10

The Egyptian Modern Pottery Project: Pilot Phase Findings

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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 re-

search: 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.

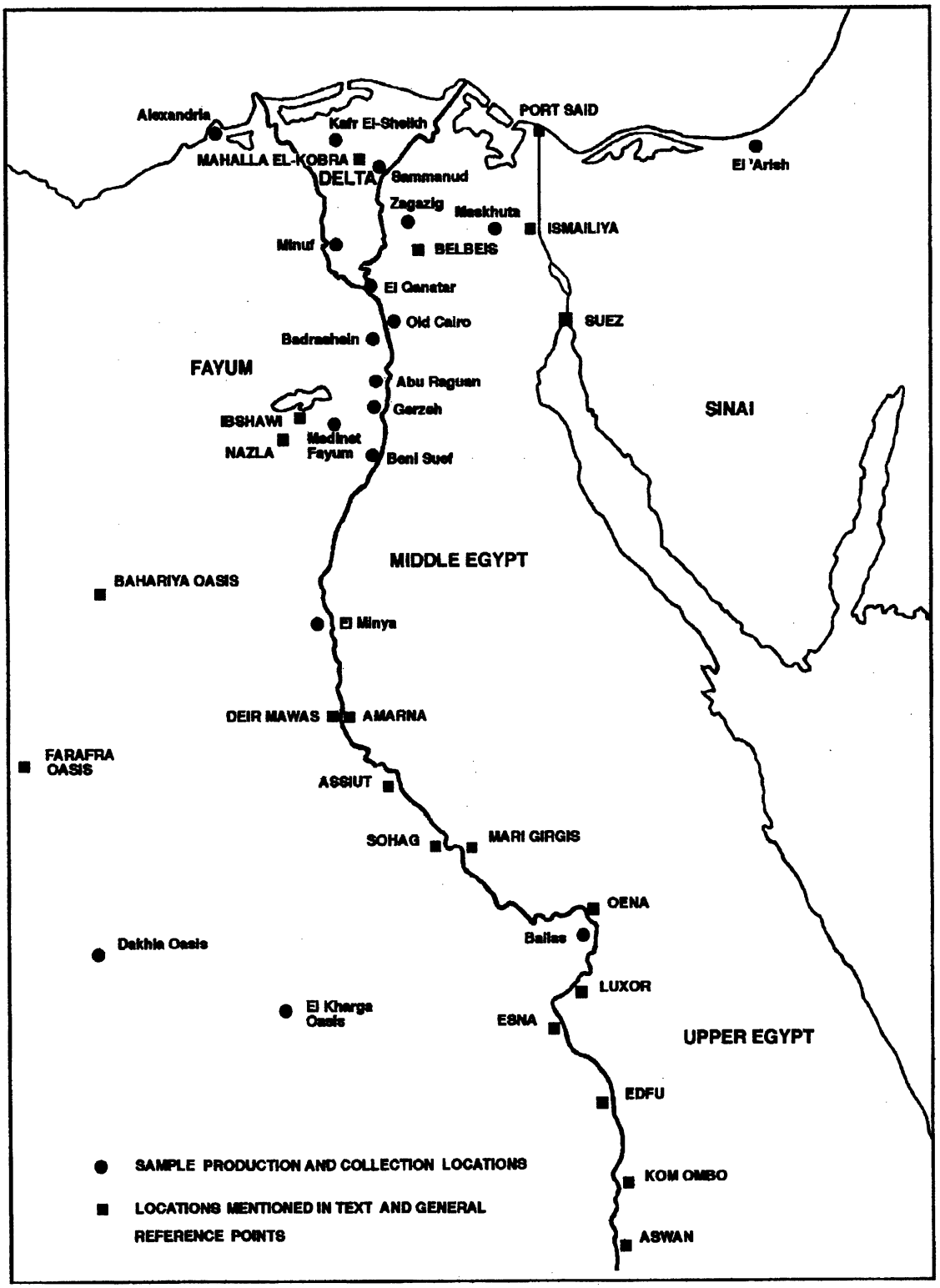


Figure 10.1 Map of Egypt showing sample production and collection locations, locations mentioned in text, and points of general reference. Adapted from Henein 1992.

