted and eroded; remnants of sieve base of int neck; reacts HCl; hard; uniform, fine-grained, buff colored fabric w/scattered pores and scattered quartz sand and ash inclusions; dominant pore size rounded, porosity by volume 15%

Number: 14 **Field Number**: 13.28 **Form English**: jug ? **Form Arabic**: *'olla*
Made: Gerzeh area? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Sinai silt and marl clay
Dec: none **Core**: 0 to 3; single; v diffuse
MunsExt: now closest to 2.5yr 7.4 pale yllw (but ltr, more yllw) **MunsInt**: as ext but sl pinker
MunsFab: 10yr8/4 v pale brwn **MunsCore**: closest to 7.5yr8/4 (but pinker, dker); 7.5yr7/6 red yllw
Comments: most likely same vessel as 13.77; speckled fabric; surfaces weathered to vitreous texture and appearance; remnants of sieve visible around edges int base of neck; reacts HCl; very dense, hard, fine-grained, sandy fabric, almost sintered w/ v occ large pores and calcium carbonate, and scattered quartz sand inclusions of different sizes; dominant pore shape elongated and rounded, porosity by volume 3% to 8%

Number: 15 **Field Number**: 13.81 **Form English**: jug ? **Form Arabic**: *'olla*
Made: Egypt? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 2 to 3; split; v diffuse
MunsExt: now closest to 2.5yr 7.4 pale yllw (but ltr, more yllw) **MunsInt**: 5y7/3 pale yllw
MunsFab: 10yr8/4 v pale brwn **MunsCore**: closest to 7.5yr8/4 (but pinker, dker); 7.5yr7/6 red yllw
Comments: int diam 8cm at 48%; s-shaped crack ext base; ext sand polished and worn, but patches org surface preserved; pink-orange and yllw fabric, speckled and mottled fabric, v fine grained, dense, w/occ scattered pores and red mudstone inclusions; under 10X loupe, scattered calcium carbonate, quartz sand, and red mudstone inclusions; fabric closely similar in appearance to 13.204 and 13.81; dominant pore shape round, porosity by volume 3% to 5%

Number: 16 **Field Number**: 13.118 **Form English**: pitcher ? **Form Arabic**: *abrī'*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: 2.5yN5/ gry **MunsInt**: 2.5y6/2 lt brwn gry
MunsFab: 2.5y5/2 gry brwn to 5y5/1 gry to 215y6/2 lt brwn gry **MunsCore**: n/a
Comments: Black Sinai silt ware; reacts to HCl; fine grained, lt gry to gry brwn fabric w/numerous opaque quartz sand inclusions, occ other quartz sand inclusions, occ ash and calcium carbonate, and scattered pores; reacts HCl; dominant pore shape elongated and rounded; porosity by volume 18%

Number: 17 **Field Number**: 13.121 **Form English**: pitcher ? **Form Arabic**: *abrī'*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 7, defined
MunsExt: 2.5yN4/ dk gry and lighter **MunsInt**: 5y6/1 gr/lt gry to2.5yN4/ dk gry
MunsFab: 2.5yN4/ dk gry **MunsCore**: 2.5yrN5/ gry to 7.5yr3/2 brwn, 5/2 gry brwn to 2.5y7/2, 1 lt gry
Comments: ring base; Black Sinai Silt ware; ext diam 6.5cm at 40%; hard; scattered occ white to buff calcium carbonate ext, int, fabric; fine-grained, somewhat porous gry fabric w/occ opaque quartz sand; under 10X loupe, numerous pores, scattered opaque quartz sand; slight reaction HCl; dominant pores elongated and rounded, porosity by volume 20%

Number: 18 **Field Number**: 13.37 **Form English**: pitcher ? **Form Arabic**: *abrī'*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 0 to 3; split; defined
MunsExt: ranges from 5y4/1 dk gry to 7.5yrN3/ vdk gry brwn (but dker) **MunsInt**: closest to 10yr6/3 pale brwn (but dker)
MunsFab: 2.5y5/2 gry brwn to 5y5/1 gry to 215y6/2 lt brwn gry **MunsCore**: 2.5yrN5/ gry to 7.5yr3/2 brwn, 5/2 gry brwn to 2.5y7/2, 1 lt gry
Comments: Black Nile Silt ware; ring base; dk gry curst ext surface; sand polished; faint ribbing on ext; dense fabric, light brwn-pink towards ext w/sharp division to int grey to lt gry fabric, scattered light colored inclusions (opaque quartz sand); under 10X loupe, very fine-grained fabric w/occ scattered pores and calcium carbonate, numerous scattered opaque quartz sand (reflect light); reacts HCl; dominant pore shape elongated, porosity 2% to 4%

Number: 19 **Field Number**: 13.119 **Form English**: pitcher ? **Form Arabic**: *abrī'*?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: 7.5yrN4/ dk gry (but not as blue) **MunsInt**: 7.5yrN4/ dk gry
MunsFab: 10yr3/1 v dk gry (but bluer) **MunsCore**: n/a
Comments: ring base; Black Nile Silt ware; 2 joining pieces; sand polished; weatherworn, remnants of int surface in base; hard; dense, fine-grained, uniform dk gry brwn fabric w/numerous opaque quartz sand inclusions and scattered calcium carbonate; same under 10X loupe, also scattered pores and scattered black ash; slight reaction HCl; dominant pore shape elongated and rounded, porosity by volume 14%

Number: 20 **Field Number**: 9.3 **Form English**: jug? **Form Arabic**: *'olla*
Made: Gerzeh area? **Obtained**: Gerzeh area **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 5y6/4 pale olive **MunsInt**: as ext
MunsFab: 5y7/3 pale yllw (but yllwer) **MunsCore**: n/a
Comments: int base diam 8cm at 20%; ring base; v fine-grained, fairly porous, pale greenish buff fabric; numerous v small, different colored quartz sand inclusions visible under 10X loupe, also scattered larger quartz sand; dominant pore shape rounded, porosity by volume 15%

Number: 21 **Field Number**: 13.49 **Form English**: jar? **Form Arabic**:?
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 6; v diffuse
MunsExt: betw 7.5yN5/ gry and N4/ dk gry (but duller, gryer, greener) **MunsInt**: 2.5y8/2 white
MunsFab: crust 10yr3/1 v dk gry (but brwner) **MunsCore**: 10yr3/3 dk brwn (but brwner)
Comments: Black Sinai Silt ware; stance approx; sand polished; v hard fabric; fine-grained and porous; int white (v white, no reaction HCl) –self slip??, slip??; dense, fine-grained, uniform v dk brwn fabric w touch of gry and numerous opaque quartz sand inclusions and scattered calcium carbonate; same under 10X loupe, also scattered pores and scattered black ash; virtually identical to 13.119 except brwner; reacts HCl; porosity data n/a

Figure 10.16

Number: 1 **Field Number**: 13.13 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Egypt? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 6; defined
MunsExt: 5y8/2 white (but brwner) **MunsInt**: betw 5y8/2 white and 7/4 pale yllw
MunsFab: crust 5y8/2 white **MunsCore**: 2.5y6/2 lt brwn gry but brwner
Comments: int diam 9.5cm at 16.5%; ext and int discolored in places; some weathering; light, porous, v fine-grained, dense, yellow-gry mottled and speckled fabric w/greenish tinge and occ scattered pores and burned calcium carbonate inclusions; under 10X loupe, scattered quartz sand and calcium carbonate and rare ash inclusions; dominant pore shape rounded, porosity by volume 3% to 5%

Number: 2 **Field Number**: 10.35 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Gerzeh area? **Obtained**: Gerzeh area **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: none
MunsExt: betw 2.5yr5/6 red and 4/6 red **MunsInt**: as ext
MunsFab: 2.5yr4/8 red and 5/6 red **MunsCore**: n/a
Comments: int diam 9cm at 50%; fabric closely similar to that of 5/15; ext badly worn; uniform red brwn, fine-grained, grainy (texture like fine sandpaper), w/only occ scattered pores and inclusions (ash, calcium carbonate, sand) of varying size; dominant pore shape elongated and rounded, porosity by volume 5% to 8%

Number: 3 **Field Number**: 5.9 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 2.5y7/2 lt gry (but brwner and 6.2 lt brwn gry **MunsInt**: as ext where not discolored
MunsFab: 2.5y7/4 pale yllw (but lter) **MunsCore**: n/a
Comments: int diam 10cm at 32.5%; post-depositional encrustations ext, discoloration int; fine-grained, speckled, muted buff-green-gry mottled fabric w/occ scattered pores, scattered calcium carbonate and numerous quartz sand inclusions of different sizes and colors; occ red grog or mudstone; slight reaction to HCl; dominant pore shape rounded, porosity by volume 4% to 6%

Number: 4 **Field Number**: 1.12 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Minya? **Obtained**: Minya **Technique**: **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 7
MunsExt: betw 10yr6/4 lt yllw brwn and 10yr5/3 brwn **MunsInt**: 10yr7/4 and 7/3 v pale brwn
MunsFab: 10yr7/4 pale brwn but pinker **MunsCore**: n/a
Comments: int diam 1acm at 15%; reacts to HCl; was probably originally white scum on int and ext, but post-depositional discoloration has obscured original color; post-depositional concretions on int; v fine-grained, dense pinkish buff, yllw mottled, speckled, hard fabric; under 10X loupe, scattered pores, medium to small quartz sand, ash, and calcium carbonate inclusions; fabric similar in appearance to 1.7; dominant pore shape elongated and rounded, porosity by volume 10%

Number: 5 **Field Number**: 1.7 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Minya? **Obtained**: Minya **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 10yr7/4 pale brwn **MunsInt**: 10yr7/4 and 7/3 v pale brwn
MunsFab: 7.5yr7.4 pink **MunsCore**: n/a
Comments: strong reaction to HCl; speckled fabric; int and ext wet smoothed; int diam 12cm at 17.5%; fabric closely similar to that of 5.1, 1.12; v fine-grained, dense, pinkish yllw buff, mottled and speckled hard fabric; under 10X loupe, scattered pores, medium to small quartz sand inclusions, occ small brwn mudstone inclusions; dominant pore shape elongated and rounded, porosity by volume 5% to 8%

Number: 6 **Field Number**: 5.15 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 7.5yr5/4 brwn and 6/4 lt brwn **MunsInt**: 5yr6/6 red yllw and 7.5yr6/4 lt brwn
MunsFab: 2.5yr4/8 red **MunsCore**: n/a
Comments: diam ext 12cm at 38%; post-depositional encrustation, almost like slip, ext and to base of rim int, 5y5/1 gry to 6/1 to 7/1 lt gry to 6/2 lt olive gry to 2.5y7/2 lt gry; ext rim badly chipped; sloppily made, lopsided pot; fabric closely similar to that of 10.35; v fine-grained, dense, somewhat brittle, uniform orange brwn fabric w/occ quartz sand and calcium carbonate inclusions; under 10X loupe, scattered pores and calcium carbonate inclusions, occ quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 5% to 10%

Number: 7 **Field Number**: 5.6 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: betw 2.5y6/2 lt brwn gry and 7/2 lt gry **MunsInt**: 2.5y7/4 pale yllw
MunsFab: 10yr6/4 lt yllw brwn **MunsCore**: n/a
Comments: surfaces wet smoothed; hard, fine-grained mottled and speckled, muted brwn-buff fabric w/scattered pores, quartz sand, ash, and calcium carbonate inclusions; yllw mottling; poss occ red grog?; dominant pore shape elongated and rounded, porosity by volume 12%

Number: 8 **Field Number**: 15.4* **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: El Qanatar **Obtained**: El Qanatar potter **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 2; single; diffuse
MunsExt: 5yr4/6 yllw red **MunsInt**: as ext
MunsFab: betw 5yr5/6 and 4/6 yllw red **MunsCore**: 2.5yr6/6 lt red
Comments: *analyzed chemically; fine-grained, red brwn, fairly dense and somewhat brittle fabric w/scattered pores and occ calcium carbonate inclusions; under 10X loupe, scattered ash and calcium carbonate and occ rare quartz sand inclusions; dominant pore shape rounded, porosity by volume 10% to 15%

Number: 9 **Field Number**: 13.3 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: 0 to 2; single; diffuse
MunsExt: 2.5yr4/4 red brwn (but brwner) **MunsInt**: 2.5yr5/4 and 4/4 red brwn (dker near rim, lter on body)
MunsFab: 2.5yr3/4 dk red brwn **MunsCore**: n/a
Comments: int diam 12cm at 25%; scummy discoloration ext and int rim ranging from 7.5yr7/4 pink to 5y8/3 and 7/4 pale yllw and 2.5y7/4 pale yllw, reacts to HCl; porous, brittle, coarse red brwn fabric, w/numerous different sized opaque quartz sand, ash, and calcium carbonate inclusions; dominant pore shape rounded, porosity by volume 30%

Number: 10 **Field Number**: 1.4 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Minya? **Obtained**: Minya **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: betw 5y7/2 lt gry and 7/3 pale yllw, some 10yr6/3 pale brwn **MunsInt**: 10yr7/4 v pale brwn
MunsFab: 5y6/3 pale olive **MunsCore**: n/a
Comments: int diam 12cm at 11%; reacts HCl; ext and int wet smoothed; fabric has speckled appearance; some post-depositional discoloration est and int; greenish, mottled yllw and speckled hard, v fine-grained, dense fabric w/scattered brwn mudstone inclusions; under 10X loupe, scattered pores and many small pores w/calcium carbonate coating and occ scattered quartz sand, brwn mudstone and calcium carbonate inclusions; porosity data n/a

Number: 11 **Field Number**: 1.10 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Minya? **Obtained**: Minya **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 10yr7/2 lt gry (scum) **MunsInt**: 10yr7/4 v pale brwn
MunsFab: 7.5yr7/4 pink **MunsCore**: n/a
Comments: int diam 16cm at 7.5%; white scum ext and int; reacts to HCl; speckled fabric; some post-depositional discoloration ext and int; greenish mottled yllw and speckled hard, v fine-grained, dense ware, w/occ large red mudstone inclusions; under 10X loupe, scattered pores and red mudstone inclusions, occ quartz sand and rare calcium carbonate inclusions; dominant pore shape elongated and rounded, porosity by volume 6% to 10%

Number: 12 **Field Number**: 15.1 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: El Qanatar **Obtained**: El Qanatar potter **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 10yr6/4 lt yllw brwn **MunsInt**: as ext
MunsFab: betw 10yr5/4 and 6/4 yllw brwn (but pinker, esp ctr) **MunsCore**: n/a
Comments: int diam 15.5cm at 15%; reacts HCl; carelessly thrown and finished; part ext rough with horiz drag marks (scraped?), part smothed; finger blotches; rim dented prefiring in several places; fairly dense, v fine-grained, light brwn-gry, finely speckled fabric w/occ pores and calcium carbonate inclusions; under 10X loupe, occ scattered pores and rare quartz sand inclusions; under 10X loupe, occ scattered pores and calcium carbonate inclusions and rare quartz sand inclusions; dominant pore shape rounded, porosity by volume 3% to 5%

Number: 13 **Field Number**: 5.1 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 7.5yr6/4 lt brwn **MunsInt**: betw 2.5yr7/4 pale yllw and 10y8/3 v pale brwn
MunsFab: betw 10yr7.3 and 8/3 v pale brwn to 10yr7/4 v pale brwn **MunsCore**: n/a
Comments: diam 15cm int at 10%; thin band of encrustation on ext rim extending just over int rim, almost has appearance of gry-brwn slip, 10yr6/1 gry and 6/2 lt brwn gry; reacts to HCl; fabric closely similar to 1.7: speckled, mottled, fine-grained muted buff-yllw-brwn fabric w/occ large pores and scattered smaller ones; under 10X loupe, scattered different colored and sized quartz sand inclusions, occ ash and calcium carbonate; dominant pore shape elongated and rounded, porosity by volume 18% to 20%

Number: 14 **Field Number**: 5.4 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 3; single; v diffuse
MunsExt: betw 5yr5/6 and 4/6 yllw red **MunsInt**: as ext
MunsFab: 5yr4/6 yllw red **MunsCore**: 2.5yr6/6 lt red at center core to 5/6 red
Comments: ext diam 20cm at 7.5%; porous, soft, fine-grained medium brwn fabric with vague pink and purplish core, scattered large pores and occ scattered large calcium carbonate inclusions; under 10X loupe, scattered pores and occ calcium carbonate inclusions and rare quart sand and possible grog inclusions; dominant pore shape elongated and rounded, porosity by volume 20%

Number: 15 **Field Number**: 7.12 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Hurghada **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 10yr6/4 lt yllw brwn **MunsInt**: as ext
MunsFab: betw 7.5yr5/4 brwn and 6/6 red yllw and 5/6 strong brwn **MunsCore**: n/a
Comments: int diam 26cm at 30%; reacts to HCl; thin, very diffuse crust at exterior surface of fabric in section; v fine-grained, pale brwn fabric with scattered large inclusions (calcium carbonate, quartz sand, grog) and occ pores, under 10X loupe numerous different colored, different sized quartz sand inclusions (majority v small); dominant pore shape rounded, porosity 4% to 8% by volume

Number: 16 **Field Number**: 5.10 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: Nile silt
Dec: slip ext and int rim10yr6/4 lt yllw brwn to 10yr5/2 gry brwn **Core**: 6
MunsExt: as dec **MunsInt**: closest to 7.5yr4/2 (but lter and brwner)
MunsFab: as core; crust 10yr4/2 dk brwn gry (but gryer) **MunsCore**: betw 2.5yr5/4 red brwn and 5/6 red
Comments: int diam 20.5cm at 20%; some post depositional discoloration in and ext; light and porous; incipient overfiring; hard, brittle, fine-grained, fairly porous, pink orange fabric w/scattered pores and large calcium carbonate inclusions; under 10X loupe, scattered pores and calcium carbonate and quartz sand inclusions; closely similar to W-3 except more porous; dominant pore shape elongated and rounded, porosity by volume 18% to 20%

Number: 17 **Field Number**: 13.58 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: none
MunsExt: 7.5yr5/4 brwn (but lter) **MunsInt**: 7.5yr5/4 brwn
MunsFab: 7.5yr4/6 strong brwn (but more muted) **MunsCore**: n/a
Comments: ext diam 5.5cm at 27.5%; sand polished ext and int; hard; fine-grained, uniform, dense fabric w/numerous different sized quartz inclusions, dominantly opaque (and clear); reacts HCl; closely similar to Sinai Black ware except brwn in color; porosity by volume 8%

Number: 18 **Field Number**: 13.14 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Egypt? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: betw 5y8/3 and 7/3 pale yllw **MunsInt**: 5yr7/2 lt gry
MunsFab: 5y7/3 pale yllw **MunsCore**: n/a
Comments: dense, yllw-green, speckled and mottled v fine-grained fabric, w/occ pores and scattered ash, calcium carbonate, and quartz sand inclusions; dominant pore shape rounded; porosity by volume 3% to 5%

Number: 19 **Field Number**: 13.11 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Egypt? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 5y8/2 white to 7/2 lt gry **MunsInt**: betw 5y8/3 and 7/3 pale yllw
MunsFab: 5y8/3 pale yllw (but dker and more gry-green) **MunsCore**: n/a
Comments: reacts HCl; two joining pieces; v fine-grained, dense, yllw-green, speckled and mottled fabric w/scattered occ red mudstone or grog, ash, and quartz sand inclusions; under 10X loupe, scattered red mudstone or grog, ash, and quartz sand inclusions; dominant pore shape rounded, porosity by volume 5% to 10%

Number: 20 **Field Number**: 5.5 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: n/a
Dec: n/a **Core**: n/a
MunsExt: n/a **MunsInt**: n/a
MunsFab: n/a **MunsCore**: n/a
Comments: n/a

Number: 21 **Field Number**: 5.13 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Cairo? **Obtained**: Cairo **Technique**: wheelmade **Fabric**: Nile silt
Dec: none **Core**: 0 to 3; single; very diffuse w/in core, diffuse betw core and fabric
MunsExt: 5yr5/6 yllw red **MunsInt**: closest to 5yr5/6 yllw red (but more muted and darker)
MunsFab: 2.5yr5/6 red (but more orange) **MunsCore**: patches of 7.5yrN4/ dk gry and N5/ gry; 2.5yr6/4 lt red brwn
Comments: fine-grained, porous fabric; ext diam 5cm at 7.5%; severe post-depositional discoloration ext except for base; base scraped?; hard, fine-grained fabric w/pink and gry core and orange to red brwn fabric, scattered pores, and occ large calcium carbonate inclusions; under 10X loupe, numerous scattered pores, and scattered calcium carbonate, occ ash and rare quartz sand inclusions; dominant pore shape elongated and rounded; porosity by volume 35%

Number: 22 **Field Number**: 2.1 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Minya? **Obtained**: Minya **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: 10yr8/2 white (scum) to 5yr6/6 red yllw **MunsInt**: range 10yr8/2 white and 10yr8/3 v pale brwn (self slip) to 5yr6/6 red yllw
MunsFab: betw 5yr5/6 and 6/6 yllw red **MunsCore**: n/a
Comments: flowerpot base; reacts strongly to HCl; white scum ext, thick white self-slip over most of int and ext base; substantial transition zone of white self-slip into fabric, 2.5y8/2 white; hard; post-depositional discoloration (varies from 10yr4/1 dk gry to 10yr3/1 v dk gry); fairly uniform, v fine-grained, dense pink fabric w/scattered pores and occ white $CaCO_3$ inclusions; zone of incipient sintering (darker color) below ext wall; dominant pore shape rounded, porosity by volume 6% to 8%

Figure 10.17

Number: 1 **Field Number**: 13.21 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**: none
MunsExt: as fabric but closer to 7.5yr6/6 red yllw **MunsInt**: 7.5yr6/6 red yllw, w/mottling 2.5yr4/4 red brwn
MunsFab: betw 5yr6/6 red yllw (but brwner) and 7.5yr6/6 red yllw **MunsCore**: n/a
Comments: Hard Buff Sinai ware; int diam 12.5cm at 12%; reacts HCl; sand polished; ext rim slightly eroded; post-depositional discoloration int; very hard; dense, fine-grained fabric w/numerous scattered quartz sand inclusions of different sizes and colors; under 10X loupe, scattered pores and numerous quartz sand inclusions, occ calcium carbonate; dominant pore shape elongated and rounded, porosity by volume 10%

Number: 2 **Field Number**: 13.110 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 6
MunsExt: 5y4/1 dk gry (but gryer) **MunsInt**: as ext
MunsFab: crust 10yr4/1 dk gry (but brwner); ext only 10yr7/1 lt gry **MunsCore**: 7.5yrN4/ dk gry (but duller and brwner)
Comments: Sinai Black ware; int diam 11cm at 11%