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

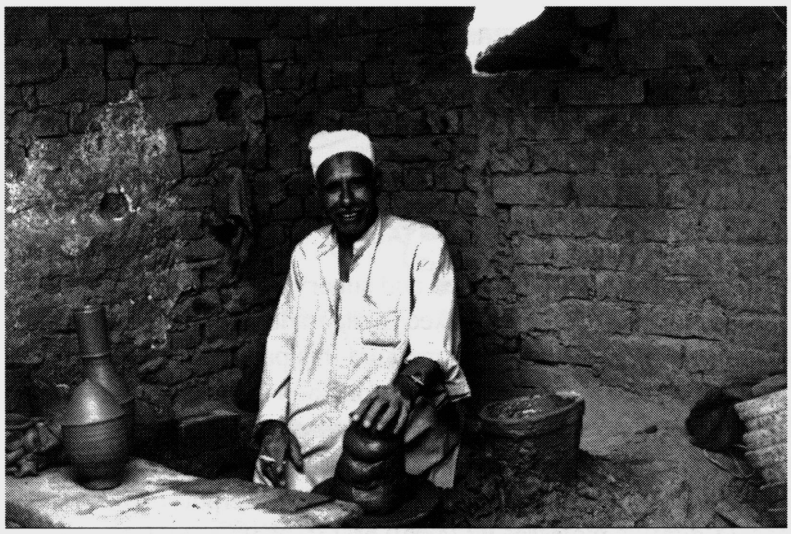


Plate 10.1 Master potter Abdullah Mahmoud Megahit, *raiyiss* of the traditional potter's workshop in Old Cairo, at a potter's wheel. Note the completed and partially completed *'olall* in the left foreground.

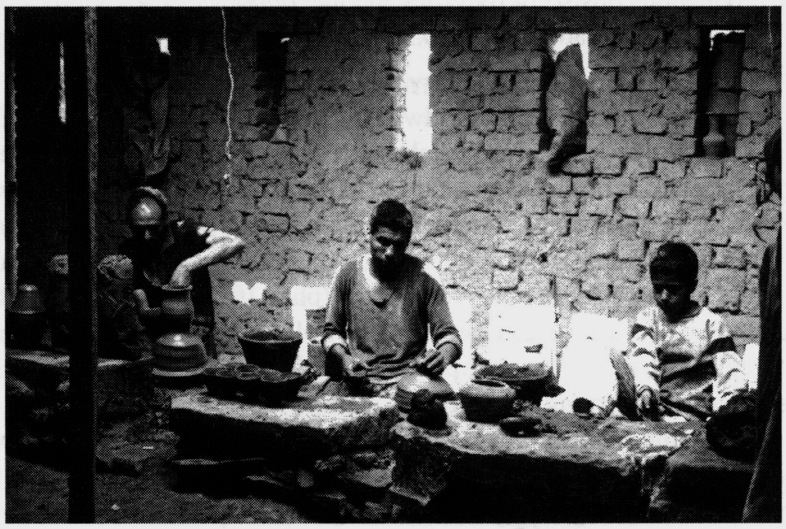


Plate 10.2 Two skilled workers throwing pots at the Old Cairo workshop as a young assistant waits for additional tasks.

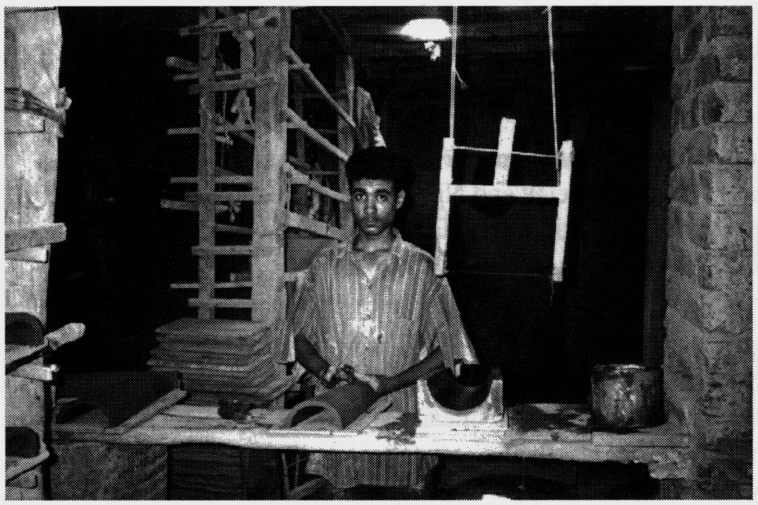


Plate 10.3 A skilled worker putting finishing touches on a molded roof tile (*aramīt*) at the Old Cairo workshop; note the mold at his left elbow. The hanging wooden frame just above the mold has a cord stretched across its lower part; this is used to trim the edges of the roof tile when it is still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