Number: 3 **Field Number**: 13.30 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Sinai silt and marl clay
Dec: none **Core**: none
MunsExt: 7.5yr6/4 lt brwn **MunsInt**: betw 7.5yr7/4 pink and 6/6 red yllw
MunsFab: closest to 7.5yr6/6 red yllw (but brwner) **MunsCore**: n/a
Comments: Hard Buff Sinai ware; int diam 12.5cm at 24%; 3 pieces joined together; reacts strongly HCl; sand polished; dense, uniform fabric, very hard, w/numerous quartz sand inclusions of diff colors and sizes; many quartz sand inclusions clear and reflect light (like mica); occ calcium carbonate inclusions; dominant pore shape elongated and founded, porosity by volume 2% to 5%

Number: 4 **Field Number**: 13.34 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: Egypt ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: mixed Nile silt and marl clay
Dec: none **Core**:
MunsExt: **MunsInt**:
MunsFab: **MunsCore**:

Number: 5 **Field Number**: 13.10 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 6; sl diffuse
MunsExt: 2.5yr6/6 lt red **MunsInt**: as ext
MunsFab: 2.5yr5/8 red **MunsCore**: 10yr4/3 brwn/dk brwn to 7.5yr4/4 dk brwn
Comments: Orange Brown Sand Sinai ware; int diam 20 at 14%; hard; surfaces sand polished

Number: 6 **Field Number**: 13.1 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 4; single; diffuse
MunsExt: 2.5yr5/6 red w/occ patches 2.5yr6/6 lt red **MunsInt**: 2.5yr5/6 red
MunsFab: 2.5yr5/8 red **MunsCore**: 5yr4/2 dk red gry (greyer near center)
Comments: Orange Brown Sand Sinai ware; reconstructed from four smaller sherds; top of rim wet smoothed, is slight ridge of clay int and ext rim; very hard; surfaces sand polished; fabric grainy and dense; int diam 21cm at 11.5%

Number: 7 **Field Number**: 13.8 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 6; diffuse
MunsExt: prob betw 10yr5/3 brwn and 5/4 yllw brwn **MunsInt**: 10yr6/4 yllw brwn
MunsFab: crust 5yr6/6 red yllw at surf to 10yr5/4 yllw brwn **MunsCore**: 10yr4/2 dk gry brwn
Comments: Orange Brown Sand Sinai ware; int diam 23cm at 17.5%; reacts HCl; hard

Number: 8 **Field Number**: 13.68* **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3. 6; single; defined
MunsExt: betw 5yr5/4 and 4/4 red brwn **MunsInt**: as ext
MunsFab: crust 5yr4/4 red brwn; 2.5yr6/8 to 5/5 lt red **MunsCore**: ranges from 10yr4/2 dk gry brwn to 7.5yr4/4 brwn/dk brwn
Comments: * analyzed chemcially; Orange Brown Sand Sinai ware; int diam 27cm at 13%

Number: 9 **Field Number**: 13.67 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3. 6; single; diffuse
MunsExt: 2.5y6/2 lt brwn gry **MunsInt**: 2.5yr5/4 red brwn to 5yr4/2 dk red gry to 5yr4/3 red brwn
MunsFab: crust 5yr4/4 red brwn; 2.5yr6/8 to 5/5 lt red, 5/8 red **MunsCore**: 10yr4/2 dk brwn gry
Comments: Orange Brown Sandy Sinai ware; int diam 25cm at 15.5%; int surface chipped

Number: 10 **Field Number**: 13.72 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3; single; v diffuse to defined
MunsExt: betw 5yr5/4 and 4/4 yllw red adn 2.5yr4/6 red **MunsInt**: closest to 2.5yr5/4 red brwn (but brwner, dker)
MunsFab: 5yr5/6 and 5/8 yllw red to 4/6 yllw red **MunsCore**: from 10yr4/2 dk brwn gry to 10yr4/3 brwn /dk brwn
Comments: Orange Brown Sandy Sinai ware; int diam 26cm at 5%; hard

Number: 11 **Field Number**: 13.70&13.73 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3, 6; single; diffuse to v diffuse
MunsExt: betw 2.5yr5/2 and 4/2 weak red and 5/6 red **MunsInt**: betw 2.5yr 5/6 and 4/6 red
MunsFab: 2.5yr6/8 lt red; crust 10yr4/3 brwn/dk brwn **MunsCore**: 10yr4/2 dk gry brwn to 10yr3/3 dk brwn to 2.5yr lt red transition to fab
Comments: Orange Brown Sandy Sinai ware; int diam 33cm at 12.5%; 2 joining pieces; hard; sand polished; localized post-depositional deposit 2.5yr8/2 white to 6/2

Number: 12 **Field Number**: 13.69 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3, 6; single; defined
MunsExt: betw 2.5yr5/6 and 4/6 red (but brwner) **MunsInt**: as ext
MunsFab: crust 7.5yr5/8 strong brwn; 10r6/6 lt red **MunsCore**: mostly 10yr4/2 dk brwn gry with some 10yr5/1 gry
Comments: Orange Brown Sand Sinai ware; int diam 32cm at 8%; stance and diam approx, rim area eroded; hard; ext surf sand polished

Number: 13 **Field Number**: 13.71 **Form English**: flowerpot **Form Arabic**: *'asreyya*
Made: ? **Obtained**: Sinai Bedouin camp **Technique**: wheelmade **Fabric**: Sinai silt
Dec: none **Core**: 3 to 4, 6 (rim), 7 (body); single at rim, slim at rim, split on body; diff to sl diff
MunsExt: betw 2.5yr5/6 and 4/6 red (but brwner) **MunsInt**: 7.5yr4/2 brwn/dk brwn
MunsFab: crust 7.5yr5/8 strong brwn; 10r6/6 lt red **MunsCore**: betw 7.5yr4/2 brwn/dk brwn and 3/s dk brwn
Comments: Orange Brown Sand Sinai ware; int diam 30cm at 11%; stance and diam approx, top of rim eroded; greenish slip/self slip ext?; sand polished; hard, incipient sintering; fine-grained, porous fabric w/scattered large quartz sand inclusions; dominant pore shape elongated and rounded, porosity by volume 18%

Notes

[1] The catalyst for this effort was archaeological survey work undertaken in the Wadi Tumilat under the auspices of the Wadi Tumilat Project, directed by J. S. Holladay, Jr. Copious amounts of surface pottery, encompassing a wide range of forms and fabrics from many different time periods, were collected during the survey. While processing the pottery, it proved impossible in many cases to distinguish adequately between modern and ancient sherds; this difficulty stimulated further research into modern pottery that in turn led to the creation of the EMPP.

[2] At the time of the EMPP's inception, publications on modern traditional Egyptian pottery were limited. These works included Brissaud's (1982) study of potters in the Luxor region, an otherwise notable ethnographic work that is oddly lacking in detailed discussion and illustration of the vessels produced by the workshops; the research of Golvin, Thiriot, and Zakariya (1982) into the Fustāt potters of Cairo; the first of the groundbreaking ethnoarchaeological investigations of the Ballās Pottery Projects (Lacovara 1985, Nicholson and Patterson 1985a, 1985b, 1989); and Henein's (1988) masterful study of the Upper Egyptian village of Mari Girgis, which includes an account of a woman village potter. A few scattered earlier publications relating to modern ceramic production in Egypt also were available, such as the *Description de l'Égypte* (1823, 199-205) and works by Randall-Magiver (1905) and Blackman (1968, 135-53). In addition, Butzer (1974) and Matson (1974) had undertaken some suggestive research into modern and ancient clay sources. Since that time, a few additional significant publications have appeared, such as Nicholson and Patterson (1992); Henein (1992a and 1992b); Mahmoud (1992); and Nicholson (1995); but the area remains largely underexplored.

[3] For a brief discussion of some of the modern Egyptian ceramic industries, as well as of a more traditional glazed-ware workshop that caters to the foreign market, see Mahmoud (1992).

[4] One complicating factor in interviewing potters is the critical difference of perspective and perception between potter and archaeologist: ". . . potters are essentially concerned with creation and with actions, while scientists are more analytical, describing these actions in words and searching for their significance. As a result, the two groups look at pottery in different ways. Actions, unlike words, exist in many dimensions at the same time. They are poly-interpretable. The artifacts that result from these actions also exist in an infinite number of dimensions at the same time. Any artifact, in this perspective, exists because it has a positive existence in all the relevant dimensions at the same time . . . Creating a certain pot, therefore, is dependent on more dimensions than can be perceived with the analytic mind. Any analysis at most encompasses part of the reality of the pot, and you never entirely know which part" (van der Leeuw 1991, 12-13). In short, what appear to be contradictory or mutually exclusive answers to the archaeologist are no such thing to the potter.

A further caution also needs to be sounded about informant-based research in Egypt in general. Accuracy and precision on occasion may take a back seat to a commendable but sometimes frustrating Egyptian desire to be helpful. "I don't know" usually is not an acceptable cultural response for an Egyptian in an informant context. Asking the same question two or more times, therefore, will not necessarily elicit the same answer each time. Moreover, there is no cultural interdiction against simply making up an answer in an attempt to be helpful. Reasonable caution thus needs to be exercised when accepting informant statements at face value.

[5] Minya was the southernmost collection point in the Nile Valley. Scattered ceramics from the Oases, the Red Sea coast, and Upper Egypt were also obtained from various sources; these were not numerous and for the most part are not discussed here. I personally collected all the pottery reviewed in this paper.

[6] A glossary of Arabic terms used in this report is provided in Appendix 10.A. See also note 8 below.

[7] For an overview of the basic production sequence for traditional pottery manufacture see Rye (1981). The type of information collected and the level of detail recorded during visits to potters and retailers varied somewhat, as will become clear in the following account. As my experience with modern pottery increased and I became more familiar with the practical aspects of ceramic production, my methods evolved and my observations and questions became more focused and more consistent.

[8] See Golvin, Thiriot, and Zakariya (1982) for an extended discussion, including workshop descriptions and plans, of the *Fustāt* potters' complex. Mahmoud (1992, 186-88) also discusses a *Fustāt* potter who specializes in manufacturing glazed wares made of Aswan clays that are intended primarily for sale to tourists and foreigners resident in Egypt.

[9] Arabic terms for pots are given in the singular (if known) the first time they are used; afterwards an effort is made to be grammatically correct. Transliterations are taken whenever possible from Henein (1992a) or Golvin, Thiriot, and Zakariya (1982) and are based on colloquial Egyptian usage. Colloquial usage and transliteration systems for Egyptian Arabic are frustratingly variable and I have made no attempt to be consistent except within this paper. Terms not found in either publication I have transliterated myself to the best of my very limited Arabic capabilities. Where I have been given only the singular or only the plural of a given word I retain the known usage whether or not it is grammatically correct. This results in some rather strange mixtures of singular and plural forms throughout the paper. Illustrations of the various pottery forms are provided in figures 10.2-18.

[10] According to Mahmoud (1992, 183) the red and white *aswani* clays, as well as the kaolin of Aswan, come from various deposits in the region of Aswan and Kalabsha.

[11] This practice contrasts with that reported in Golvin, Thiriot and Zakariya (1982, 9) for the potters where different clay types are hydrated together: "La fosse étant garnie, c'est-à-dire à moitié remplie d'eau dans laquelle on a versé quarante couffes d'argile jaune, vingt couffes de limon et quatre de poteries non cuites concassées . . ."

[12] Other combinations and proportions of these clays are used in other workshops. Matson (1974, 131, 133-35) records that two potters' shops he visited in Old Cairo used *tebbīn* clay (a calcareous clay similar or identical to the *tīn gebelī*; see note 15) as their major ingredient. The dominant clay recipe consisted of two parts *tebbīn* clay, one part Nile silt and "as much furnace ash as seems right." This ash was derived both from the pottery kilns and from bread ovens. He also mentions another potter's shop in Old Cairo that used a clay body recipe consisting of 10 parts *Aswani* clay, 20 parts *tebbīn* clay, and 70 parts Nile silt. Matson characterizes the Aswan clay as a "very fine textured tough clay" with a low linear drying shrinkage and low water of plasticity. It has a soapy feel, burnishes well, and is not calcareous. According to Butzer (1974, 377), ash is added to *'olla* mixtures to create "porous, 'cooling' water jars." Golvin, Thiriot and Zakariya (1982, 9) report that the *Fustāt* potters use a mixture of half *tebbīn* clay and half Nile silt. They also cite an earlier report, Bahgat and Massou, *La céramique musulmane de l'Egypte*, that described the paste recipe for *'olall* as 80 [parts?] "argile de Tabbin (près de Guizeh)"; 30 [parts?] "limon du Nil"; and 10 [parts?] "argile calcaire du Muqattam."

[13] This is what the master potter told us on our second visit to his workshop in 1995. On our first visit, in 1992, he indicated that it took three days to produce a kiln full of *'olall* and a kilnload was fired every ten days. Kiln configuration and usage was identical both times. The Old

Cairo potter is the only location discussed in this study that was visited more than once.

[14] Nicholson and Patterson (1989; 1992) carried out tests to determine temperature and color variations for single firings for an Upper Egyptian kiln full of *ballās* jars made of marl clay. They concluded that there were significant temperature variations across the kiln section as well as in profile, ranging from 100° to 150°C (1989, 84; 1992, 38-39) to as much as 200° to 250°C (1989, 83). This temperature variation produced a range of colors for the fired pots that extended from pink to white to olive green. Results of this study should be a warning to archaeologists against a too rigid and too detailed reliance on color when classifying pottery. Such temperature variability within a single firing also has important implications for the derivation of firing temperatures from studies of color changes. "Caution must be urged when examining the results of any kind of refiring study before conclusions as to different types of kiln or more advanced technology are reached. Sherds from the same firing of a single kiln could yield markedly different results as well as appear sufficiently different to be thought of as different or variant fabrics" (Nicholson and Patterson 1989, 84).

[15] These kilns are the same general design as the one shown in Golvin, Thiriot and Zakariya 1982, 70, fig. 31.

[16] Spelled Anaatir in an earlier publication (Redmount and Morgenstein 1996).

[17] The term "clay body" is used here and throughout this work to signify "the blend of materials used for forming pottery, whether before or after firing . . . 'paste' and 'fabric' are synonymous with fired body" (Rye, 1981, 18-19).

[18] The color of the unfired silt clay body (*before* ash or other temper is added) provides an important clue to the source of the silt: a brown color indicates a terrigenous, oxidizing source such as Nile overbank sediments (e.g., field topsoil); a black or grey color points to an aquatic reducing environment such as a stagnant canal, suggesting the sediment came from canal dredgings or the equivalent. The black reducing sediments generally make better pottery because they have a higher clay content (from sediment settling) with less silt and sand. Both terrigenous and reducing sediments fire to an identical range of colors.

[19] Golvin, Thiriot, and Zakariya (1982, 6) indicate that the *Fustāt* potters call this clay, which was sandy and yellow, *ramla tabbini.* Matson (1974) evaluated samples of *tebbīn* clay, which he transliterated as Tabeen, as part of a study of eight potters' clays. It had low linear drying shrinkage and water of plasticity. The clay was also test-fired in a thermal gradient furnace. With an increase in firing temperature, the color of the clay (using Munsell system terminology) changed from pale brown through reddish yellow to pale yellow. There was, however, little difference in hardness, which ranged only from 2.5 to 3.0 on Moh's scale, at different temperatures. Butzer (1974, 381) analyzed two different marl wadi clays used by the *Fustāt* potters, one called "Tapini," the other called "sel" or "special gebel clay." Tapini is clearly another transliterative variant of *tebbīn*. Both these clays were highly calcareous and silty. The Tapini clay was taken from the edge of cultivation at Tapini, contained more sand and was montmorillonitic. No specific source location was given for the sel/special gebel clay. Butzer also analyzed a "light" clay mixture used by the *Fustāt* potters to make buff colored pottery; this consisted of "a lime-rich, silty clay loam, obtained primarily from wadi marls with perhaps one-third nilotic mud."

[20] They were of the same basic design as kiln 1 shown in Golvin, Thiriot, and Zakariya 1982, fig. 24, pls. X.a,b; XI; XII.a-c.

[21] This powder was either *ğir*, calcium carbonate or lime or both, or *ğibs*, the Egyptian equivalent of plaster of paris (calcium sulfate). My uncertainty is due to a translation misinterpreta-

tion, which I did not even realize existed until very recently and which I had inadvertently compounded by noting inconsistently sometimes English and sometimes Arabic terms in my field notes. *Gibs* is commonly used for plastering and derived from gypsum; *ğir* is powdered calcium carbonate and/or lime which is mixed with water and dyes and used for whitewash. I suspect the powder added to the unfired clay body and used for the pre-firing slip was *ğir*, whereas I am virtually certain that the white powder mixed with water for the post-firing wash was *ğibs*. Nevertheless, these attributes need to be re-checked in the field, and samples of both the *ğir* and the *ğibs* should be tested to establish their exact compositions.

[22] Here I am following Rice's (1987, 151) definition of wash: ". . . a wash usually refers to a separate postfire coating of the surfaces; this may be a pigment or a lime-based stucco and may subsequently be painted. The major distinction between a wash and a slip is that a slip is applied before firing and a wash is applied after firing." See also Rye 1981, 41.

[23] No effort was made to record consistently or in detail the exact range of pottery stocked by each retailer. In future full inventories of pottery stocked by specific retailers will be recorded.

[24] These black and dark grey pots are invariably attributed to Sharqiya province or its capital, Zagazig. A visit to the market in Zagazig and a discussion with one of the pottery vendors there elicited the information that potters who made the black pots lived in a village close to but outside of the city. Unfortunately, due to time and logistical constraints, this village was not visited. It is also important to note that the production tradition is not confined to Zagazig or Sharqiya; Henein (1992a, 12-14) reports that such pottery is also manufactured in Minoufia province (see p. 179).

[25] The desirability and wide regional or national distribution of particular vessels is a phenomenon that needs further investigation. It would be interesting to know which of the modern pots are marketed nationally, which have more restricted regional or local distributions, and the reasons behind the variations in circulation. This distributional variability for particular forms also seems to have occurred in antiquity, possibly for similar reasons.

[26] The colloquial term for this general pot type may be transcribed "*ʿādūs*, *gādūs*, or *qādūs*." Pronunciation of the initial consonant varies in different regions of Egypt.

[27] Due to time limitations, no effort was made to plot sherd locations, define activity areas or attempt other more detailed investigation of the site. There were no indications anywhere of any kind pointing to occupation on the dune by anyone other than the Bedouin or the hotel, which was originally constructed by Israelis prior to the return of Sinai to Egypt.

[28] Nicholson (1995, 288) makes an interesting observation about such post-firing decoration, which he calls fugitive slip. At Deir Mawas in Middle Egypt, defective vessels in particular were chosen for post-firing treatment. A handful of gypsum would be dipped into a pot full of water mixed with iron oxide (ocher) and the resulting paste would be forced into imperfections to conceal their presence. Then another assistant would spread the wash over the rest of the pot with a cloth. The prevalence of this practice elsewhere in the country remains to be established, but I suspect it is widespread.

[29] Lucas and Harris (1989, 372-76) discuss black pottery in both ancient and modern contexts. They characterize the procedure for producing the modern black, or, as they point out, more accurately dark grey, pottery in the following manner. At the end of the firing, some smoke-producing combustible, such as pitch or a combination of coal and pitch, is thrown onto the hot ashes. This creates a dense smoke that blackens the pots. The combustible

material itself does not come into contact with the pot. They also recount another process for producing black pottery whereby the pots are first removed from their firing location while still red-hot and then buried in and covered with some organic material such as chaff, dung or leaves. Contact with the hot pots causes the organics to smolder; this produces a dense smoke that blackens the pots.

[30] The two marl clays are quite distinct, however. The marl clay from Qena differs in both origin and composition from that found at Ballas (Butzer 1974).

[31] Brissaud (1982) investigated a series of pottery workshops in this area. In his publication, he reviews, inter alia, the origins of the workshops and the potters, the types and sources of raw materials used in ceramic production, and the manufacturing sequence and organization of work employed at the various workshops. He also provides a description and a typology of the workshops. The clay bodies employed by the Luxor area potters are composed of various combinations of the following: 1) two different sources of Nile silt (field earth and canal dredgings); 2) a number of different marl clays, which are grouped into two main types (*tafla*, and *hîb*); 3) ashes; and 4) water. The limited discussion (there are no drawings) of the output (ibid. 173-74; see also the list of pieces fired in kiln-loads, 154-58) indicates that the workshops regularly produced *azyār, balālīs, qulall, bokla, qawādis*, and *mawāǧir*. Products manufactured irregularly included "diverses petites cruches, petites coupelles, des bols (ressemblant souvent à des *māǧūr* en réduction), des gobelets, des pots de fleurs, des tuyaux." Only the larger workshops could offer a broad range of products; the others were more limited in their production output. The major market for all the potters was for the following: the *qadūs* for drawing water; the *zīr* and the *ballās* for water transport, storage and cooling; and the *māǧûr* for making bread or processing milk.

[32] A more detailed account of a very similar or identical process is given by Nicholson (1995, 282-86) in his description of the manufacturing method used by the Deir Mawas potters to make a *ǧidr*, a type of water container or cooler closely similar or identical to the *bokla* form from the Fayum (see below). Deir Mawas is located in Middle Egypt in the Amarna area.

[33] As far as I have been able to ascertain, all of the potters mentioned in this paper, with two exceptions, engaged in year-round ceramic production. The first exception is the potters of Deir el-Gharbi in Upper Egypt who manufacture *balālīs*; they restrict production to the spring and summer (Lacovara 1985, 21). The second exception occurs at el-Târif, also in Upper Egypt, where potters stop work for several months (Brissaud 1982, 172-73).

[34] Henein (1988, 197-202) describes a woman potter at Mari Girgis, the sole potter in the village. This woman learned her craft from her mother-in-law, who in turn had learned it from her own mother. The Mari Girgis potter made pots every day, firing her output once a week in a small updraft kiln measuring 1m high and 70 cm in interior diameter, with walls about 10 cm (half a brick) thick. She made the pottery by hand using a tournette, producing four different types of pots, none large and all relating to food preparation or storage. The clay body was composed of two parts black Nile silt from neighboring agricultural fields and one part talc purchased from Akhmim. Because of the increasing price of talc, the potter sometimes substituted grog, made from pots she had previously produced, for the talc temper. The potter produced more pots than needed by the households of the small village in which she lived, so she sold the remainder. Once a week, accompanied by her grandson and his donkey, she journeyed to a nearby village to sell her pottery. In her own village, she did not sell the pots; rather she exchanged them for goods in kind. This woman potter, at least as portrayed by Henein, fits into Peacock's (1982, 9) classification of individual workshop, since pottery-making was her main source of subsistence. There is no indication that the woman's role as

village potter was derived from what are usually characterized as the economically less important categories of household production or industry.

The role of gender in traditional potting in general is worthy of further study. According to Blackman (1968, 135-46), in Egypt handmade pottery might be made by men or women, but the wheel was used only by men. Randall-MacIver (1905, 20-22) reported that in Nubia the potters were women who produced handmade pots, whereas in Egypt the master potter was always a man who used a lathe, a wheel, or a mould, and "if the women take any part in the work, their share is confined to the burnishing and decorating." On a more general level, it is commonly assumed, often universally, that pottery production at the household level is undertaken only by women, whereas as soon as production becomes "economically important" it passes into the hands of men. I suspect this analysis may be over-simplistic. Peacock (1982, 8-9, 17, 26, 31) sees women dominating his ceramic production modes of 1) household production, where individual households make the pottery needed for their own consumption (a category that, he notes, is rare ethnographically), and 2) household industry, where pottery production is in the hands of professionals potting for profit, but potting remains "a part-time activity, not an essential means of livelihood and subsistence would be feasible without it . . . because of its secondary role we would . . . expect it to be a craft practiced mainly by women . . ." Men, on the other hand, dominate his individual workshop production mode where "pottery-making is a main source of subsistence." Peacock himself notes that the boundary between his categories of household and workshop production is hazy at best. His distinction between the poor women who "produced for others in order to supplement a meagre existence" (classed as household industries), and the men who potted only during the summer months and were employed the rest of the year in forestry (classed as individual workshops) seems to be based more upon gender and gender-related assumptions regarding "households" than economic substance. Peacock also refers to traveling groups of brickworkers, discussed in his individual workshop category, who could be under the leadership of a man or a woman.

[35] The workshops discussed by Brissaud (1982, 39-48) appear to fall into both this category and the category of single workshop.

[36] It is worth noting in this context, however, that Randall-MacIver (1905, 23, 25) reports that in his time the village of Ballas produced wheel-made "haematitic bowls" made of about "two-thirds Nile mud blended with about one-third of a white earth obtained in the neighborhood" and also a distinctive painted pottery, both presumably in addition to the *balālīs*. This suggests that the potters of the village may not have been always as highly specialized in either pot form or clay type as they are today.

[37] See Redmount 1993, 1995a for preliminary reports on the EMPP. Four sherds listed in tables 10.2 and 3 (14.6, 15.2, 15.3, and 13.76) were analyzed petrographically but not drawn. One vessel listed in table 10.1 (W-32) was drawn but not included in the petrographic analysis.

[38] Fine wares are still produced in limited quantities by a few specialty potters who employ modern equipment and techniques. These craftsmen cater to foreigners and those among the Egyptian upper classes who value ceramics for their aesthetics.

[39] A more detailed theoretical discussion of forms and typologies and the general interrelationships of form, function and technology is beyond the scope of this work. For a consideration of the issues involved, see, inter alia, Rice (1987, chapter 7) and Orton, Tyers and Vince (1993, chapter 6).

[40] The rose wash did not quite coat the entire interior bottom of the vessel; the tip of the base remained uncovered. This omission was most likely due to careless application rather than design, however, and is typical of the slap-dash way such washes normally are applied.

[41] See Lacovara 1985 and Nicholson and Patterson 1985a, 1985b, 1989, 1992 for a thorough, insightful study of *ballās* jar production at Deir el-Gharbi, a village located near Ballas.

[42] These so-called *ballās* clays should not be confused with the marl clays found near Qena that are used to manufacture the Qena *'olall*. The Qena clay deposits, which are mined from fields, date only to approximately A.D. 1000-1200 and could not have been exploited in antiquity. It is important not to assume automatically "that the clay landscape of today is necessarily the same as that of antiquity" (Butzer 1974, 380, 382; Matson 1974, 131-32).

[43] Henein (1992a, 12, 72.3) calls an almost identical jar a *megōza*. This pot is made of the characteristic black fabric associated with Sharqiya province. There is no indication that it was glazed. The *megōza* is used for storage of pickled cucumbers and turnips, white cheese, and other food items. These two vessels (the *megōza* and *zarawiyya*) apparently are not part of the ceramic repertoire in the Fayum or in Aswan. Another similar but smaller vessel illustrated by Henein (14, 71.7) is called an *'edra gazzawi* and used for long term storage of salted beans, pickled cucumbers, and other similar items.

[44] Recent analysis indicates that this glaze is approximately 30% lead.

[45] The same term, *qist*, is used for a different pot form in the Fayum; the Fayumi vessel is used only for milk (Linda Oldham, personal communication).

[46] *'Olla* use may not be countrywide, however. There are apparently villages in the Fayum where *'olall* are not in use (Linda Oldham, personal communication).

[47] Golvin, Thiriot, and Zakariya (1982, 27-29, fig. 14) discuss seven different subtypes of *'olall*, some of which have their own subdivisions. In addition, they illustrate four further vessels (figs. 14.f,h,j,l), not included in the discussion in the text, that seem to represent further *'olla* subtypes. The authors also review (23-26, pl. V) the four manufacturing steps involved in creating an *'olla*: 1) throwing the body followed by drying for twenty-four hours; 2) throwing the neck; 3) joining the neck to the body, followed by another drying period of approximately twenty-four hours; and 4) attaching and turning the base.

[48] According to Henein (1992a, 20.20,23), handleless jugs with long necks that easily and clearly fit into an *'olla* classification are sometimes designated *mašrabeyyāt* (20.20,23). Similarly, a vessel that appears to have all the characteristics of a *mašrabeyya* (ibid., 21.#25) is also sometimes called an *'olla*. This fluidity of terminology for what appear to be two very distinct forms, easily distinguished from each other, is striking. All of these jugs serve an identical function: holding and cooling drinking water.

[49] Golvin, Thiriot, and Zakariyya (1982, 26, pls. VI, VIIa-d) describe seven steps in the creation of an *abrī'*. First the body of the vessel is thrown separately and allowed to dry for twenty-four hours. Next, the neck is thrown and attached to the *abrī'* body. Then the spout is created and attached to the body of the vessel in the appropriate position. The handle is formed and attached after this and the almost completed vessel is allowed to dry for another twenty-four hours. Finally, the base is thrown while simultaneously being attached to the bottom of the vessel body.

[50] As noted above, the same term is sometimes used to refer to the *abrī'* pitcher.

[51] Henein (1992a, 57.75) illustrates a completely different form for a *mahlaba*, a two-handled jar from Dakhla oasis used for milking.

[52] Henein (1992a, 71.7; cf. fig. 29.4) also uses this same term for a two-handled jar with

totally different contours.

[53] Rizqalla (1978, 19) describes a typical *māğūr* as follows: "C'est un récipient évasé, de couleur brique, fait en terre cuite. Il mesure 26 cm. de hauteur, son diamètre supérieur est de 51 cm. et son diamètre au fond est de 22 cm. On le fabrique en Haute-Egypte." The attribution to Upper Egypt is somewhat surprising, but perhaps suggests that the form originated in the south.

[54] For a more detailed discussion of the form and its production see Golvin, Thiriot, and Zakariya 1982, 30-38; fig. 20.c,e,h; pls. VII.d-j. Interestingly, these authors note that in the *Fustāt* potters' complex in Cairo there is a group of workshops that specializes either in drum (*tabla*) or waterpipe head (*hağar*) production.

[55] Golvin, Thiriot, and Zakariya (1982, 32-36, pl. VIII) provide a description of the pipeheads and their method of manufacture; Henein (1988, 177, figs. 170-71) gives a description and illustration of a completed waterpipe, which he calls a *ğoza*, as well as of a *hağar*.

[56] *Gawādīs* also have been used in the past in the construction of mud houses: the vessels were incorporated into the second story walls for strength (Linda Oldham, personal communication).

[57] A number of these large baking griddles are shown drying in the open air prior to firing in plate 10.19. The Rizqallahs (1978, 6, figs. 3, 4) illustrate a bread oven with the griddle in place and give typical *balata* measurements as approximately 90 cm in diameter and 5 cm in width.

[58] See, for example, Mahmoud (1992). The latter are considered "art" forms for purposes of EMPP research.

[59] Until six or seven years ago nearly all the molasses available in Cairo was marketed in *balālīs*; now it is sold mostly in plastic containers in grocery stores (Linda Oldham, personal communication).

[60] I use the term food here in a broad sense to incorporate all sources of human sustenance, including water.

[61] Henein (1992a, 69-70) uses a different set of criteria to group his larger collection of material. He first divides the pots into four primary functional categories: containers, children's toys, architectural elements, and "movables" (*mobilier*). Only the container category has additional major subdivisions, each of which has further subcategories. The major subdivisions and a partial listing of the subcategories comprise the following: storage containers (water jar, jar for long term storage, jar for temporary or daily storage, and so forth); containers intended for food (drinking vessel, cookpot, yogurt plate, and so forth); containers in which a transformation is achieved (mortar, brazier, pipehead, vessel to prepare bread dough, and so forth); containers intended for collection (milking vessel, basin, and so forth); and containers intended for transport (water jar, milk jar, *saqiyah* pot for irrigation, and so forth).

[62] *Azyār* are also used for storing non-drinking water; those used for non-potable water, however, are never mixed-up with those used for drinking water.

[63] The spelling differences result from pronunciation variations of the same word in different parts of Egypt.

[64] A cursory review of the photographs accompanying Henein's (1992a) functional classification groupings provides additional ample and graphic indication of differently shaped ves-

sels called by identical terms (see, inter alia, 71.18A and 42, 5 and 7; 73.10 and 23; 75.47,58,and 73).

[65] After being drawn and photographed, whole pots were broken into pieces and sherd fragments were divided further. Several fabric sample sets were created from this material. One set was brought to the U.S. for further study; one set was left in Egypt; and one set was given to the Wadi Tumilat Project laboratory in Toronto.

[66] Table 10.5A and all others used in this study report only on the ceramic material illustrated in figures 10.2-18 and analyzed in the petrographic study described below. There are some minor discrepancies between table 10.5A and appendix 10.B; since both represent preliminary categorizations taken directly from field notes, I have not attempted to resolve the inconsistencies.

[67] For details relating to these and the other individual samples see the descriptions for figures 10.2-18 and the petrographic analysis presented in tables 10.6 and 7. Munsell color chart readings were taken from the complete pots and the sherds as collected, rather than from the fabric chips.

[68] For a discussion of the basic clay sources available in Egypt and a more detailed definition of Nile alluvium and marl clay fabrics in particular (as well as a summary of the most commonly used archaeological fabric typology in Egypt, the "Vienna System") see especially Nordström and Bourriau 1993, 160-82; and Arnold 1988, 124-29. Petrographic analysis has also been undertaken for some of the different fabric types represented in the Vienna system (Bourriau and Nicholson 1992).

[69] Self-slip here refers to a surface coating produced naturally by the pot itself during the manufacturing process. This coating may occur on the exterior surface, interior surface, or both. When the coating is fairly thick and even it is referred to as a self-slip; when it is uneven and patchy it is called a scum. A major characteristic of a self-slip or scum is the presence of a transition zone where the coating on the pot's surface gradually merges into the underlying ceramic paste (color plate section 10.1a, 2a). Separately applied slips more typically exhibit a sharp and clear division between surface slip and pot paste. According to Rye (1981, 35-36) the self-slip probably results from the presence of salt(s) in the marl clays or other raw materials used to form the pot. Dissolved salts can affect vitrification, and therefore hardness and porosity, as well as color. Soluble salts are carried in solution to vessel surfaces as the pot dries. With evaporation of the water, the salts remain in a concentrated form on the pot's surfaces; this salt concentration forms a layer, the self-slip or scum, during firing. Matson (1974, 137-38) reports specifically that the white exterior surface on the marl clay *ballās* jars from Ballas is attributable to soluble salts concentrating on the surface of the jars as they dry; the very rapid drying rate accentuates the concentration of the salts. He examined three modern sherds with a scanning electron microscope (SEM), and concluded that "there is more than one reaction involving soluble salts in the drying and firing of the ware, depending upon the clay mixture used." Some of the Ballas potters that provided Matson with information reported that they mixed 5%-10% Nile silt with the marl clay; some of the marl clay *ballās* jars examined by Matson contained small percentages of Nile silt.

[70] Some of the combinations can be quite picturesque, with color zones ranging, sometimes shading, from tones of brown to red to pink to purple. While working with Second Intermediate period Pottery from Tell el-Maskhuta and the Wadi Tumilat I dubbed such fabrics "rainbow ware," a term I still use informally for richly colored silt wares (see appendix 10.B).

[71] Hardness was not measured on the Mohs or other formal scale. In general Nile clay fabrics range from 3-3.5 and marl clay fabrics from about 4-5 on the Mohs hardness scale

(Arnold 1988, 124).

[72] I had not used this procedure before and found it quite effective, as well as simple and inexpensive, although it is labor intensive. The coarse sandpaper abrades the rough edges of the ceramic sample to a flat surface, the medium sandpaper smooths the section further and the fine sandpaper, especially if used with a circular motion, evens any remaining rough edges or grooves. How a given sherd reacts to the various sandpapers, as noted above, also may provide clues to its composition. The color fabric sections shown in color plate illustrations 10.1a, 2a, 4-5a, 6a, 7-10, 12-13a, 14a, 15-17a are the product of this technique.

[73] Analysis of the SEM photographs (see also the relevant figure captions) and categorization of the SEM texture types were undertaken by M. Morgenstein (personal communication).

[74] Morgenstein has described his petrographic methodology for the EMPP material as follows: "Petrographic analysis of each sample was undertaken using standard principles (Pettyjohn, 1949; Williams, Turner and Gilbert, 1954; Moorhouse, 1959; Huang, 1962; Tickell, 1965; Jones and Fleming, 1965; Folk, 1968; Kerr, 1977). Mineralogic identifications and modal analyses were made using polished sections set up on a binocular microscope with reflected light. Minerals requiring conoscopic observations for identification were hand picked from the polished section and made into grain mounts for polarized light observations. Mineralogical data obtained were tabulated and compared to field sample collection records and [where relevant] laboratory geochemical results (Redmount and Morgenstein 1995, 745)." Unless otherwise indicated, the discussion and interpretation of the results of the petrographic study are based both on the petrographic tables and on extended and sometimes lively geological and geochemical discussions with Morgenstein.

[75] Nordström and Bourriau (1993, 163) define groundmass as "the finest matrix of the paste, which is made up of particles smaller than 60 microns, i.e. particles of the clay and silt fractions."

[76] For a discussion of sediment/soil types, sizes and definitions see also Nordström and Bourriau (1993, 149-55), Rice (1987, 31-53), and Folk (1968, 25-31).

[77] Note that table 10.5D lists a total of 32 mixed fabric samples (25 from the mixed Nile silt/marl clay category and 7 from the mixed Sinai silt/marl clay group). The discrepancy is due to sample 15.1 from El Qanatar. The petrographic analysis indicated that its fabric consisted of silt with mudstone and powdered calcium carbonate. Like sample 15.2, however, it is supposed to be composed of a mixture of Nile silt and *tebbīn* clay. Since sample 15.1 is very close in appearance and texture to 15.2, since it clearly differs visually from the Nile silt group of fabrics, and since mudstone is characteristic of marl clay or mixed marl clay and silt fabrics (see below), I have retained 15.1 as an anomaly within the mixed classification.

[78] "To say that the sherd has inclusions is a description of the sherd, a material object (inclusions being "attributes". . .). To say that the sherd is tempered is a statement about human behavior . . ." (Rye 1981, 31). Orton, Tyers, and Vince (1993, 70) include voids in their definition of inclusions; this usage is not followed here. The term temper is defined differently by different authors. The two most common meanings of the word are: 1) any material other than clay minerals ("non-clay additives") in the fabric whether natural to the clay or mixed into it by the potter; and 2) only that non-clay material added purposely by the potter. In this paper, temper is used in the second, restricted sense. Various other terms have been proposed to replace the use of temper in its first, all encompassing meaning, including non-plastics, additives, modifiers, openers, aplastics, and fillers. Whatever the terminology, these may be defined as "stable (non-soluble) materials, which do not develop plasticity in contact

with water . . . [they] can be mineral (such as quartz and calcite), organic (seeds, plant stems, root fragments), bio-mineral (shell, burned bark, coral, sponge spicules) or man-made (crushed pottery)" (Rye 1981, 31). See the discussions of temper and inclusions in Rice 1987, 406-13; Rye 1981, 31-37; Shepard 1956, 24-31; Orton, Tyers and Vince 1993, 115.

[79] Percentages are not given for fabric groups with fewer than 10 total samples.

[80] Quartz has three reversible inversion points which cause physical changes in its atomic structure. Two of these occur at temperatures lower than approximately 1000-1100°C, generally considered to be the maximum temperature reached by ancient Egyptian or traditional firing practices (for an overview of ancient Egyptian firing practices see Nicholson 1993; Rye notes that "Greek, Roman, and other Mediterranean pottery, and Islamic glazed ware were fired in updraft kilns below about 1100°C"). Shepard (1956, 28-29), however, reported that she never observed inversion effects on quartz grains in thin sections, and that she considered quartz generally to be an inert inclusion (but cf. Hodges, cited in Nicholson 1993, 103). See also Rice 1987, 94-96 and Rye 1981, 34-35 for discussions of quartz and silica in pottery.

[81] Shepard (1956, 28) notes both that two varieties of feldspar are altered at 900°C and that the effects of this inversion have not been detected in pottery.

[82] For the geology of Egypt, see Said 1962, 1990.

[83] See, for example, Hamroush 1985, 172-242.

[84] See the description of ash tempering in Golvin, Thiriot, and Zakariya (1982, 14). According to Brissaud (1982, 72-74, 179), the potters in the Luxor region in Upper Egypt consider ash important for the creation of a proper clay body. These potters use ash from two different sources: pottery kilns, and bread ovens and other domestic hearths. Although all the potters agree that ash strengthens the clay body, there is considerable discussion over which type of ash is best. Some of the potters use only ash from the ceramic kilns. Others use only animal dung ash from bread ovens. Still others use diverse types of domestic ash or various combinations of the different ash types. Evidently there is lively disagreement among the potters regarding the relative merits of the different ashes and their appropriateness for use with particular clays. Whether any reality exists behind these cultural beliefs regarding the supposedly variable properties of ashes from different sources remains to be established. According to Brissaud, ash temper plays two roles in ceramic production: "elle évite au maximum les risques d'éclatement des parois;" and "elle relève le point de fusion de la pâte, et empêche l'effrondrement des pots dans le four par début de vitrification." As remarked above, Butzer (1974, 377), records that ash is added to *'olla* mixtures to create "porous, 'cooling' water jars."

[85] If, however, the new firing temperatures exceed the original firing temperatures of the grog, or if the firing atmosphere is significantly different, the grog can be (further) oxidized, reduced, hardened, vitrified, or otherwise changed. It also may vary greatly in refractoriness depending upon its ceramic paste (Shepard 1956, 28). Grog has several advantages over other tempers. It turns a potential waste product into a useful raw material; it requires no transportation; and sherds are easier to crush than many other temper materials (Rye 1981, 33).

[86] When heated, the carbon in the organic material gradually decomposes and migrates from the interior of the vessel wall to its surface. The oxidation of carbon begins about 200°C. The carbon is burned out or oxidized as CO or CO_2 and generally is not completely eliminated until temperatures above 600°C (and usually about 750°C or more) are reached in an atmosphere with free oxygen (Rice 1987, 88). Carbon burns out of coarse clays faster than fine clays. "The firing conditions necessary to burn out carbonaceous material vary from clay to

clay, depending on the amount originally present, the fineness of the clay body . . ., and the kind of clay mineral present. A coarse clay will lose small quantities of organic matter even in relatively rapid, low-temperature firings, while a very fine montmorillonitic clay with large amounts of organic matter may retain some carbon coring even after firing to 800°C . . . In a fully oxidizing atmosphere, the carbonaceous matter can be readily burned out of the clay beginning at low temperatures . . ." (Rye 1981, 334-35).

[87] Organics were identified by the presence of organic textures (casts), phytoliths, and carbon in the clay fabric; no attempt was made to identify specific types of organic materials (M. Morgenstein, personal communication).

[88] The temperature at which decomposition begins is debated. Rye (1981, 33) places it at 750°C. Rice (1987, 98) puts it at about 870°C, but also notes that "some researchers say it may occur at 850-900°C while others contend it may take place at as low as 650-750°C. That the argument exists highlights how time and atmosphere act in addition to temperature in governing firing behavior."

[89] According to Hamroush (1985, 293), when "calcium salts," defined as $CaCO_3$ and $CaSO_4$, are added to calcium-poor clays, sintering and vitrification begin about 800-850°C and above this range a "definite glass phase appears rapidly." Hamroush also examined fabric samples from ancient Hierakonpolis representing several basic ceramic classification categories. He determined that one of these fabrics, the "hard orange ware," was composed of Nile silt tempered with calcium salts: ". . . Ca rich salts were mixed with the Niolitic [sic] sediments to form the baking paste of the hard orange ware . . . the addition of Ca salts to the clay raw materials would lead to rapid extensive vitrification in the 800-850°C temperature range" (ibid., 302). More research is needed to investigate fully the effects of different types and sizes of calcium carbonate (and calcium sulfate) inclusions on the firing of various clays.

[90] I have the impression, from handling both ancient (in this case Late period pottery from the Delta) and modern Nile silt fabrics, that the addition of fine-grained carbonate material to Nile silt creates a harder, more brittle fabric. This impression, however, needs to be tested scientifically.

[91] As noted above, salts also can change the surface color of Egyptian marl clay pots by creating a whitish scum or self-slip. It would be interesting to discover whether the Egyptian potters recognize the efficacy of salts *per se* for creating surface color change or for preventing CaO hydration or both, or whether these properties are merely attributed to particular clays or other raw materials or some other aspect of the manufacturing process.

[92] Under certain conditions, when calcium carbonate sources occur in close proximity to Nile alluvial deposits, it is possible for $CaCO_3$ to be washed or otherwise introduced naturally into the Nile silts. This is not a common phenomenon, and is more likely to occur in the Nile valley, where limestone formations surround the river basin, and in the Fayum, discussed below (M. Morgenstein, personal communication).

[93] The Fayum is essentially a large evaporitic clay pan basin comprised of fine clay and silt and sand sediments with a very high evaporitic salt content. One of these evaporites is calcium carbonate in the form of caliche (M. Morgenstein, personal communication). It should also be noted that the other two Nile silt fabrics from the Fayum in the EMPP assemblage did not react with HCl.

[94] The material in these pores was calcium carbonate and not calcium oxide: it reacted with hydrochloric acid.

[95] Interestingly, and probably significantly, 21 of the 29 Nile silt fabrics and 2 of the 4 Sinai silt fabrics that contained angular quartz and feldspar (another probable temper) also had inclusions of burned carbonates or man-made fragments or both. On the other hand, of the 15 mixed Nile silt and marl clay samples containing angular quartz and feldspar, only 3 also had burned carbonates or man-made fragments or both. Particularly in the case of the Nile silts, therefore, the angular quartz and feldspar evidently was introduced into the clay body together with or as part of a calcium carbonate temper.

[96] Magnetic susceptibility data were collected using a Magnetic Susceptibility Meter Kappameter Model KT-5. This is a remote sensing susceptibility meter at an operating frequency of 10 kHz. Readings are measured in SI units. The sensitivity of the unit is 1 x 10^{-5} SI units or 0.8 x 10^{-3} cgs. One (1.0) SI unit (or a volume susceptibility of about 3 x 10^{-3} cgs) is approximately equivalent to 1% magnetite by weight. Magnetic susceptibility may be thought of as the ability of a volume of material to enhance the local magnetic field. Magnetic susceptibility readings have been used with considerable success by Morgenstein to characterize native American pottery; an evaluation of the applicability and usefulness of the technique for Egyptian pottery (ancient and modern) is presently underway.