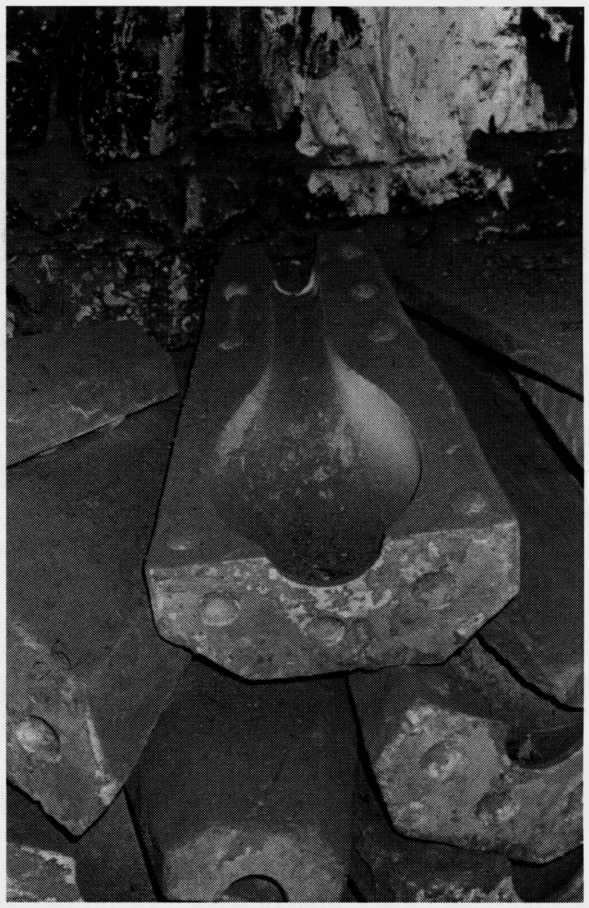


Plate 10.4 Molds for producing candle holders/vases (*šama'danī*) in the Old Cairo workshop.

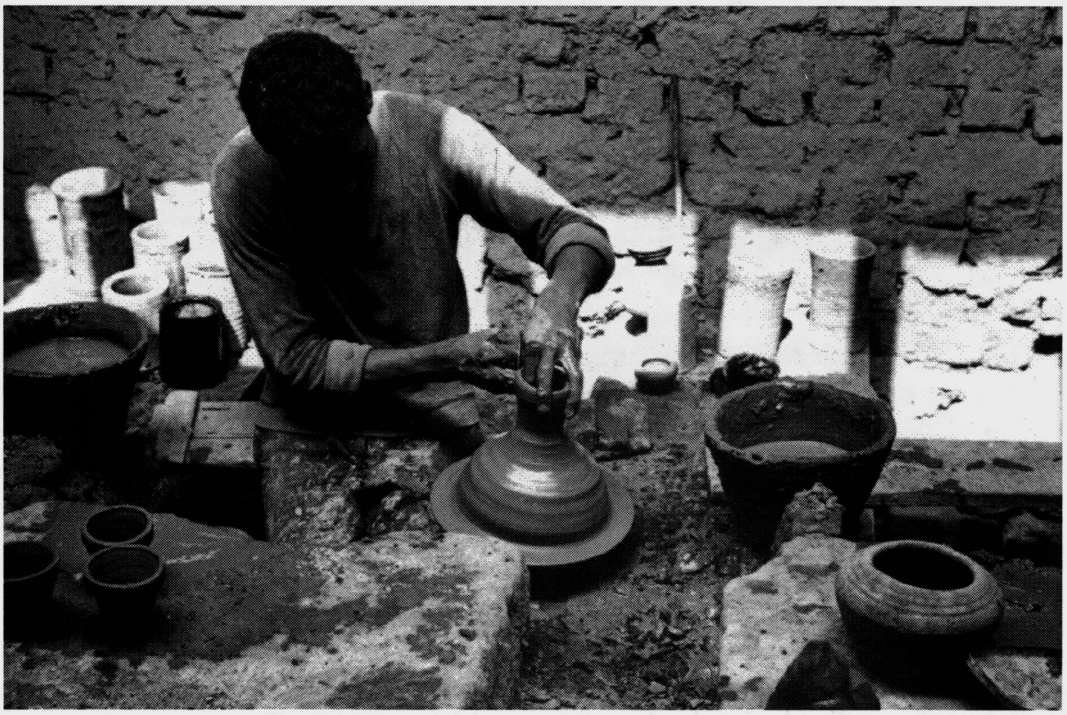


Plate 10.5 A skilled worker throwing a pot on a kick-wheel at the Old Cairo workshop.