[97] Nevertheless, it is important to note in this context that the EMPP findings regarding the two marl clay fabrics in the assemblage are generally consistent with other discussions of marl fabrics (e.g., Nordström and Bourriau 1993, 160, 166, 175-82).

[98] Manufacturing locations have been attributed to samples when reasonable on the basis of collection location or fabric or both. For the purpose of this study, it has been assumed that samples were manufactured in the vicinity of their place of collection unless there was evidence to the contrary. Some of the mixed marl clay and silt fabrics collected in Sinai appear closely similar or identical to Egyptian counterparts; these have been classified as Nile silt and marl clay mixtures (NM) and identified as coming from Egypt. Note that there is an error in the petrographic tables in the manufacturing location (which reads Sinai rather than Egypt) assigned to samples 13.011, 13.200, and 13.204.

[99] If the Minya sherds are subdivided by fabric type, other correlations emerge. The 4 Nile silt samples all contained ash and organic debris and gave medium magnetic susceptibility readings; 3 of the 4 also contained mica, burned carbonates and man-made fragments. The 5 mixed Nile silt and marl clay fabrics all contained angular quartz and feldspar, at least one heavy mineral and CaO coated pores; all gave medium or high magnetic susceptibility readings. Four of the 5 had a modal grain size of medium and very fine sand (the other was medium to very fine sand) and abundant amounts of both sparite and micrite.

[100] Visual analysis, however, remains the primary mode of developing fabric classifications: "The bed-rock of pottery processing procedures can only be accurate and informed visual examination, and where possible there must be feed-back from any results obtained from more sophisticated analyses" (Orton, Tyers and Vince 1993, 135). Fabric may be defined as "the composition and structure of the fired clay body" (ibid., 133). Given the amount of pottery generally processed in fieldwork, reasonable ease of visual recognition (along with sorting replicability) should be an imperative of the first order in establishing fabric types or subtypes. Wherever possible, however, visually derived categories should be checked and refined by means of the "more sophisticated analyses."

[101] The first two ware classification groupings, however, presented in tables 10.5A and 5B, were developed before the final fabric paste typology, represented by table 10.5D, had been

completed.

[102] Note, however, that there are a few discrepancies between tables 10.5E and 10.23: for example, samples 13.003 and 13.019 are misplaced with Nile silt wares in table 10.23 but correctly placed in the anomalous category in table 10.5E.

[103] Note that sample 15.1 remains highly anomalous; it perhaps should be placed in the anomalous category.

[104] One interesting correlation did occur between the calcium carbonate type attribute category and the soft-fired and hard-fired Nile Silt ware groups used for the typology of table 10.A. The soft-fired ware group seemed to contain a smaller amount of calcium carbonate inclusions (13 of the 19 samples had rare or common quantities) than the hard-fired group (14 of the 19 samples had abundant amounts). Whether this trend is apparent or real remains to be established.

[105] One of the samples, 14.06, included in this group in tables 10.5E and 10.23, clearly does not belong. The petrographic attributes of this piece differ markedly from those of the other members of the group.

[106] Excluding Sinai sample 13.19, which, as noted above, is misplaced.

[107] "As in many other fields, workers [classifying ceramic fabrics] can be divided into 'lumpers' and 'splitters': the former tend to assume that all fabrics are the same unless they can be demonstrated to be different, while the latter assume that all fabrics are different unless they can be demonstrated to be the same. These assumptions are often deep-seated and not verbalised, yet strongly held. The former may appeal to some logical proposition such as Occam's razor for support while the latter will point out that two fabric types, once defined, can always be merged later, but if one discovers later that one fabric type is really two, one has no option but to re-examine all material of this type . . . you should be as aware as possible of your own tendency to 'lump' or 'split'" (Orton, Tyers, and Vince 1993, 73-74). I am an inveterate splitter. It is only very reluctantly, from my experiences working with the different aspects of the EMPP assemblage, and especially with the petrographic analysis, that I have come to the conclusion that, with occasional notable exception, a great deal of lumping is not only desirable but also necessary to create practical, meaningful, and replicable ceramic typologies.

[108] The assumption underlying these analyses, currently being tested in a separate study, is that the combined total geochemical signature of the completed pot is the sum of the constituents used and modified during the ceramic manufacturing process.

[109] This, at least, was what our informant indicated was supposed to be the composition of the fabric. The petrographic analysis of the sample, however, indicated it was composed of approximately 80% Nile silt, 20% marl clay.

[110] When the sample was viewed under the microscope, an estimated 90% of the white inclusions in the groundmass reacted to HCl, indicating that most consisted of calcium carbonate (M. Morgenstein, personal communication). See also above n. 21.

[111] See pottery descriptions for figures 10.2-18 in appendix 10.C for more detailed information (Munsell readings and so forth) about individual samples.

REFERENCES

ARNOLD, D. E.

1991 "Ethnoarchaeology and Investigations of Ceramic Production and Exchange: Can We Go Beyond Cautionary Tales?" In ***The Ceramic Legacy of Anna O. Shepard***, edited by R. L. BISHOP and F. W. LANGE. Niwot, CO: University Press of Colorado, 321-45.

ARNOLD, DO.

1988 "Pottery." Chap. 12 in ***The Pyramid of Senwosret I***, by DI. ARNOLD. The South Cemeteries of Lisht 1. The Metropolitan Museum of Art Egyptian Expedition Publication 22. New York: Metropolitan Museum of Art, 106-46.

1993 "Techniques and Traditions of Manufacture in the Pottery of Ancient Egypt." Fasc. 1 in ***An Introduction to Ancient Egypt Pottery***, edited by DO. ARNOLD and J. BOURRIAU. Deutsches Archäologisches Institute Abteilung Kairo Sonderschrift 17, Mainz am Rhein: Philipp von Zabern, 9-141.

BALLET, P. and M. VICHY

1992 "Artisanat de la céramique dans l'Égypte hellénistique et romaine: Ateliers du Delta, D'Assouan et de Kharga." ***Cahiers de la Céramique Égyptienne*** *3* (Ateliers de Potiers et Productions Céramique en Égypte): 109-20.

BLACKMAN, W. S.

[1927] 1968 ***The Fellahin of Upper Egypt***. London: G. G. Harrap. Reprint, London: Frank Cass.

BOURRIAU, J. D., and P. T. NICHOLSON

1992 "Marl Clay Pottery Fabrics of the New Kingdom from Memphis, Saqqara and Amarna." ***Journal of Egyptian Archaeology*** 78: 29-91.

BRISSAUD, P.

1982 ***Les Ateliers de Potiers de la Région de Louqsour***. Bibliothèque d'Étude 78. Cairo: Institut Français d'Archéologie Orientale du Caire.

BUTZER, K. W.

1974 "Modern Egyptian Pottery Clays and Predynastic Buff Ware." ***Journal of Near Eastern Studies*** 33: 377-82.

Description de l'Égypte

1823 ***Description de l'Égypte, ou, Recuil des Observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'Armée française. Vol 17: État Moderne***. 2nd ed., Paris: Panckoucke.

[1809] 1994 ***Description de l'Égypte: Publiée par les ordres de Napoléon Bonaparte***. Paris: Imprimerie impériale. Ed. complete, reprint, Cologne: Benedikt Taschen.

GOLVIN, L., J. THIRIOT, and M. ZAKARIYA

1982 ***Les Potiers Actuels de Fustāt***. Bibliothèque d'Étude 89. Cairo: Institut Français d'Archéologie Orientale du Caire.

GHALY, H.

1992 "Pottery Workshops of Saint-Jeremia (Saqqara)." ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramique en Égypte): 161-71.

HAMROUSH, H. A.

1985 Archaeological Geochemistry of Hierakonpolis in the Nile Valley, Egypt. Ph.D. dissertation, University of Virginia, Ann Arbor: University Microfilms.

HENEIN, N. H.

1992a ***Poteries et Proverbes d'Égypte***. Cairo: Institut Français d'Archéologie Orientale du Caire.

1992b "L'Atelier de Potier de Badura Al-Qasr (Oasis de Dakhla). Observations Techniques." In ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramiques en Égypte): 191-201.

1988 ***Mārī Girgis: Village de Haute-Égypte***. Bibliotèque d'Étude 94. Cairo: Institut Français d'Archéologie Orientale du Caire.

HOPE, C. A.

1992 "Pottery Kilns from Oasis of el-Dakhla." In Techniques and Traditions of Manufacture in the Pottery of Ancient Egypt by DO. ARNOLD, Fasc. 1 in ***An Introduction to Ancient Egyptian Pottery***, edited by DO. ARNOLD and J. BOURRIAU. Deutsches Archäologisches Institut Abteilung Kairo Sonderschrift 17. Mainz am Rhein: Philipp von Zabern, 121-27.

HUANG, W. T.

1962 ***Petrology***. New York: McGraw-Hill.

JONES, M. P., and M. G. FLEMING

1965 ***Identification of Mineral Grains: A Systematic Approach to the Determination of Minerals for Mineral Processing Engineers and Students***. Amsterdam: Elsevier.

KERR, P. F.

1977 ***Optical Mineralogy***. 4th Edition. New York: McGraw-Hill.

LACOVARA, PETER

1985 "The Ethnoarchaeology of Pottery Production in an Upper Egyptian Deposit at Kerma." In ***Ancient Technology of Modern Science***, edited by W. D. KINGERY. Ceramics and Civilization 1. Columbus, Ohio: The American Ceramic Society, 51-60.

LUCAS, A.

[1962] 1989 ***Ancient Egyptian Materials and Industries***. 4th ed., rev. and enl. by J. R. HARRIS. London: E. Arnold. Reprint, London: Histories and Mysteries of Man.

MAHMOUD, F.

1992 "Les Argiles dans l'Égypte Actuelle: Leur Destination Artisanale et Industrielle." ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramique en Égypt): 183-90.

MATSON, F. R.

1974 "Technological Studies of Egyptian Pottery—Modern and Ancient." In ***Recent Advances in Science and Technology of Materials***, Vol. 3, edited by A. BISHAY. Second Cairo Solid State Conference, 1973. New York: Plenum Press, 129-39.

MCQUITTY, A.

1984 "An Ethnographic and Archaeological Study of Clay Ovens in Jordan." ***Annual of the Department of Antiquities of Jordan*** 28: 259-67.

MOORHOUSE, W. W.

1959 ***The Study of Rocks in Thin Section***. Harper's Geoscience Series. New York: Harper and Row.

MUNSELL COLOR

1973 Munsell Soil Color Charts. Munsell Color. Baltimore: Macbeth Division of Kollmorgen Corporation.

NICHOLSON, P. T.

1992 "The Pottery Workshop at Q 48.4 at Tell el-Amarna." In ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramique en Égypte): 61-70.

1993 "The Firing of Pottery." DO. ARNOLD, Fasc. 1 in ***An Introduction to Ancient Egyptian Pottery***, edited by DO. ARNOLD and J. BOURRIAU. Deutsches Archäologisches Institut Abteilung Kairo Sonderschrift 17. Mainz am Rhein: Philipp von Zabern, 103-120.

1995 "The Potters of Deir Mawas, An Ethnoarchaeological Study." Chap. 9 in ***Amarna Reports VI*** edited by B. J. KEMP. Egypt Exploration Society Occasional Publications 10. London: Egypt Exploration Society, 279-308.

NICHOLSON, P. T., and H. L. PATTERSON

1985a "Pottery Making in Upper Egypt: An Ethnoarchaeological Study." ***World Archaeology*** 17: 222-39.

1985b "Ethnoarchaeology in Egypt: The Ballās Pottery Project." ***Archaeology*** 38: 52-59.

1989 "Ceramic Technology in Upper Egypt: A Study of Pottery Firing." ***World Archaeology*** 21: 71-86.

1992 "The Ballās Pottery Project: Ethnoarchaeology in Upper Egypt." In ***Ceramic Production and Distribution: An Integrated Approach*** edited by G. J. BEY III and C. A. POOL. Boulder: Westview Press, 25-47.

NORDSTRÖM, H.-Å., and J. BOURRIAU

1993 "Ceramic Technology: Clays and Fabrics." Fasc. 2 in ***An Introduction to Ancient Egyptian Pottery***, edited by DO. ARNOLD and J. BOURRIAU. Mainz am Rhein: Philipp von Zabern, 144-90.

ORTON, C., P. TYERS, and A. Vince

1993 ***Pottery in Archaeology.*** Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press.

PAICE, P.

1989 "The Pottery of Daily Life in Ancient Egypt." ***Journal of the Society for the Study of Egyptian Antiquities*** 19: 50-98.

PEACOCK, D. P. S.

1982 ***Pottery in the Roman World: An Ethnoarchaeological Approach***. London: Longman.

PETTIJOHN, F. J.

1957 ***Sedimentary Rocks***. 2d ed. Harper's Geoscience Series. New York: Harper & Row.

POLLARD, C. O., Jr., and C. E. WEAVER

1973 "Opaline Spheres: Loosely-packed Aggregates from Silica Nodule in Diatomaceous Miocene Fuller's Earth." ***Journal of Sedimentary Petrology*** 43: 1072-1076.

RANDALL-MAGIVER, D.

1905 "The Manufacture of Pottery in Upper Egypt." ***Journal of the Anthropological Institute of Great Britain and Ireland*** 35: 20-29.

REDMOUNT, C. A.

1993 "Egyptian Modern Pottery Project." ***Bulletin de Liaison du Groupe International d'Étude de la Céramique Égyptienne*** 17: 47-51.

1995a "Of Silts and Marls and Mixes: Analysis of Modern Egyptian Pottery." ***Göttinger Miszellen*** 147: 93-101.

1995b "Pots and Peoples in the Egyptian Delta: Tell el-Maskhuta and the Hyksos." ***Journal of Mediterranean Archaeology*** 8: 61-89.

REDMOUNT, C. A., and M. MORGENSTEIN

1996 "Major and Trace Element Analysis of Modern Egyptian Pottery." ***Journal of Archaeological Science*** 23: 741-62.

RICE, P. M.

1987 ***Pottery Analysis: A Sourcebook.*** Chicago: University of Chicago Press.

RIZQALLAH, F., and K. RIZQALLAH

1978 ***La Préparation du Pain dans un Village du Delta Égyptien (Province de Charqia).*** Bibliothèque d'Étude 76. Cairo: Institut Français d'Archéologie Orientale du Caire.

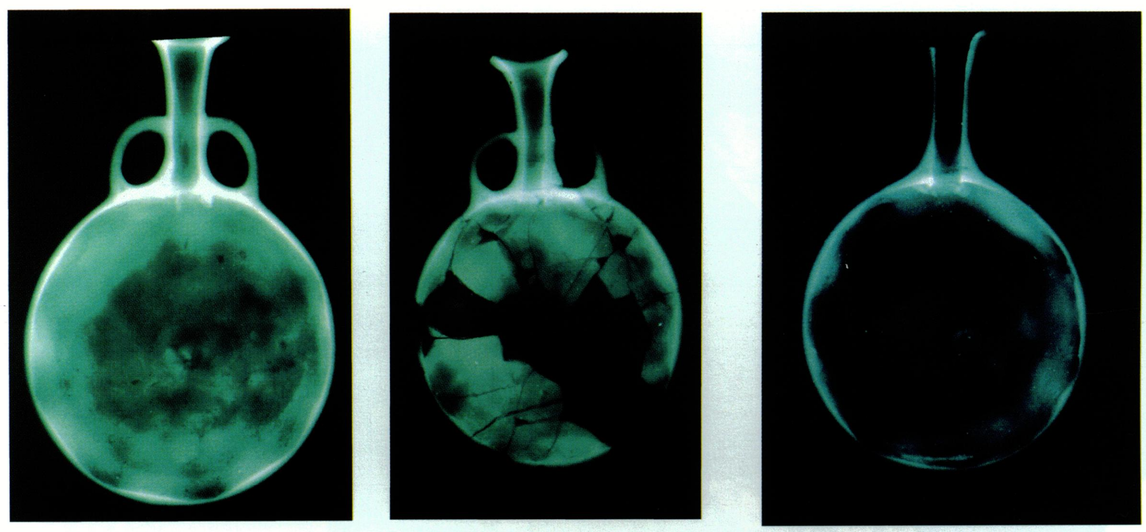
ROSE, P.

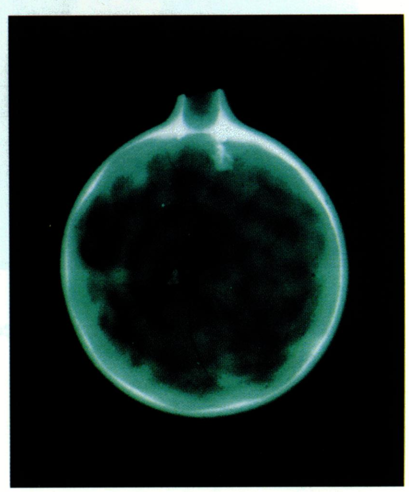
1993 "Turning Processes at Tell el-Amarna." In Techniques and Traditions of Manufacture in the Pottery of Ancient Egypt by DO. ARNOLD, Fasc. 1 in ***An Introduction to Ancient Egyptian Pottery*** edited by DO. ARNOLD and J. BOURRIAU. Deutsches Archäologisches Institut Abteilung Kairo Sonderschrift

17. Mainz am Rhein: Philipp von Zabern, 128-31.
ROSEN, S. A., and G. A. GOODFRIEND
1993 "An Early Date for Gaza Ware from the Northern Negev." ***Palestine Exploration Quarterly*** 125: 143-48.
RYE, O. S.
1981 ***Pottery Technology: Principles and Reconstruction.*** Manuals on Archaeology 4. Washington D.C.: Taraxcum.
SAID, R.
1962 ***The Geology of Egypt.*** New York: Elsevier Publishing Company.
SAID, R., ed.
1990 ***The Geology of Egypt.*** Published for the Egyptian General Petroleum Corporation, Conoco Hurghada Inc. and Repsol Exploracion, S. A. Brookfield, Vt: A.A. Balkema.
SHEPARD, A. O.
1956 ***Ceramics for the Archaeologist.*** Carnegie Institution of Washington Publication 609. Washington, D.C.: Carnegie Institution of Washington.
SINOPOLI, C. M.
1991 ***Approaches to Archaeological Ceramics.*** New York: Plenum Press.
TICKELL, F. G.
1965 ***The Techniques of Sedimentary Mineralogy.*** Developments in Sedimentology 4. Amsterdam: Elsevier.
VAN DER LEEUW, S. E.
1991 "Variation, Variability, and Explanation in Pottery Studies." In ***Ceramic Ethnoarchaeology,*** edited by W. A. LONGACRE. Tucson: University of Arizona Press, 11-39.
WERNER, M.
1992 "The Discovery of a Potter's Workshop in the Pyramid Complex of Khentkaus at Abusir." ***Cahiers de la Céramique Égyptienne*** 3 (Ateliers de Potiers et Productions Céramiques en Égypte): 55-60.
WILLIAMS, H., F. J. TURNER, and C. M. GILBERT
1954 ***Petrography: An Introduction to the Study of Rocks in Thin Sections.*** San Francicso: W. H. Freeman.

COLOR PLATE SECTION

Color plate 5.1 Pilgrim flasks from el-Ahaiwah, no. 6-18460; no. 6-18461, fragmentary; no. 6-18457, and no. 6-18462





Color plate 5.2 X rays of these pilgrim flasks, no. 6-18460; no. 6-18461, fragmentary; no. 6-18457, and no. 6-18462

Color plate 5.3 An incomplete pilgrim flask from el-Ahaiwah, no. 6-18525

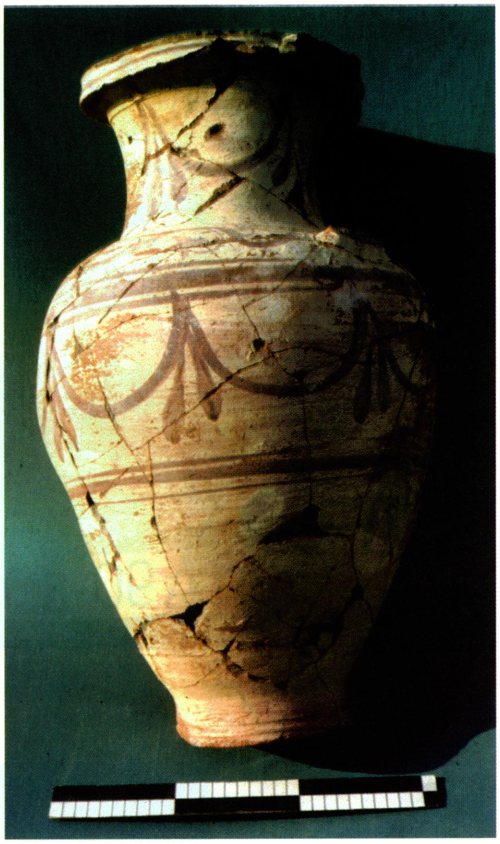
Color plate 5.4 A spherical jug recovered from Tomb A542 and made in one piece, no. 6-18519

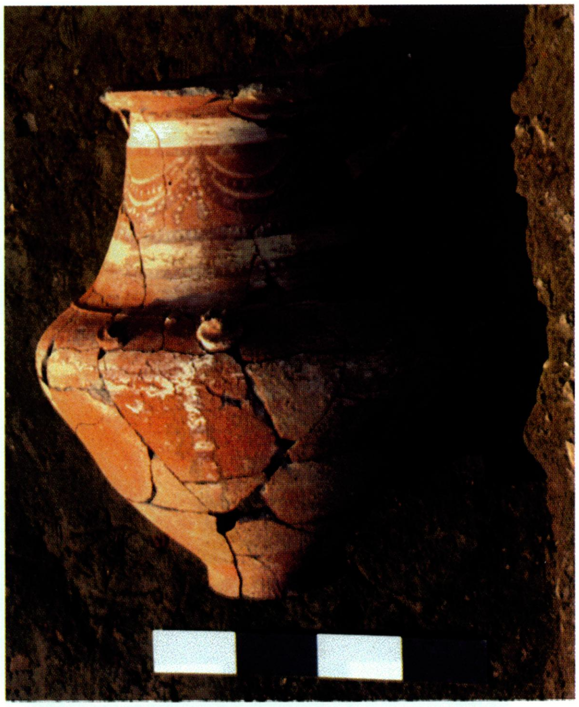
Color plate 9.1 Fragment of a vessel with relief decoration showing an erotic scene. Second half of IInd century B.C.

Color plate 9.2 Small amphora with painted decoration. Second half of IInd century B.C. Found in room 159 belonging to bath complex.

Color plate 9.3 Clumsy local imitation of a Greek krater, with irregularly shaped body. IInd century B.C.

Color plate 9.4 Large one-handled jug with painted garland patterns. Local product. Second half of IInd century B.C.



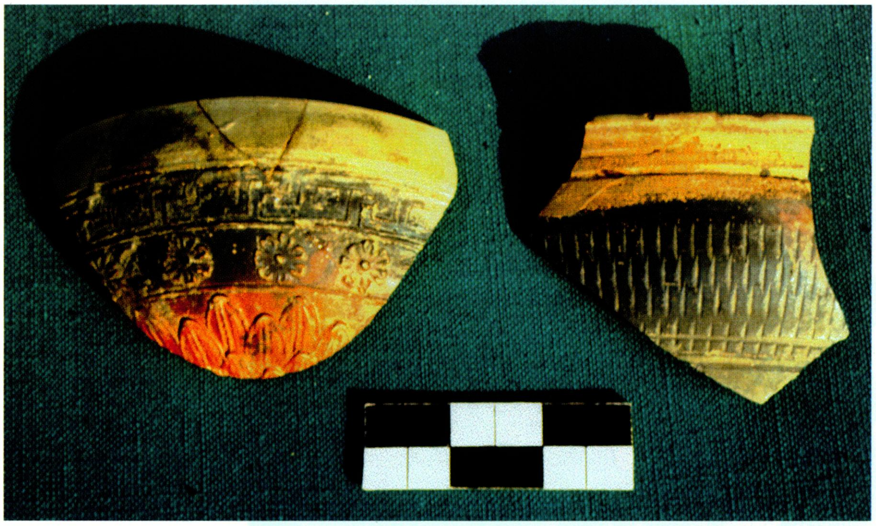


Color plates 9.5 and 6 Vessels with one vertical and one horizontal handle. Local imitations of Greek vases; 5 = Early Ptolemaic, 6 = Late Ptolemaic.

Color plates 9.7-8 Painted patterns on Early Ptolemaic vessels made in Egypt, possibly in Athribis; 7 = IIIrd century B.C., 8 = Late IIIrd-early IInd century B.C.

Color plate 9.9 Fragments of a vessel with painted figural patterns IInd century B.C.

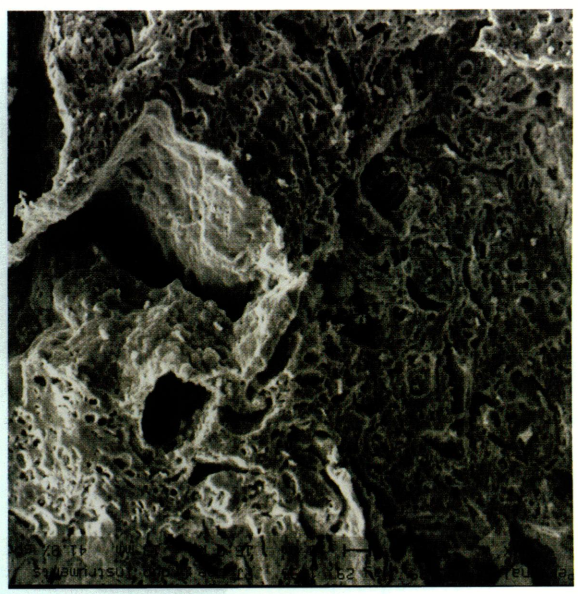
Color plate 9.10 Products of mid-Ptolemaic pottery workshops in Athribis: globular vessels with splashed decoration.



Color plates 9.11-12 Imported Hellenistic wares with stamped, incised and painted decoration, found in Tell Atrib; 11 = Sherds of "Gnathic"-type pottery, the plate probably is from Teano (Campania); 12 = small bowls.

a

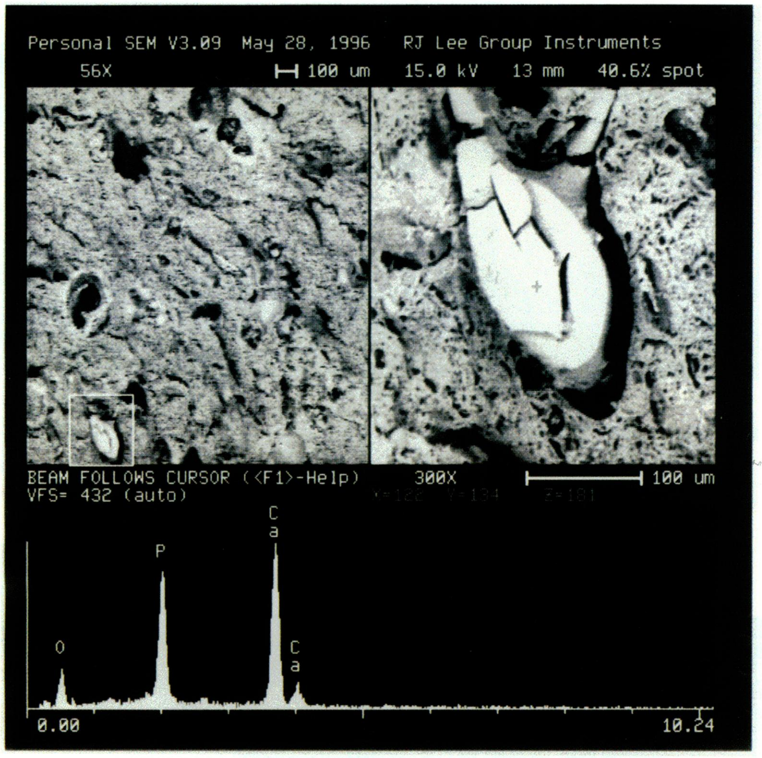
b



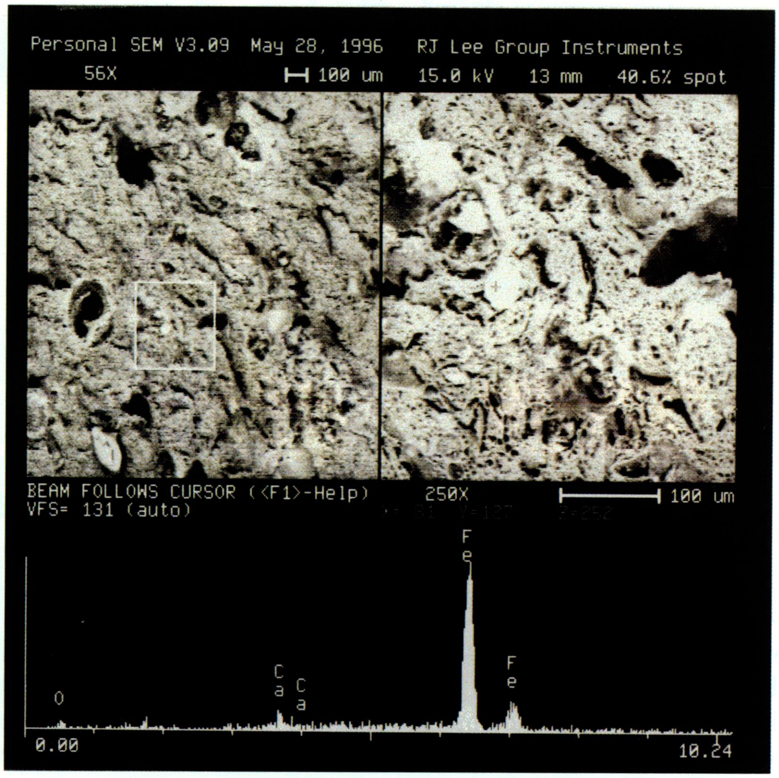
c

Color plate 10.1 Marl clay fabric from Qena region *ballās* jar (W-65; figure 10.4.2): a) color view of section; b) and c) SEM views of groundmass at 400X and 1000X, respectively; d) and e) SEM back scatter view and EDAX energy spectra showing element distribution for a calcium phosphate grain and magnetite grain, respectively. Fabric groundmass has a semi-vitrified clay-based carbonate texture with numerous silt-sized calcium oxide coated pores. The granular texture with numerous silt-sized calcium oxide coated pores. The granular texture is extremely minor due to micritic silt-sized grains. Sand-sized angular pores are numerous.

d


Personal SEM V3.09 May 28, 1996 RJ Lee Group Instruments
56X
100 um
15.0 kV 13 mm 40.6% spot
BEAM FOLLOWS CURSOR (<F1>-Help)
VFS= 432 (auto)
300X
100 um
O
P
Ca
Ca
0.00
10.24

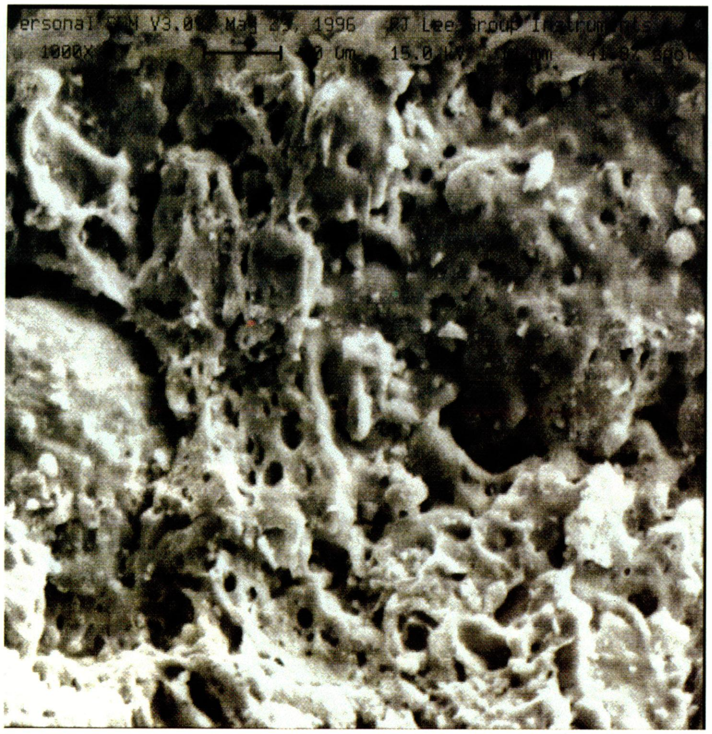
e


Personal SEM V3.09 May 28, 1996 RJ Lee Group Instruments
56X
100 um
15.0 kV 13 mm 40.6% spot
BEAM FOLLOWS CURSOR (<F1>-Help)
VFS= 131 (auto)
250X
100 um
O
Ca
Ca
Fe
Fe
0.00
10.24

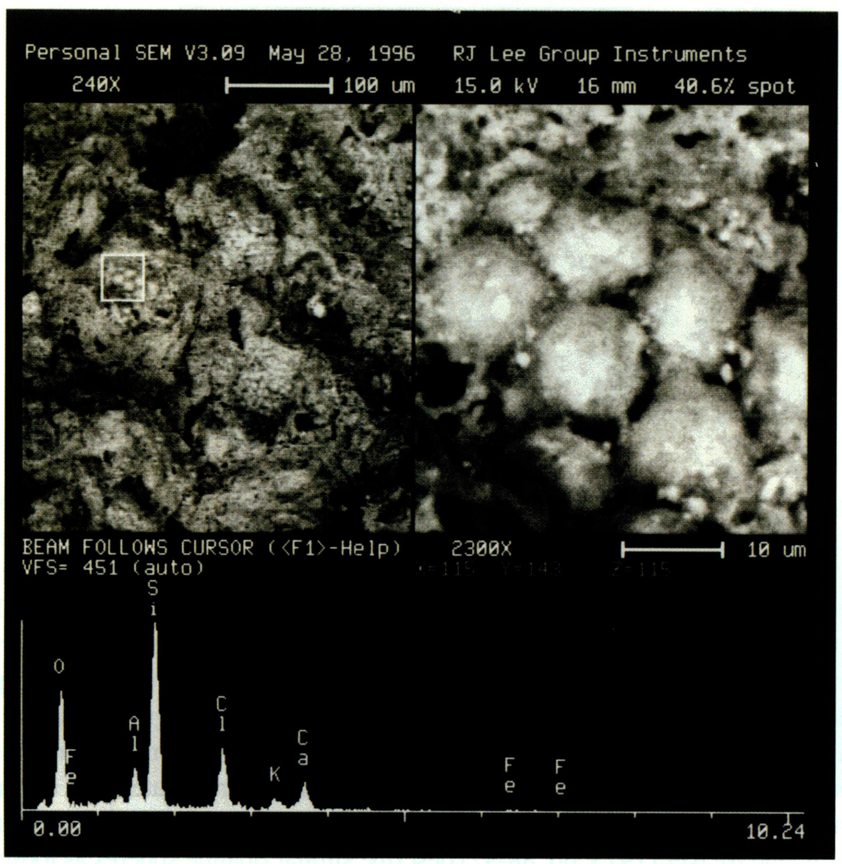
a

b

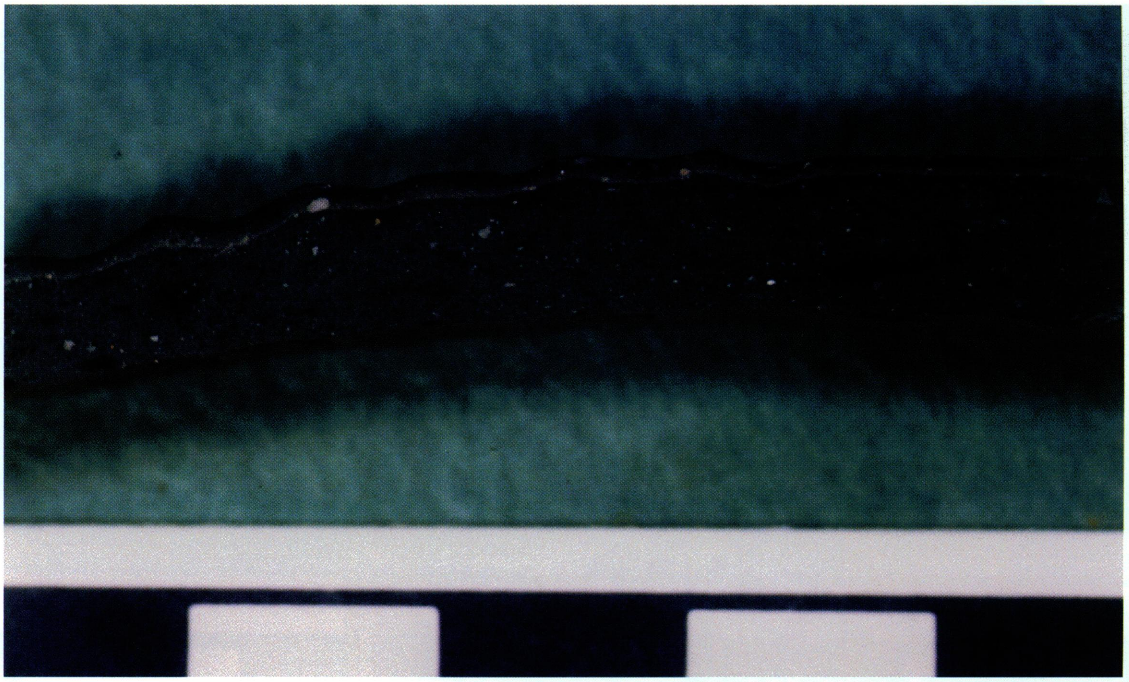
Color plate 10.2 Orange marl clay fabrics from *ballās* jar found at roadside near Gerzeh: a) color view of fabric section belonging to 11.3 (figure 10.5.3) b) and c) 400X and 1000X SEM views, respectively, of fabric groundmass belonging to 11.9 (figure 10.14.4); d) SEM backscatter view and EDAX energy spectrum showing elemental distribution of opaline spherules averaging 10 microns in diameter. Samples 11.3 and 11.9 are both made of the same orange marl fabric, and likely represent rim and body of the same jar. Fabric groundmass has a semi-vitrified clay-based carbonate with numerous silt-sized calcium oxide coated pores. The granular texture is extremely minor and due to micritic silt-sized grains. Sand-sized angular pores are numerous. Sand and silt-sized marl fragments and ash are present. The opaline spherules are present in numerous areas of the matrix as botryoidal groups and appear to be related to the limestone marl source material as either inorganic opaline spherules or as organic diatomaceous debris; in either case they can be used as a unique discriminator for the source material. Pollard Jr. andWeaver (1973, pp. 88-92) describe similar opaline spheres as loosely packed aggregates from diatomaceous miocene deposits in Georgia, USA.


1000X
15.0

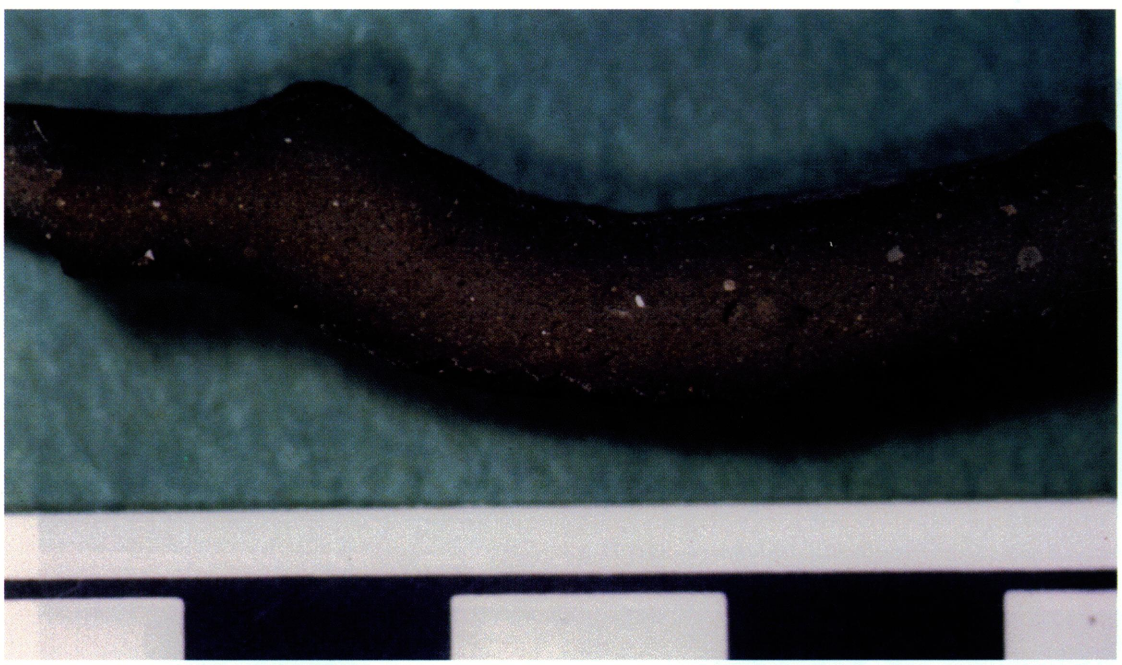
c


Personal SEM V3.09 May 28, 1996 RJ Lee Group Instruments
240X 100 um 15.0 kV 16 mm 40.6% spot
BEAM FOLLOWS CURSOR (<F1>-Help)
VFS= 451 (auto)
2300X 10 um
O
Fe
Al
Si
Cl
K
Ca
Fe
Fe
0.00
10.24

d



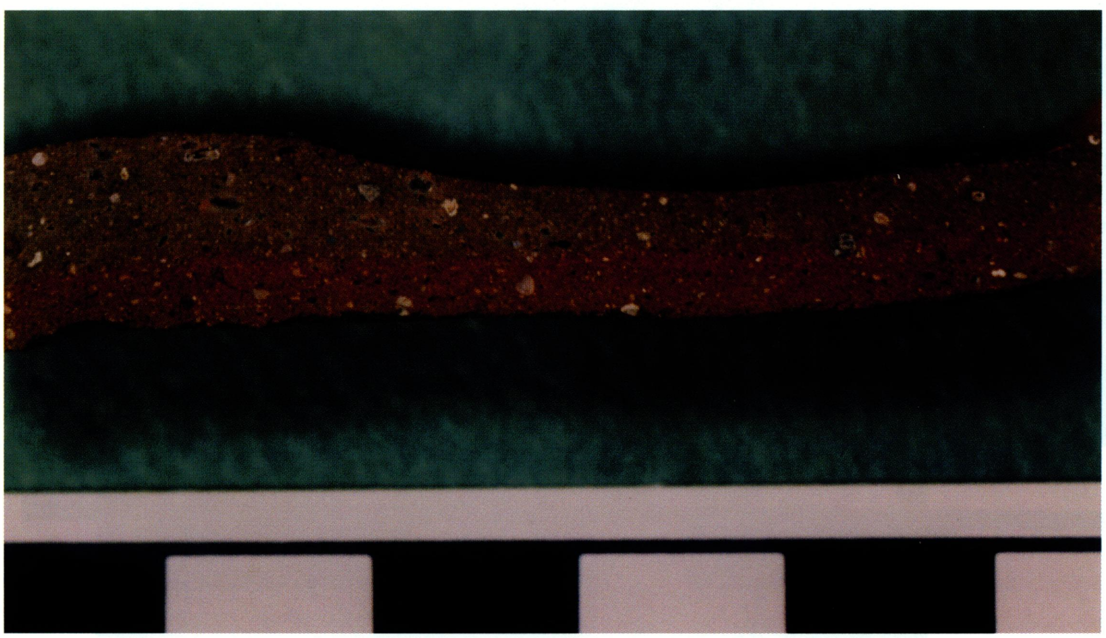
a



b

Color plate 10.3 Black fabrics made from Nile silt: a) color fabric section of ribbed *abrī*' from Sharqiya province (W-43; figure 10.9.1), note "crust" on exterior (top) of section; b) color section of fabric from *hağar* pipehead from Cairo (W-73; figure 10.9.7).