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

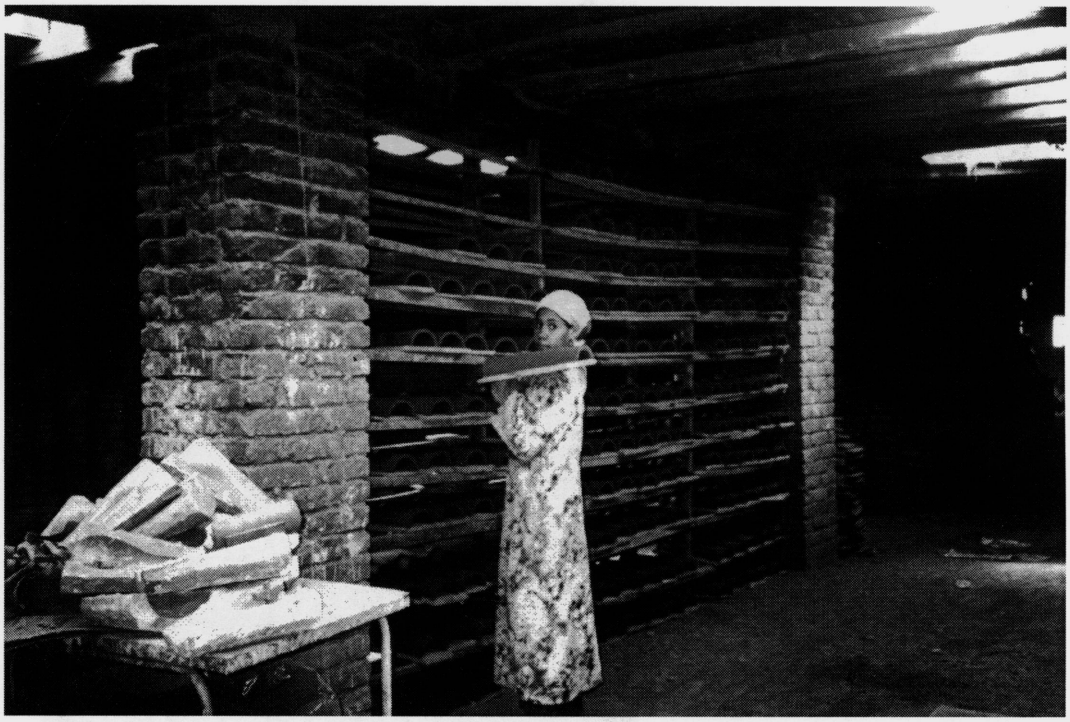


Plate 10.6 Young assistant placing unfired roof tile to dry in the slatted wooden drying racks in the center of the Old Cairo pottery workshop.

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.

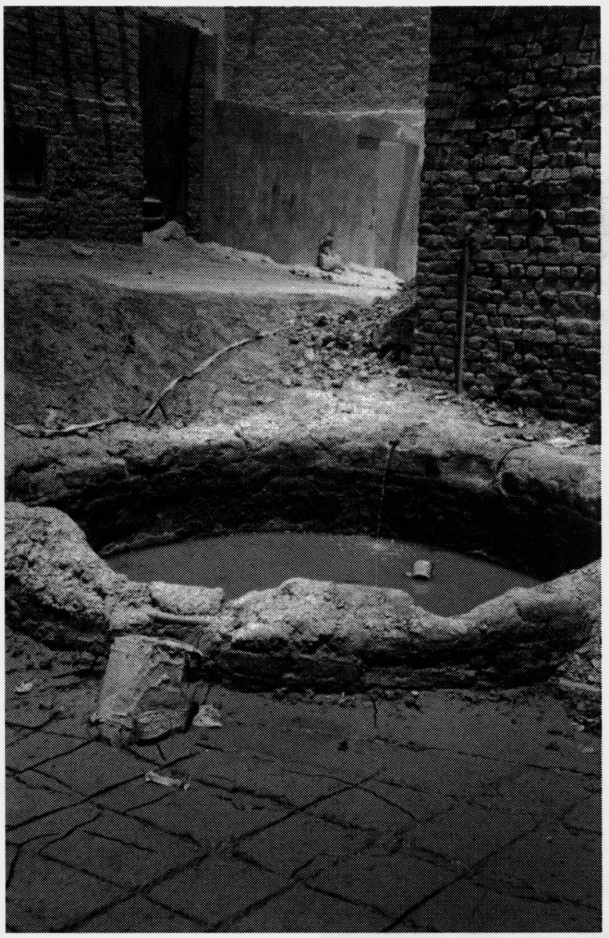


Plate 10. 9 Round hydrating basin for dry clay at Old Cairo workshop. Note pipe with running water extending out over basin. The unpaved road in back of the workshop is visible in the background.