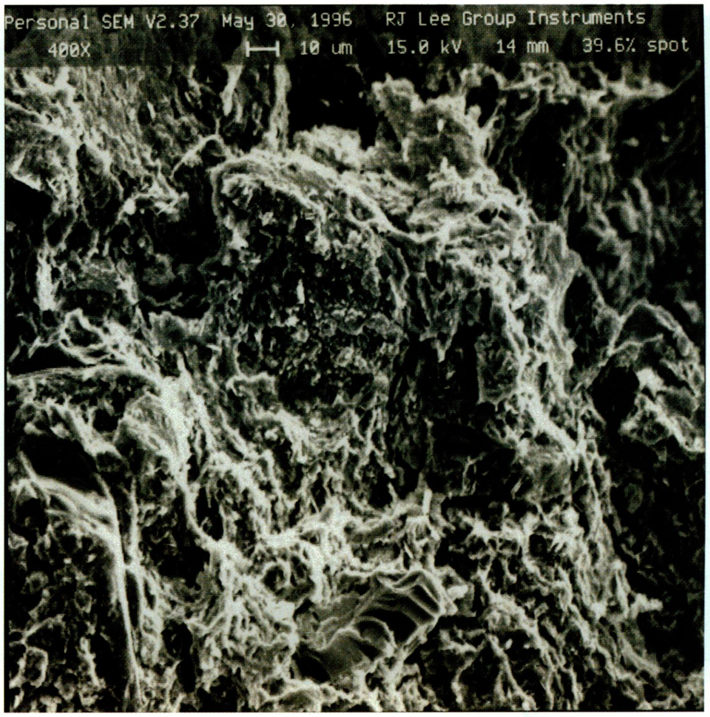
Color plate 10.4 Color view of fabric section from W-10, a Nile silt *ballās* jar manufactured in



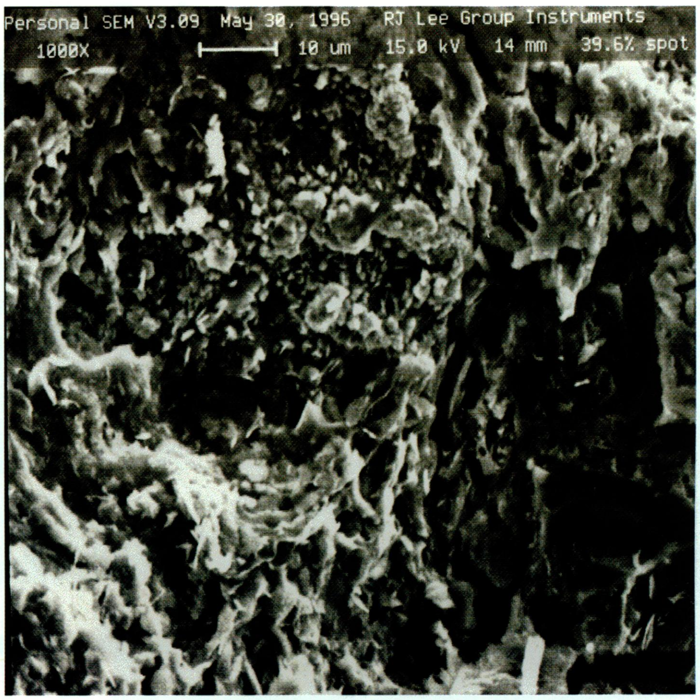
a

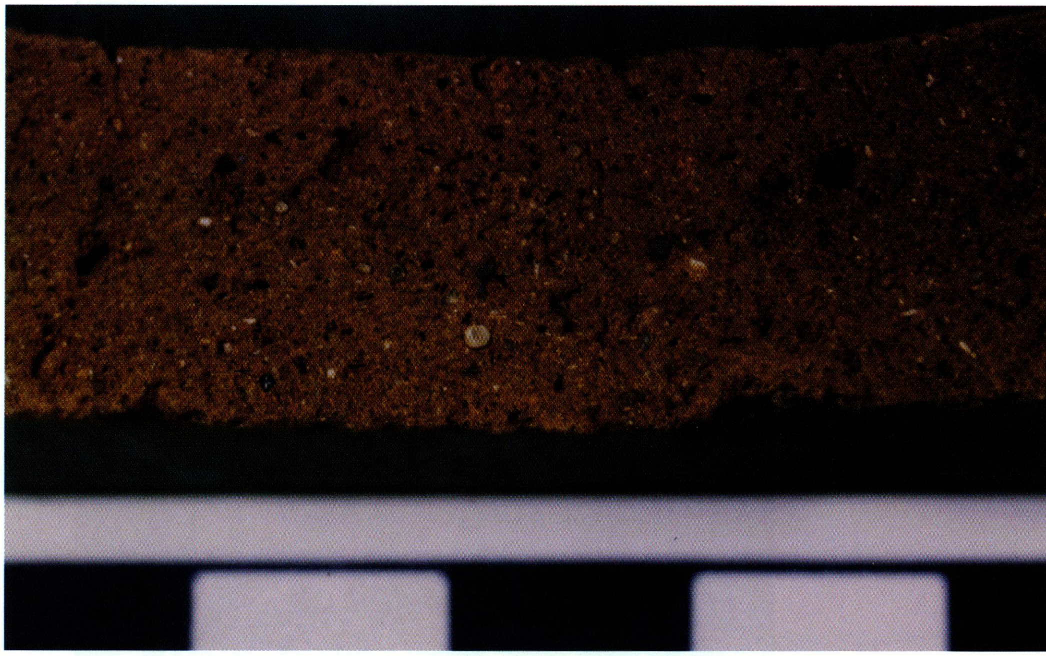
Color plate 10.5 Nile silt *'olla* or *mašrabeyya* from Samannûd (W-12; figure 10.8.3): a) color section of fabric; b) and c) SEM views of fabric groundmass at 400X and 1000X, respectively. Paste consists of rounded to subangular silt grains with tabular clays and contains silt-sized organics, quartz, feldspar, and some heavy minerals, as well as silt and sand sized calcium carbon

b


Personal SEM V2.37 May 30, 1996 RJ Lee Group Instruments
400X 10 um 15.0 kV 14 mm 39.6% spot

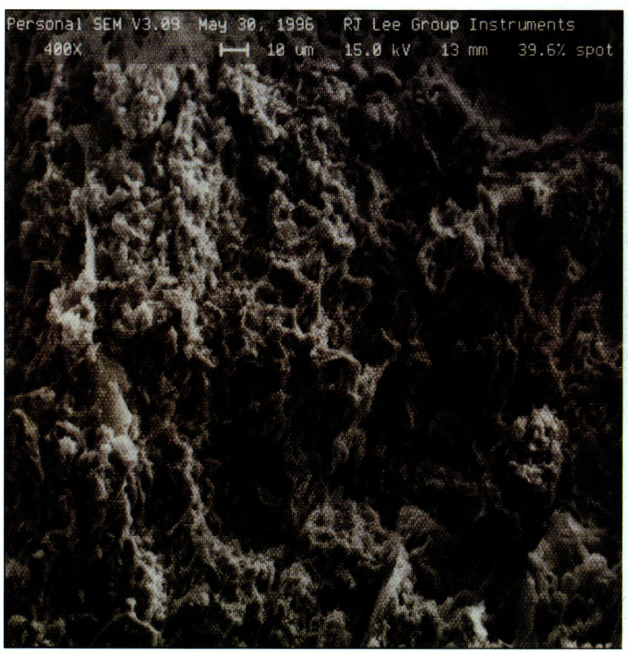
c

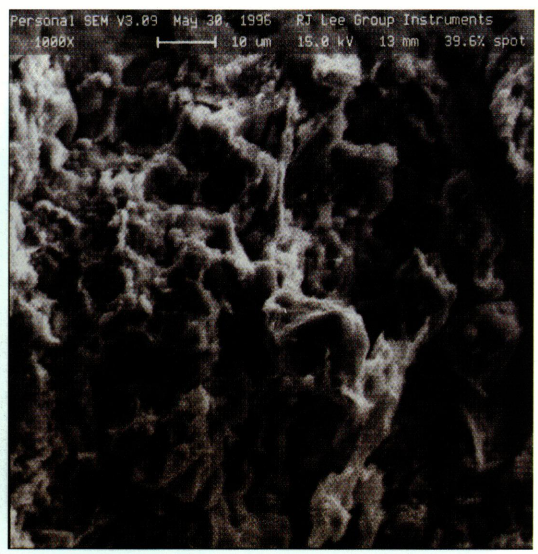

Personal SEM V3.09 May 30, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 14 mm 39.6% spot



a

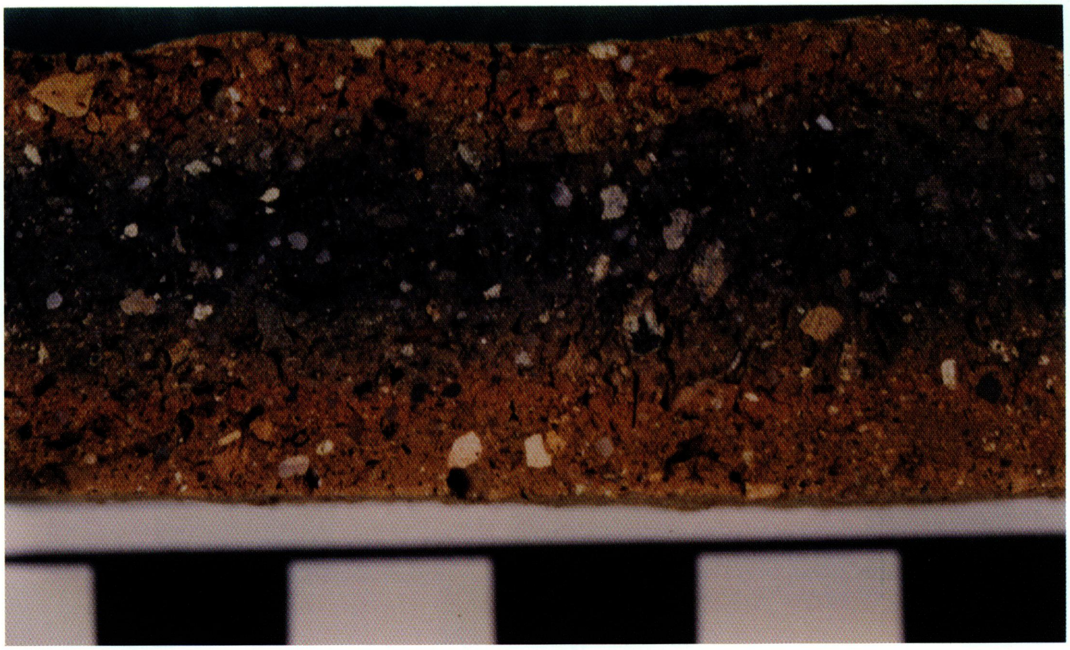
b



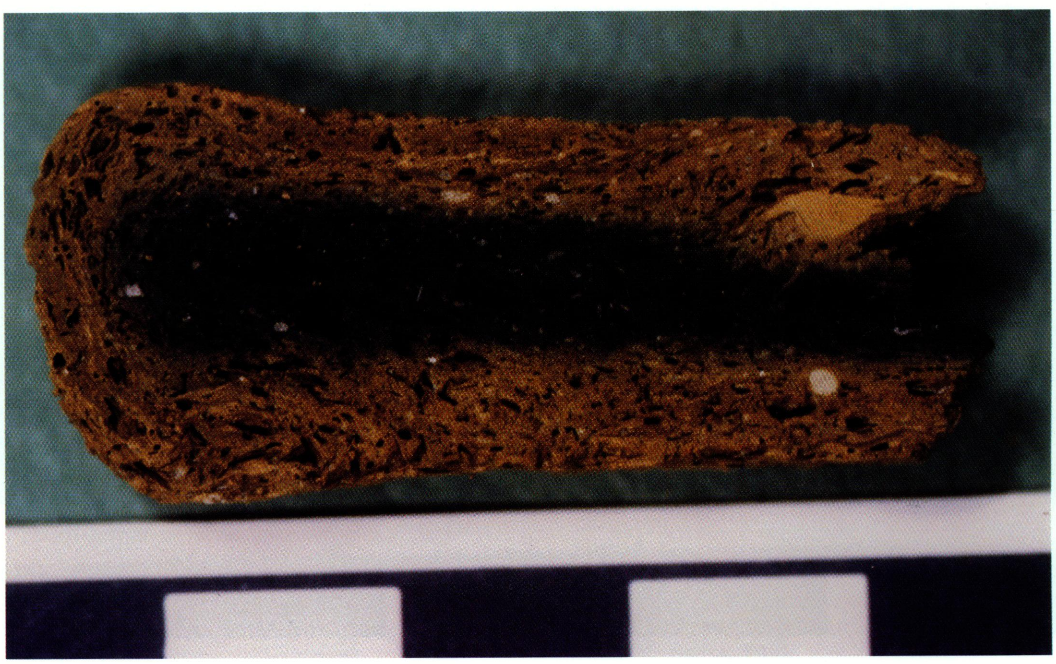


c

Color plate 10.6 Nile silt fabric from a *tāǧen* bowl made by the Abu Raguan potter (W-31; figure 10.12.4): a) color section of fabric; b) and c) SEM views of the fabric groundmass at 400X and 1000X respectively. Paste consists of granular silt with reticulated clay texture containing well-rounded to subangular silt grains, abundant tabular clays, biocarbonate (biosparite) sand-sized fragments and sand-sized ash.



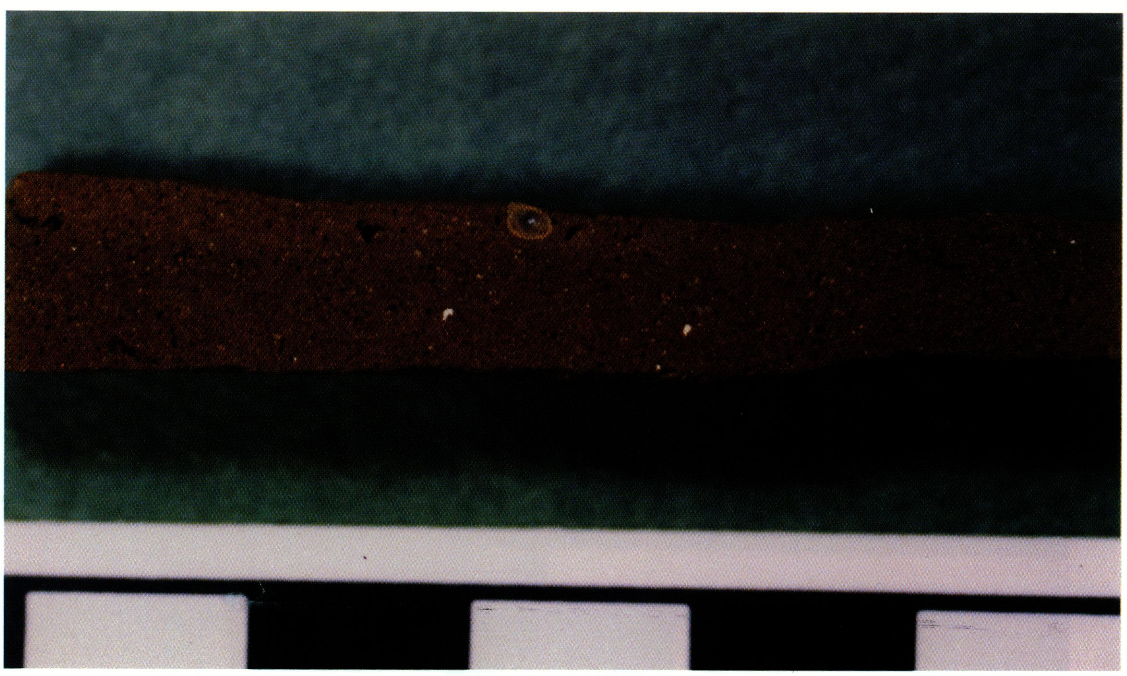
a



b

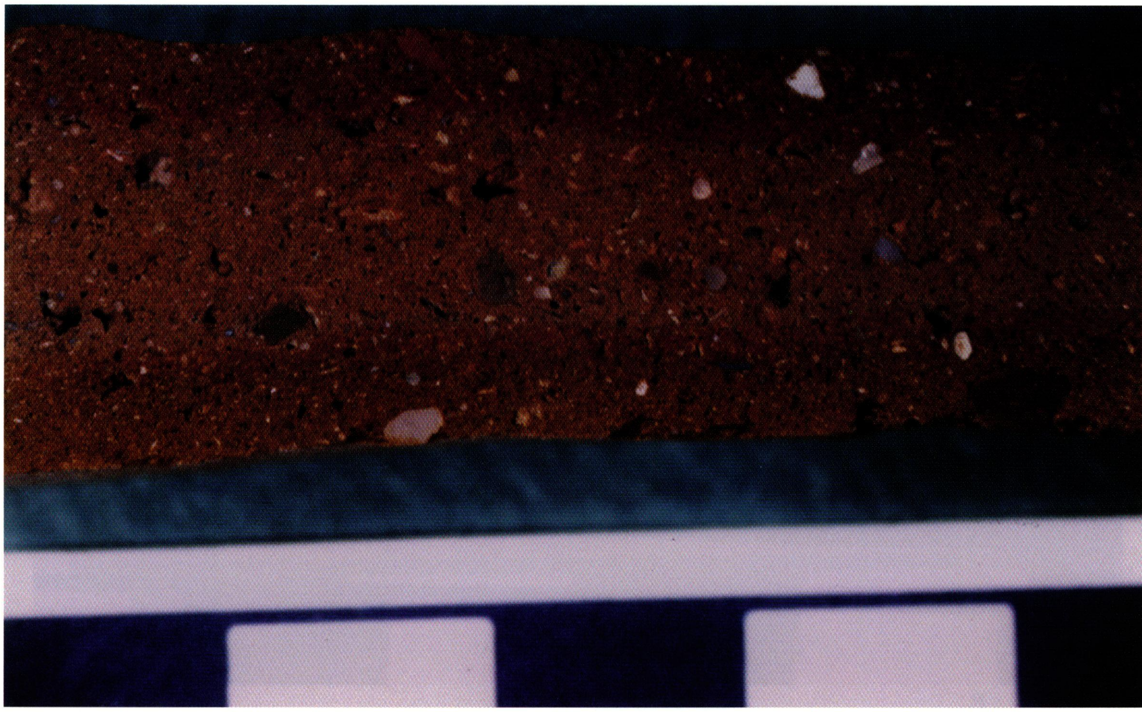
Color plate 10.7 Nile silt fabrics: a) coarse Nile silt fabric belonging to a *zīr* from the Fayum (W-64; figure 10.2.1); b) straw or chaff tempered Nile silt from a *sahfa* bowl from the Fayum (W-71; figure 10.7.2).

a

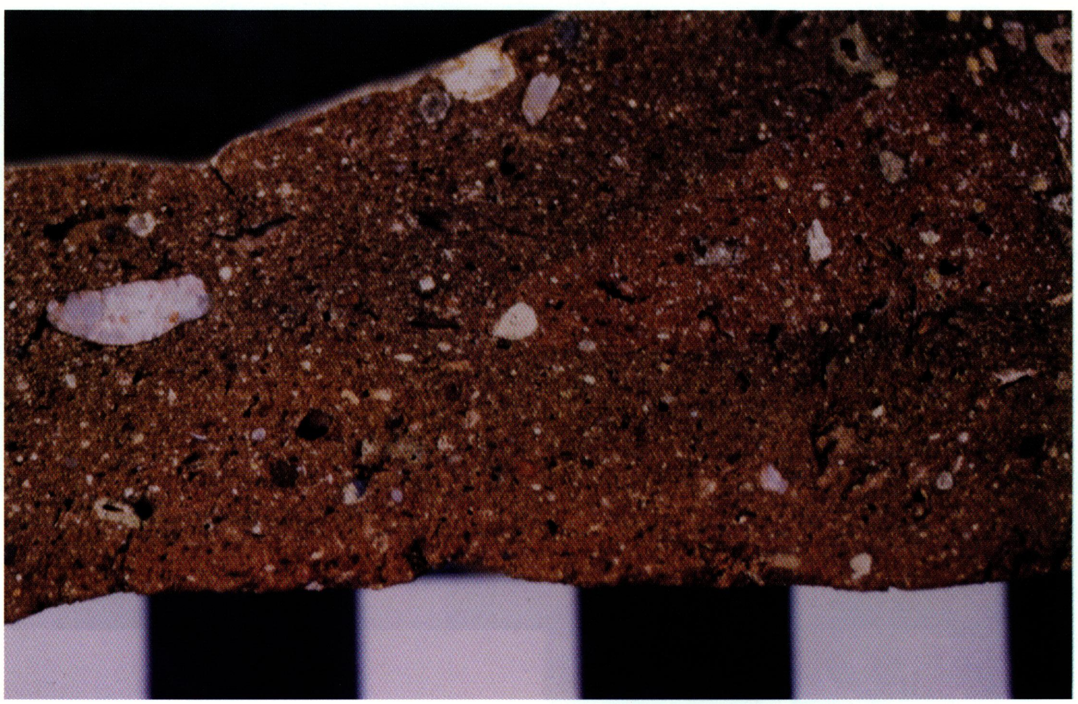


b

Color plate 10.8 Nile silt fabrics: a) *zīr* water jar from Minouf (W-52; figure 10.3.2); b) *'olla* from Minouf (W-61; figure 10.8.2).

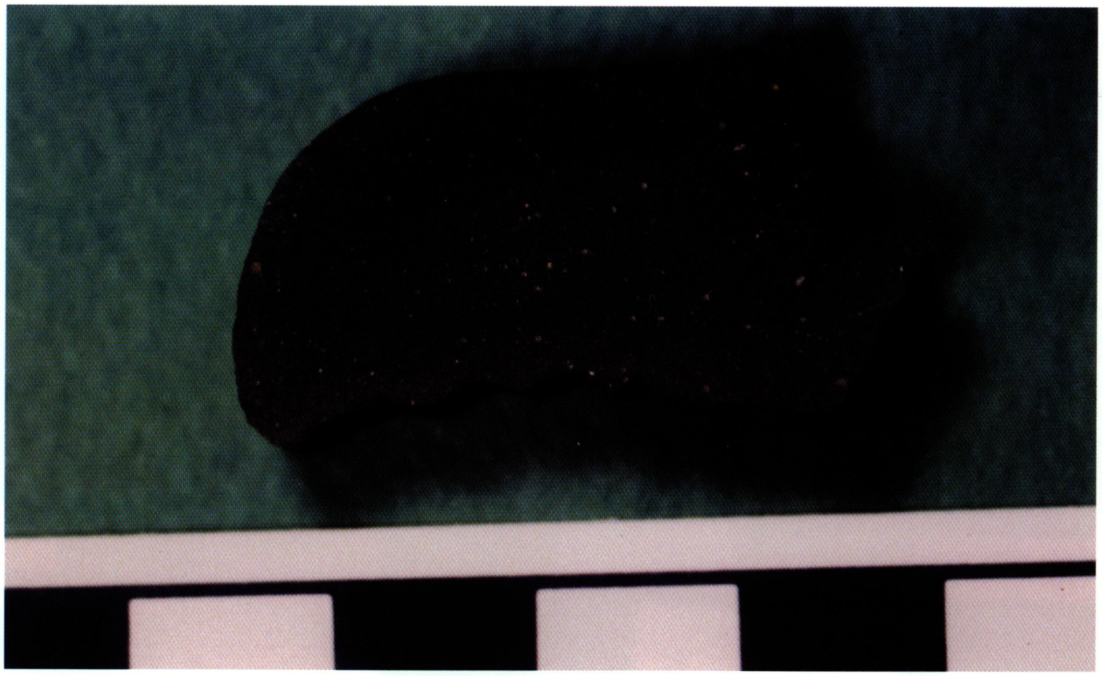


a

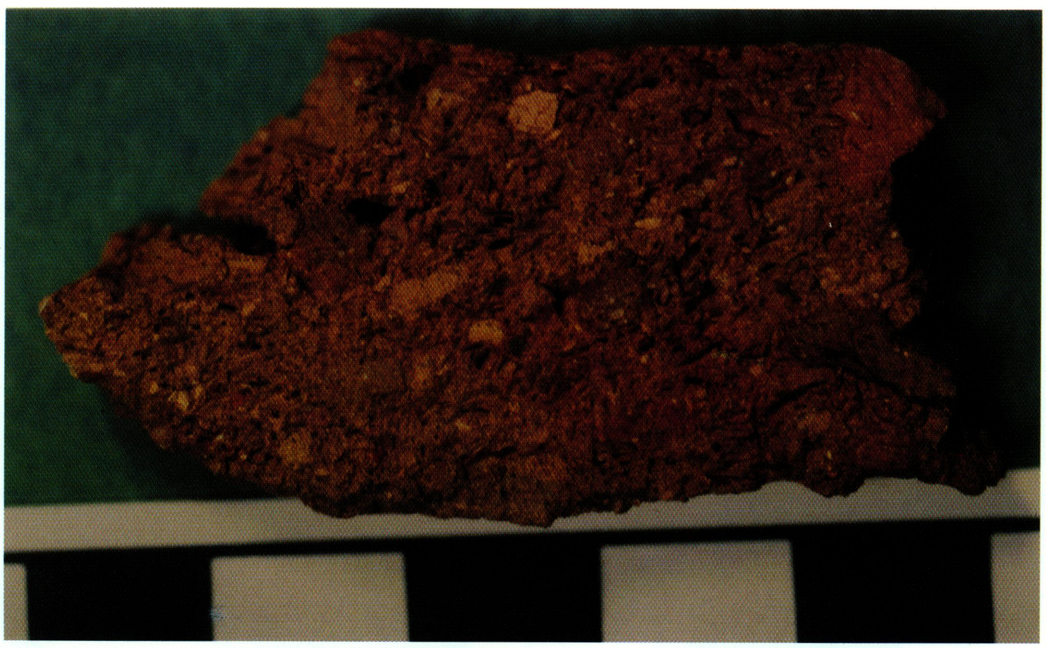


b

Color plate 10.9 Nile silt fabrics: a) *zīr* water jar from Abu Raguan (14.9; figure 10.3.3); b) *zīr* water jar from Badrashein (16.1; figure 10.3.1).