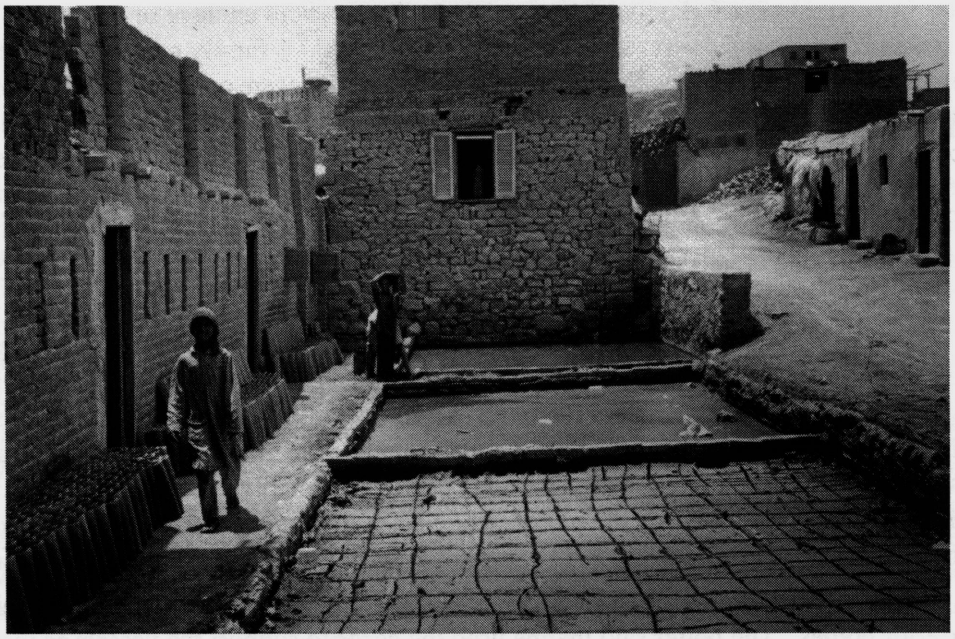


Plate 10.10 The three rectangular settling basins for clay at the Old Cairo workshop. Water remains in the two rear basins but has evaporated almost completely from the basin in the foreground, which is the same basin that appears in the foreground of plate 10.9. Note the two entrances to the workshop 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.

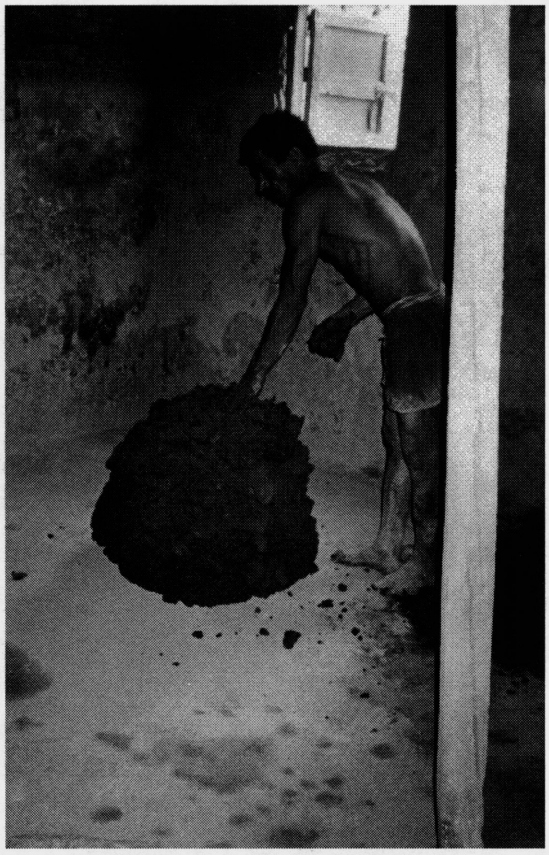


Plate 10.11 Worker inside Old Cairo workshop kneading raw clay taken from the settling basins into an appropriate working consistency.

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

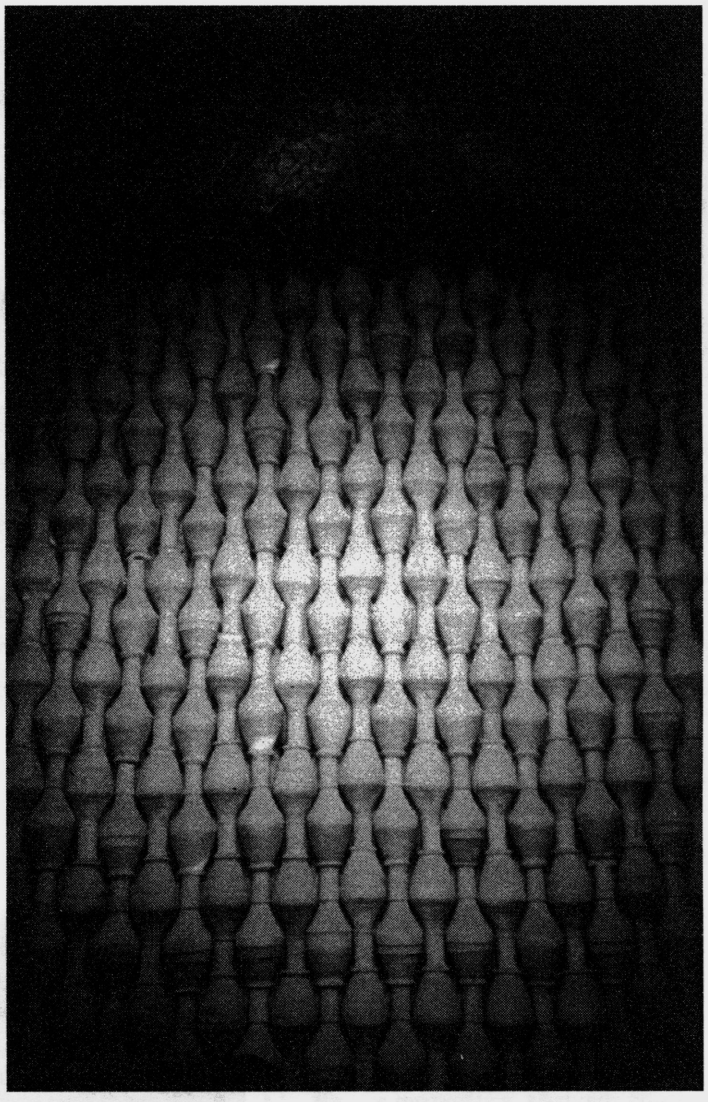


Plate 10.12 'Olall carefully stacked inside the large kiln at the Old Cairo potter's workshop.

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).

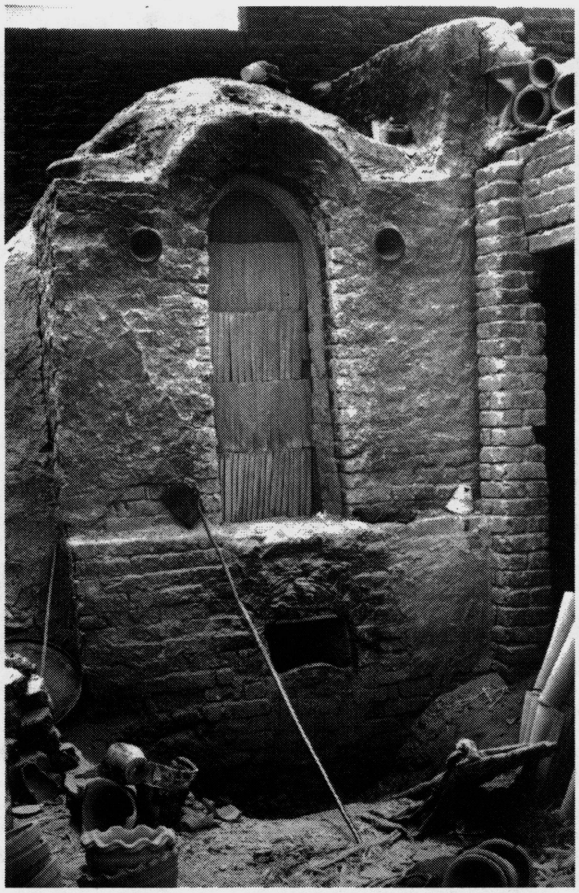


Plate 10.13 One of the two small kilns at the Old Cairo workshop, with roof tiles (*aramīt*) stacked inside ready for firing. Note permanent roof on kiln and stokehole directly below entrance to kiln where tiles are stacked.

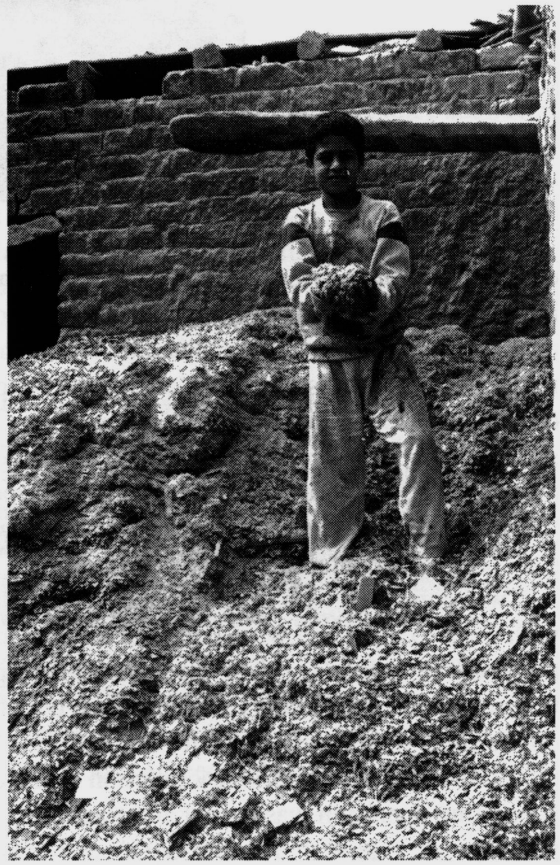


Plate 10.14 One of the young assistants at the Old Cairo potter's workshop holding some of the wood shavings, waste from a nearby factory, used for kiln fuel.