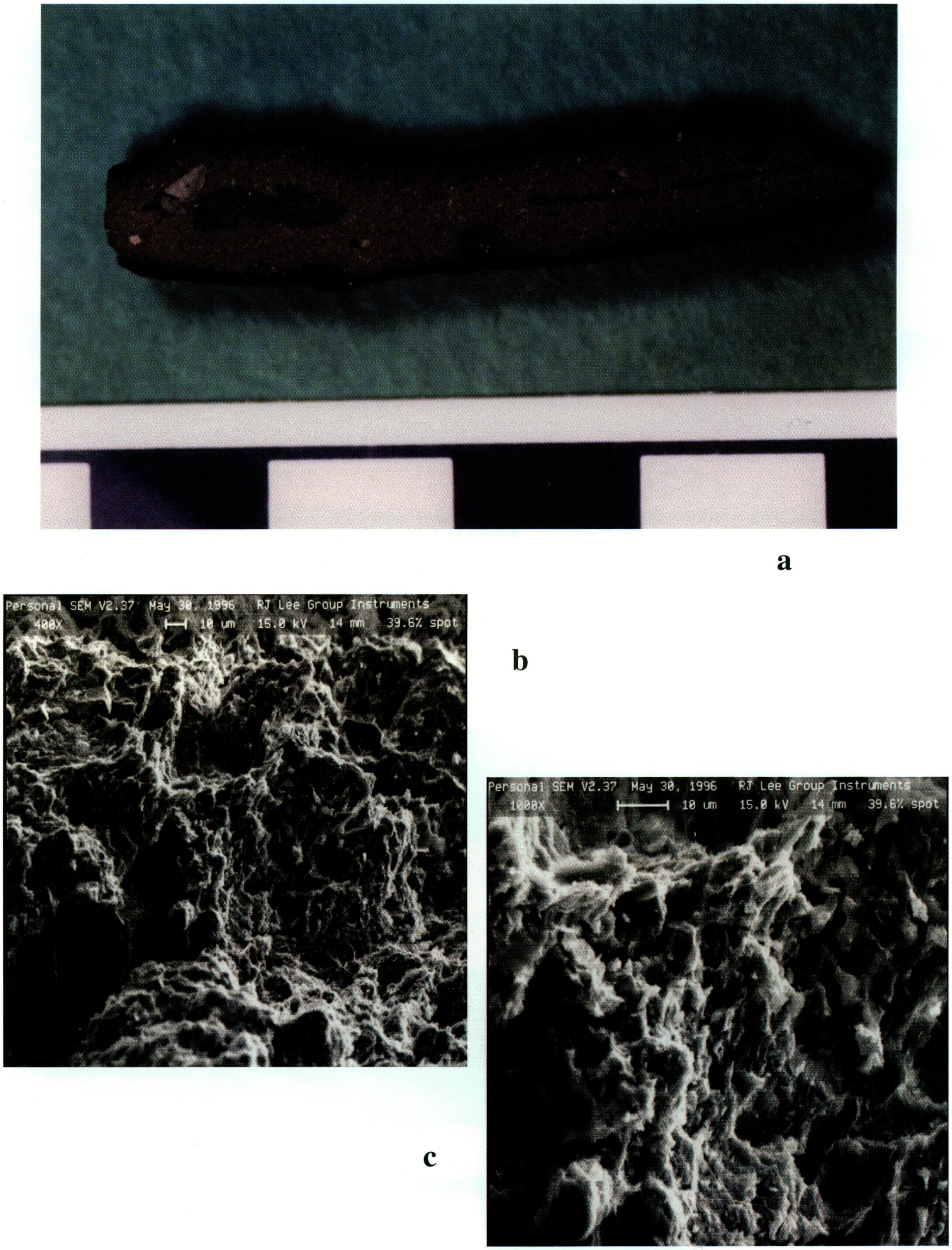


a



b

Color plate 10.10 Sinai silt fabrics: a) color section of black bowl rim (13.115; figure 10.13.1); b) color section of *tab n* fragment of anomalous fabric (13.75; not drawn).



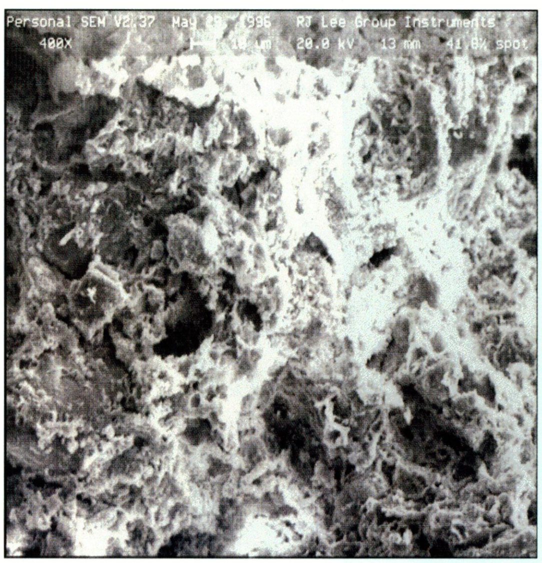
Color plate 10.11 Black fabric of Nile silt belonging to a *b ša* cookpot from Sharqiya province (W-47; figure 10.9.2): a) color section of fabric; b) and c) SEM shots of fabric groundmass at 400X and 1000X, respectively. Paste consists of granular silt with reticulated clay texture with a few subangular to angular sand-sized quartz and feldspar grains. Very minor vitrification.

a

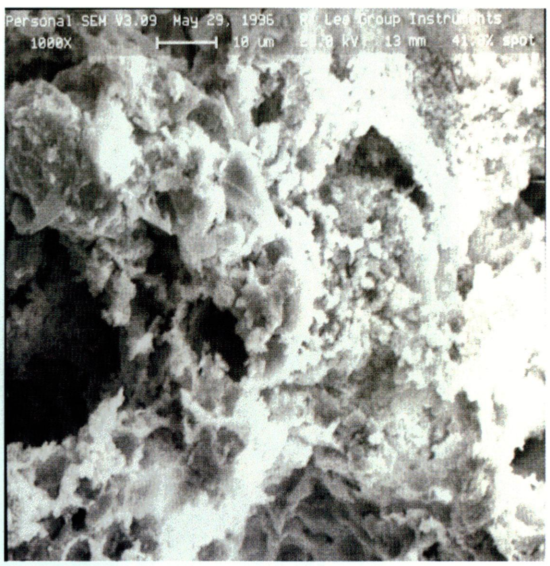
b

Color Plate 10.12 Mixed Nile silt and marl clay fabrics: a) color section of fabric belonging to an *abrī'* from Cairo (W-50; figure 10.8.5); b) color section of fabric from a Cairo *'olla* (W-51; figure 10.8.4).

a

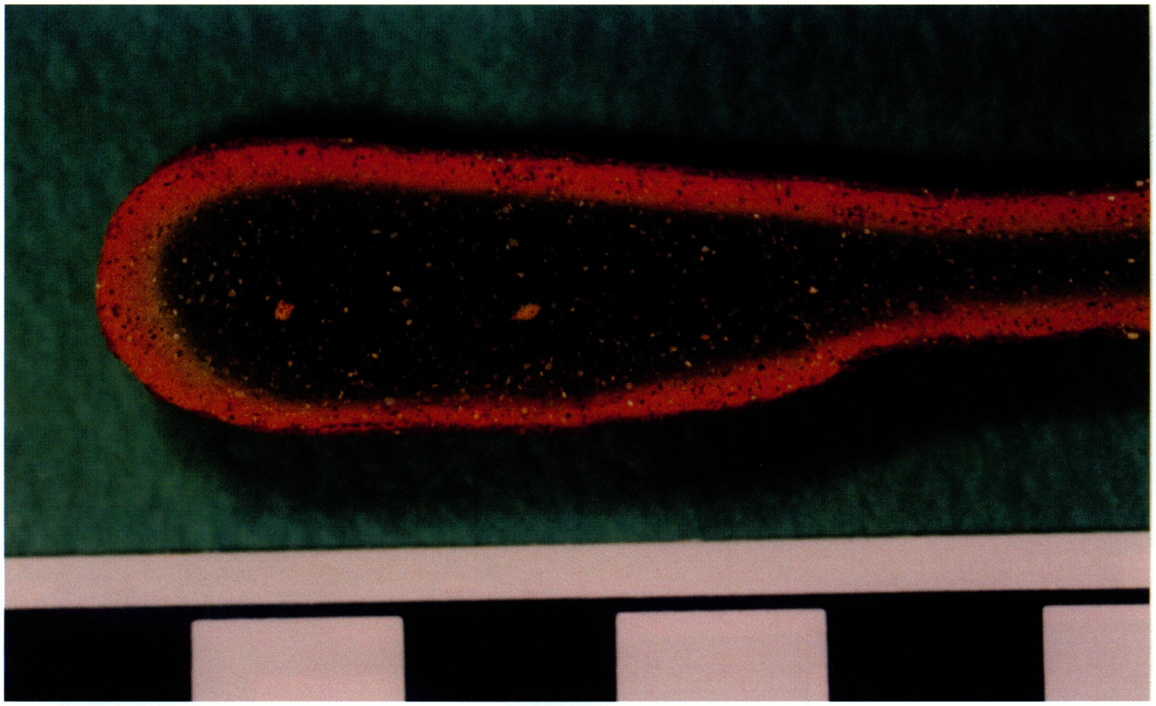


b

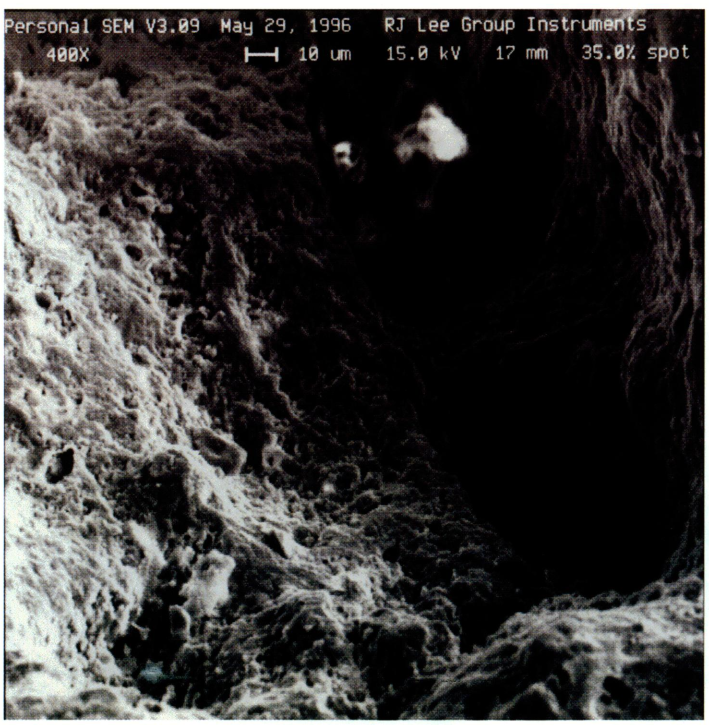


c

Color Plate 10.13 Mixed Nile silt and marl clay *'olla* from Cairo (W-39; figure 10.8.6): a) color section of fabric; b) and c) SEM views of fabric groundmass at 400X and 1000X, respectively. Paste exhibits a rounded silt and granular micrite matrix with common sand-sized pores and minor silt-sized pores. Angular to rounded sand-sized mudstone fragments are abundant. Also present are a few silt-sized grains of magnetite, common silt-sized rounded quartz and very well-formed calcium oxide coated pores. Vitrification is very minor.



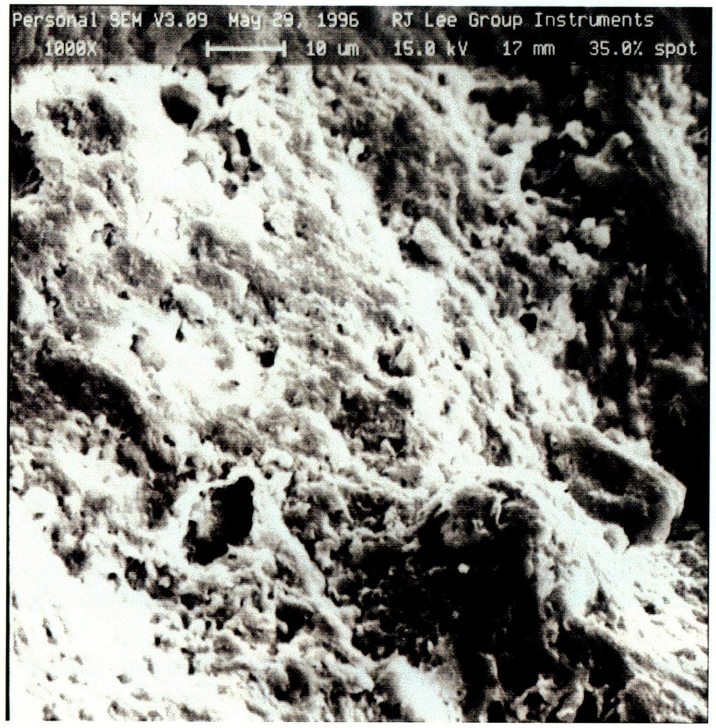
a



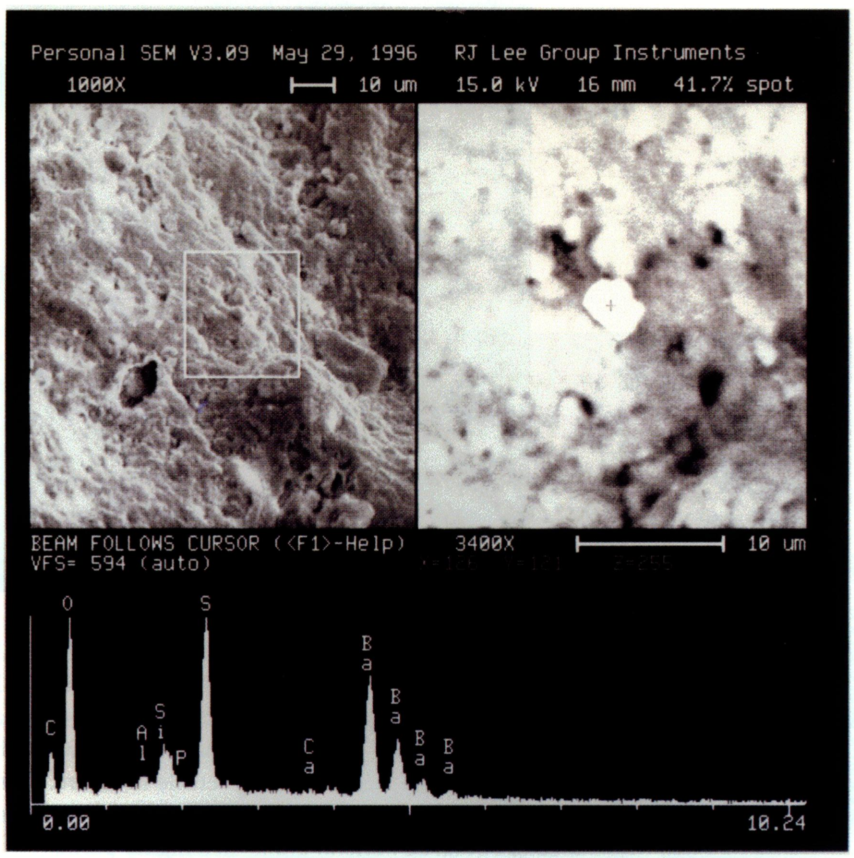
b

Color Plate 10.14 Sinai silt fabric ("orange-brown sandy" ware) belonging to a flowerpot (13.68; figure 10.17.8): a) color section of fabric; b) and c) SEM views of fabric groundmass at 400X and 1000X, respectively; d) SEM backscatter view (1000X) and EDAX energy spectrum showing elemental distribution for very fine silt-sized barite (barium sulfate) grain. Paste exhibits subrounded to subangular silt and tabular clays with calcium oxide coated pores. Sand-sized pores are common; silt-sized pores are rounded and uncommon. Minor fragments of grog are present. The barite, which almost certainly comes from an old sedimentary environment, may serve as a useful marker mineral for the source area.

c

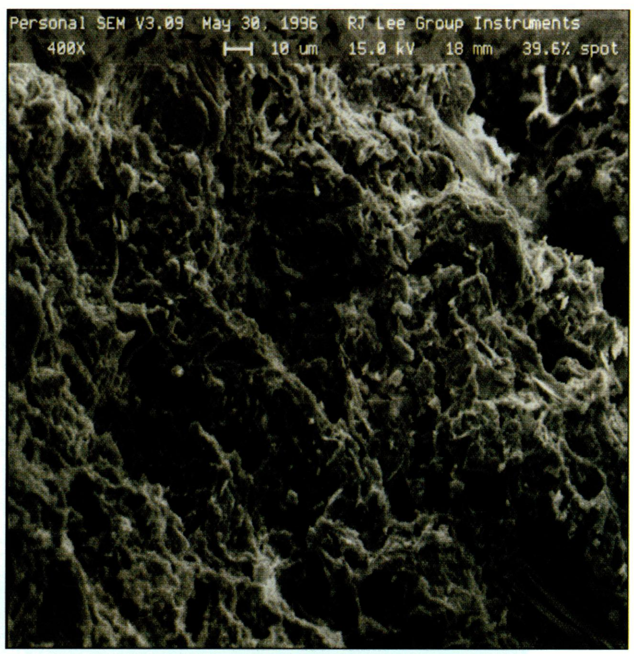

Personal SEM V3.09 May 29, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 17 mm 35.0% spot

d


Personal SEM V3.09 May 29, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 16 mm 41.7% spot
BEAM FOLLOWS CURSOR (<F1>-Help)
VFS= 594 (auto)
3400X 10 um
O
S
C
Al
Si
P
Ca
Ba
Ba
Ba
Ba
0.00
10.24

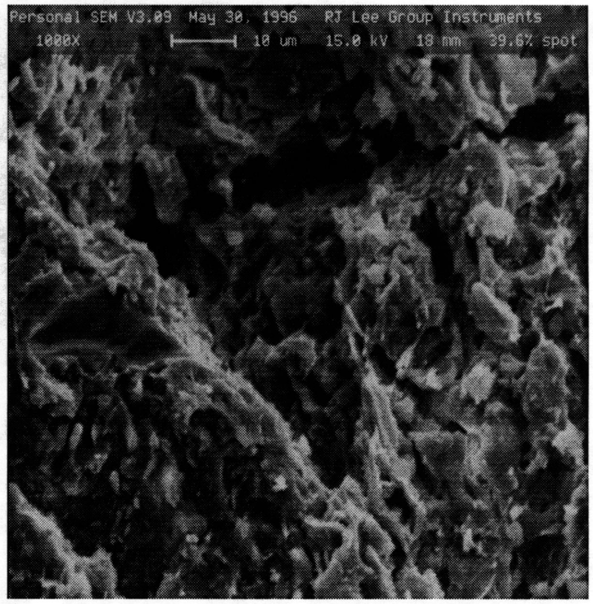
a

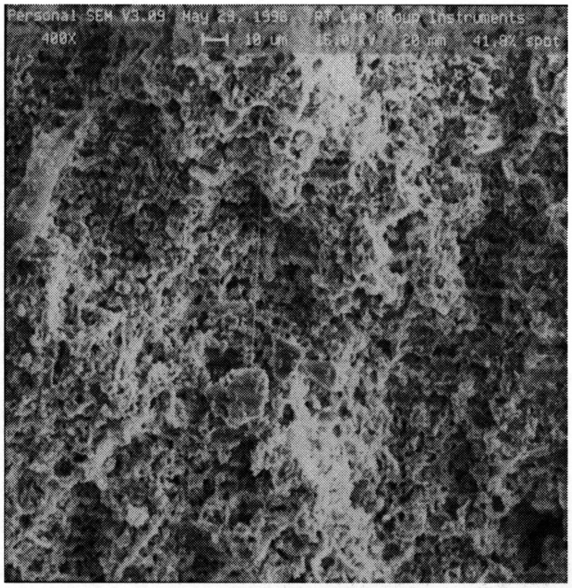
b



Color Plate 10.15 Flowerpot fabrics from El Qanatar workshop: a) color section of Nile silt fabric (bottom; 15.4; figure 10.16.8) and mixed Nile silt and Tebbine clay fabric (top; 15.2; not drawn); b) and c) SEM views of Nile silt (15.4) at 400X and 1000X respectively; d) and e) SEM views of mixed fabric (15.2) at 400X and 1000X respectively. SEM views of sample 15.4 show a paste composed of well-rounded to subangular silt with tabular clays that appear to be partially vitrified and sand-sized angular pores which are dominantly tensile in nature. Some sand-sized ash fragments are present, along with rare organics. SEM views of sample 15.2 illustrate a groundmass with a granulated silt texture containing well-rounded to subangular silt-sized mineral grains in a highly porous structure with abundant calcium carbonate silt. The pores are dominantly rounded and silt-sized. Angular sand-sized mudstone fragments are present. Welding appears to be minor.