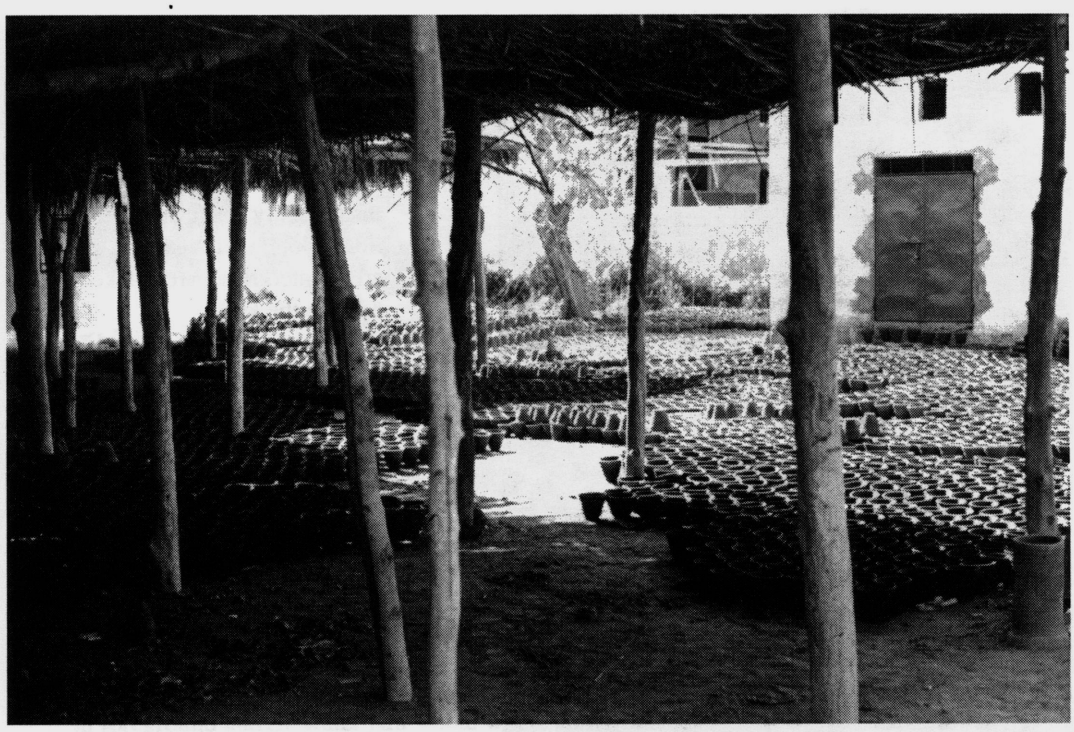


Plate 10.15 Drying sheds at El Qanatar workshop with completed flowerpots drying in the open.

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.

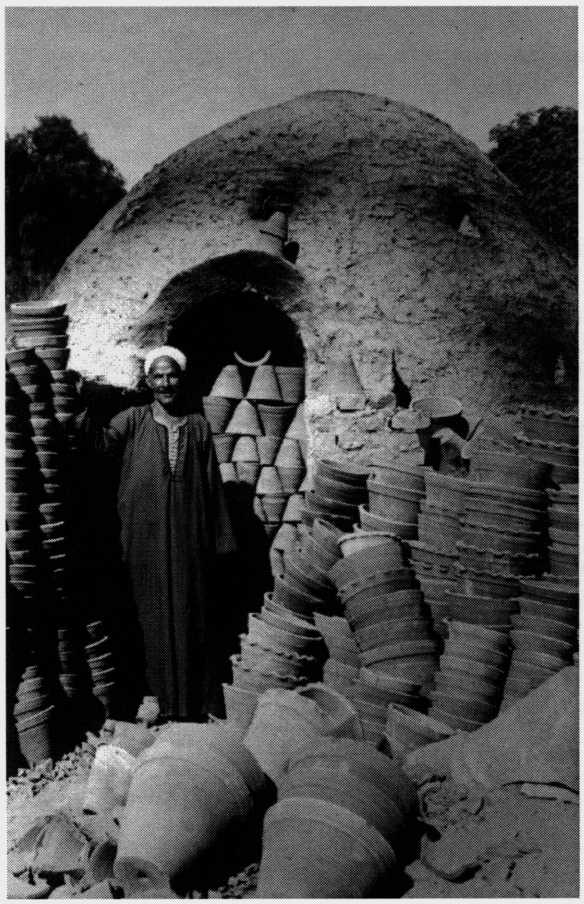


Plate 10.17 Front view of one of the kilns at El Qanatar workshop. Note permanent roof on kiln and flowerpots stacked inside ready for firing. Additional pots, with both plain and crenellated rims, are stacked outside the kiln.