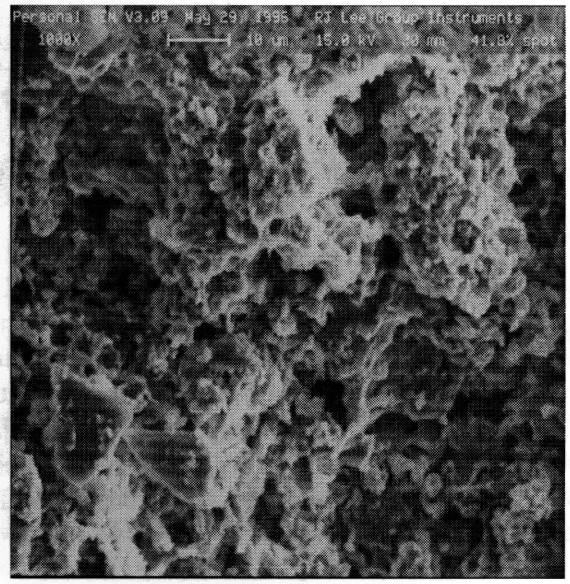
c


Personal SEM V3.09 May 30, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 18 mm 39.6% spot

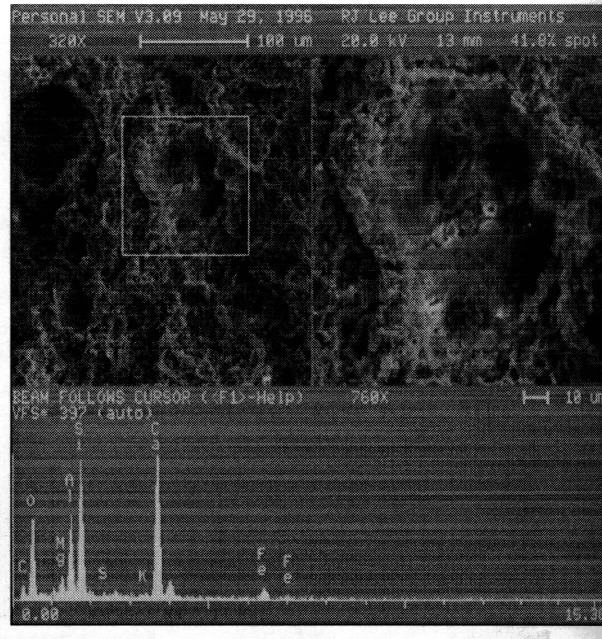

Personal SEM V3.09 May 29, 1996 RJ Lee Group Instruments
400X 10 um 15.0 kV 20 mm 41.8% spot

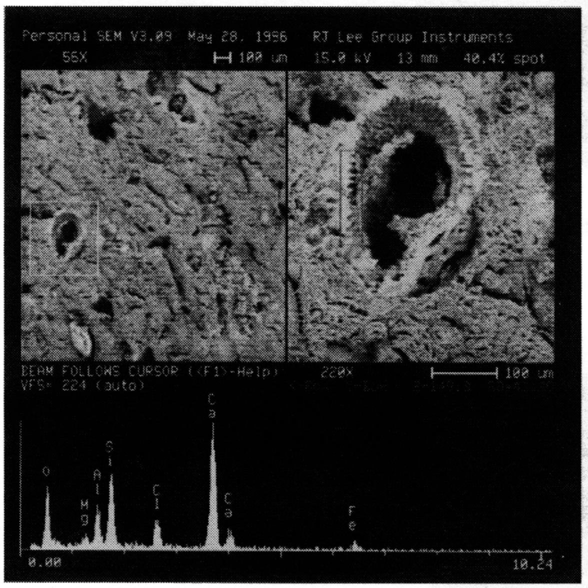
d

e

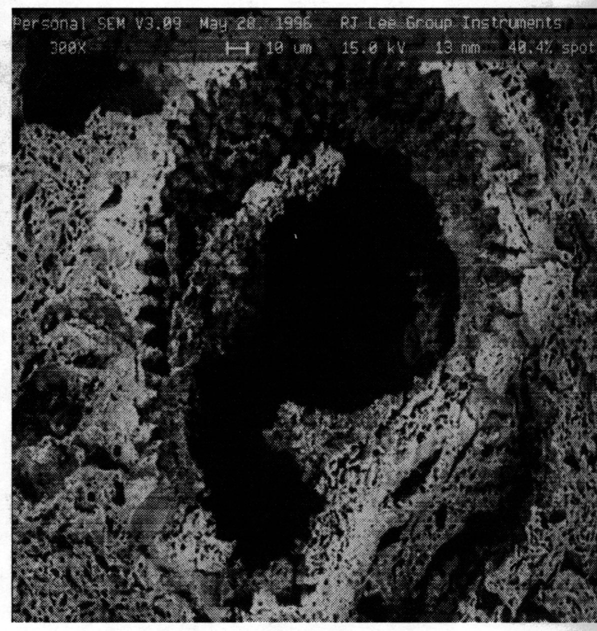

Personal SEM V3.09 May 29, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 20 mm 41.8% spot

a





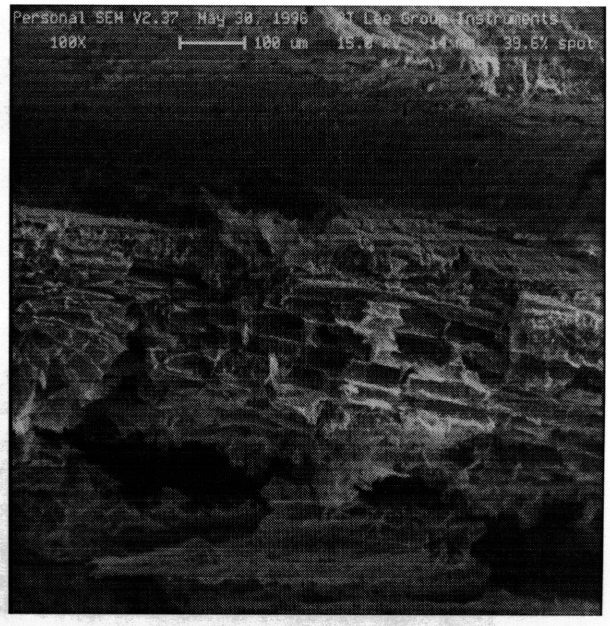
b



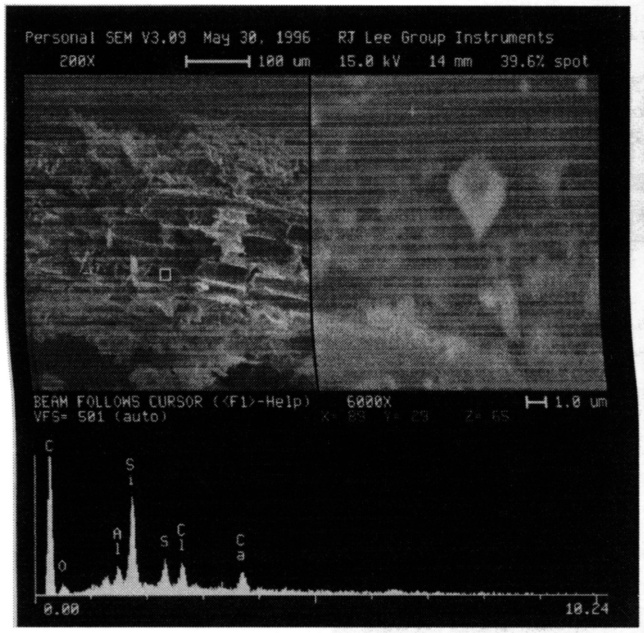
c

Color Plate 10.16 SEM backscatter views and EDAX energy spectra showing elemental distributions of CaO coated pores: a) from sample W-39, an *'olla* from Cairo made of a mixed marl clay and Nile silt fabric (figure 10.8.6); a 320X view of a calcium oxide pore structure comprised of an agglomeration of 4 to 5 individual pore degassing centroids with an approximately 10 micron thick calcium oxide wall structure; b) and c) from sample W-65, Qena region marl clay *ballās* jar (figure 10.4.2); 56X and 300X views of a calcium oxide pore comprised of two degassing centroids with a calcium oxide wall thickness averaging about 25 microns and a classic impact crown structure which probably resulted from violent carbon dioxide degassing of calcium carbonate during heating.

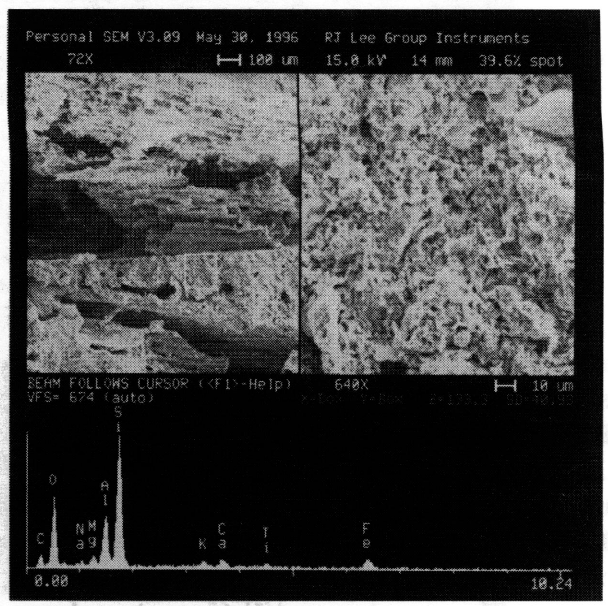
a



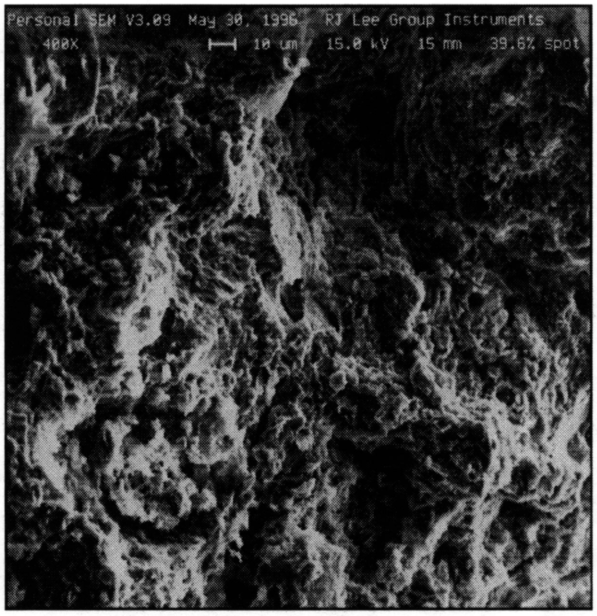
b



c

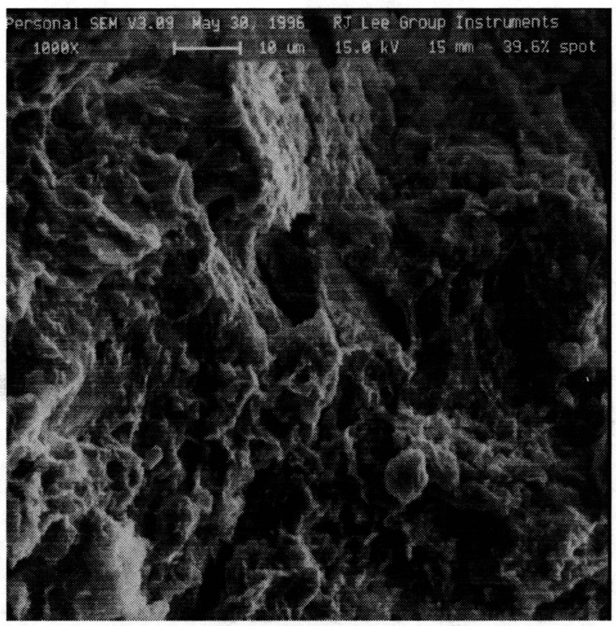


Color Plate 10.17 SEM views of carbonized phytolithic cast of chaff/straw in sample W-69, a *hanāb* from the Fayum (figure 10.7.3): a) 100X view showing cellular structure of chaff cast; b) and c) backscatter views and EDAX energy spectra showing elemental distributions for chaff zone (200X) and fabric paste (72X), respectively. The EDAX scans indicate high carbon content in the chaff cast and low carbon content in the paste matrix. The EDAX also indicates that the cast contains silicon dioxide opaline phytolithic debris.



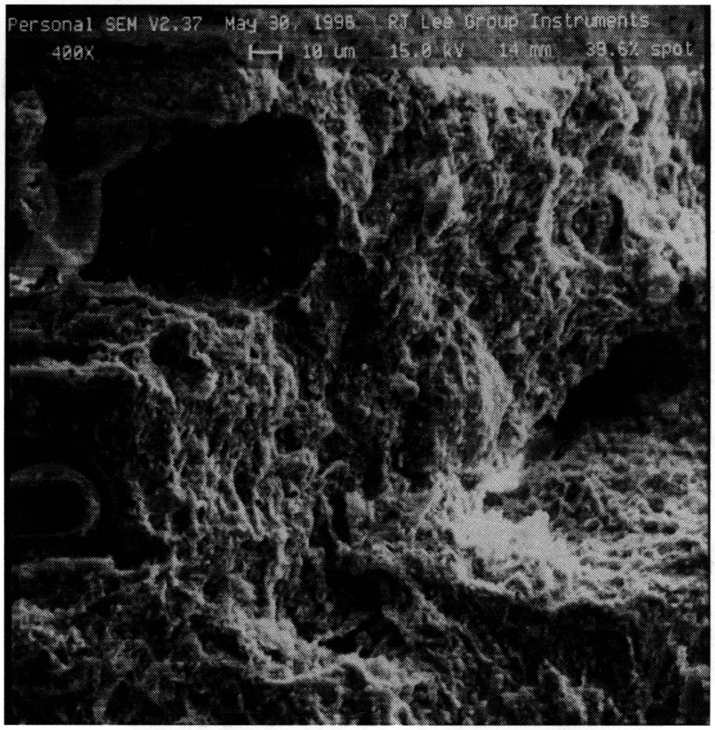
a

b

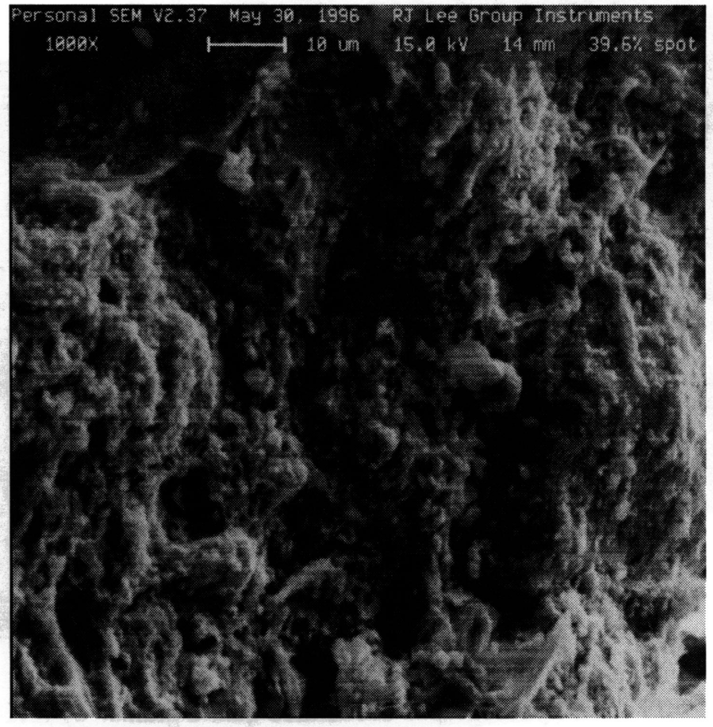


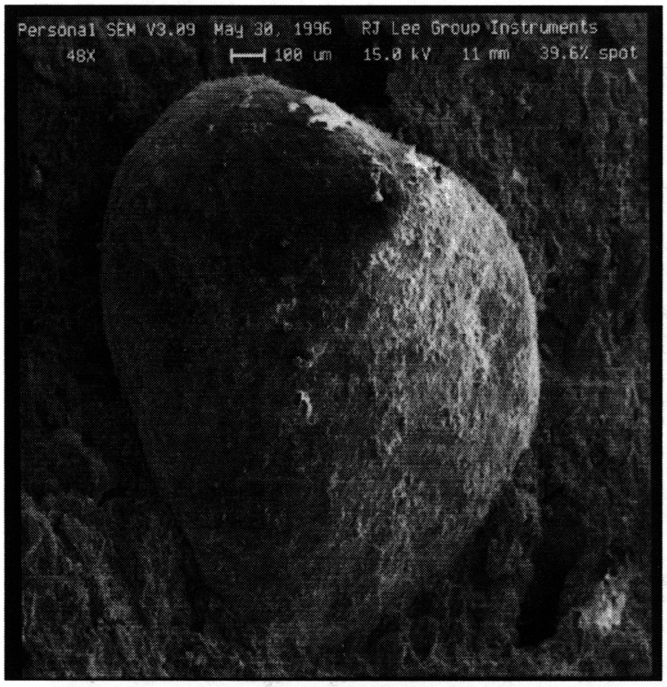
Color Plate 10.18 SEM photographs of two different Nile silt fabric pastes: a) and b) 400X and 1000X views, respectively, of the groundmass of sample W-21, a small *māğūr* bowl from Minya (figure 10.12.2); c) and d) 400X and 1000X views, respectively, of the groundmass of W-69, a *hanāb* from the Fayum (figure 10.7.3). W-21 has a paste consisting of well rounded to subrounded silt grains with tabular clays and some calcium oxide coated pores. Pores range from sand to silt-sized and are rounded to angula; some of the angular pores are in tensile configurations. Vitrification is very minor. The silt is composed dominantly of quartz and feldspar with minor heavy minerals. Some of the sand-sized mineral grains are angular. Ash is also present. The groundmass of W-69 consists of granular silt with an organic cast texture. The organic casts are dominated by carbon and phytolithic debris; many contain original cellular structure. Casts vary in size from silt to sand and are dominantly elongated. Individual phytoliths are present in the silt matrix and consist of grass short cells and non-segmented hair and hair-based forms. The tabular clay texture is overshadowed by the plant cast texture. Vitrification is very minor. Some of the silt appears to be carbonate grains.

c


Personal SEM V2.37 May 30, 1996 RJ Lee Group Instruments
400X 10 um 15.0 kV 14 mm 39.6% spot

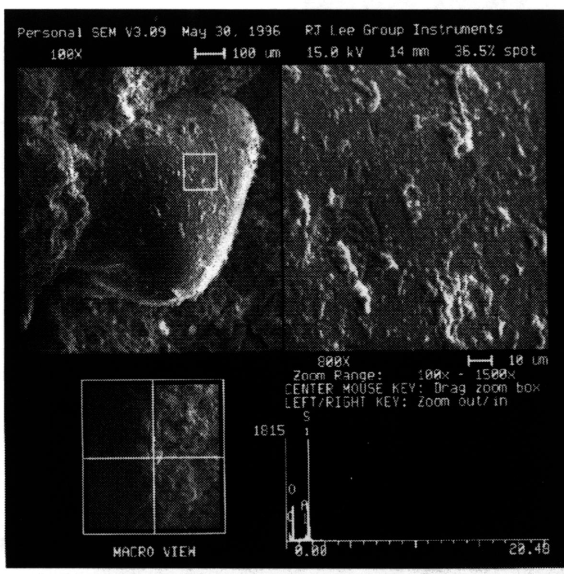
d


Personal SEM V2.37 May 30, 1996 RJ Lee Group Instruments
1000X 10 um 15.0 kV 14 mm 39.6% spot

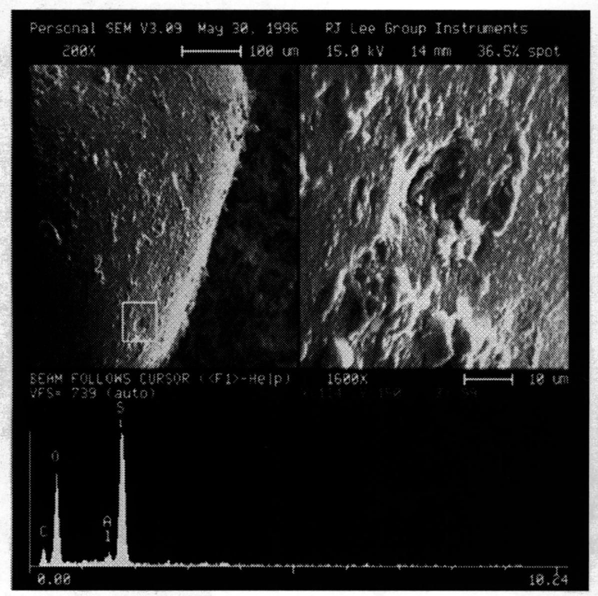


a

b



c

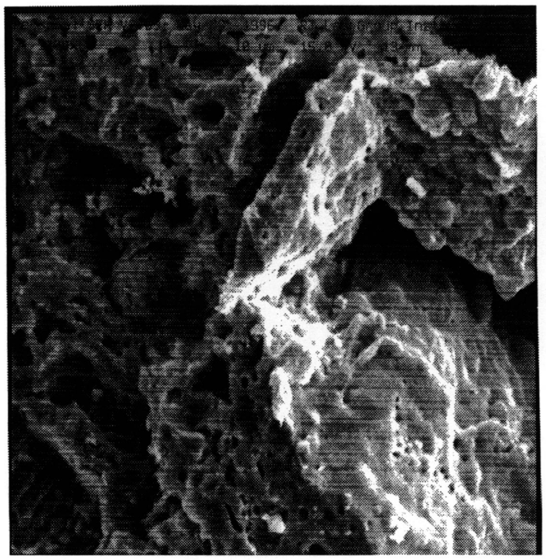


Color Plate 10.19 SEM photographs of rounded quartz grains: a) 48X view of rounded quartz grain from an *'olla/mašrabeyya* from Samannûd (W-12; figure 10.8.3); b) and c) 100X and 200X views, respectively, of frosted, rounded quartz grain from a small *māğūr* from Minya (W-21; figure 10.12.2). Note the impact scars on the righthand photographs of both b) and c). The combination of rounding, frosting, and impact scars reflects the multi-environment origins of this quartz grain: it began as dune sand (rounded and frosted) and was later transported by water (impact scars).

Addendum

The plate below is the correct image for number 10.1.c on p. 331.

c



Color plate 10.1 Marl clay fabric from Qena region *ballās* jar (W-65; figure 10.4.2): a) color view of section; b) and c) SEM views of groundmass at 400X and 1000X, respectively; d) and e) SEM back scatter view and EDAX energy spectra showing element distribution for a calcium phosphate grain and magnetite grain, respectively. Fabric groundmass has a semi-vitrified clay-based carbonate texture with numerous silt-sized calcium oxide coated pores. The granular texture with numerous silt-sized calcium oxide coated pores. The granular texture is extremely minor due to micritic silt-sized grains. Sand-sized angular pores are numerous.