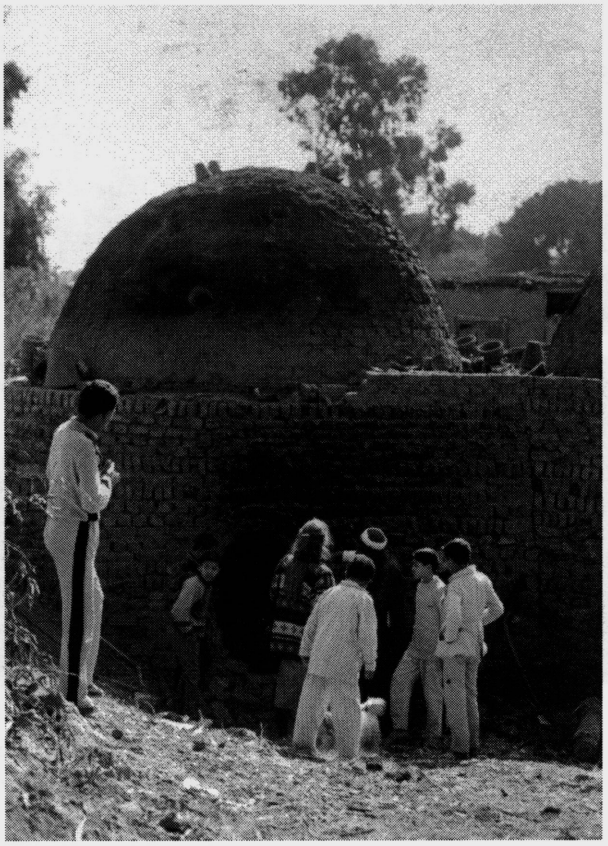


Plate 10.18 Back view of kiln at El Qanatar workshop; note the oval stokehole. A second kiln is just visible to the right.

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.

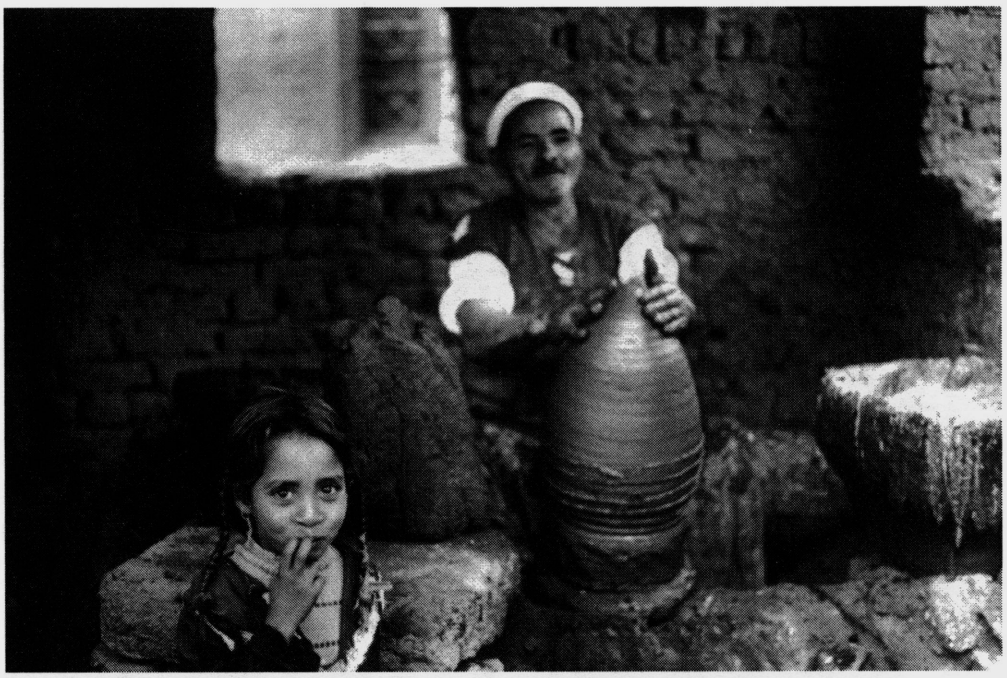


Plate 10.20 Badrashein potter throwing a pot on his kick-wheel.

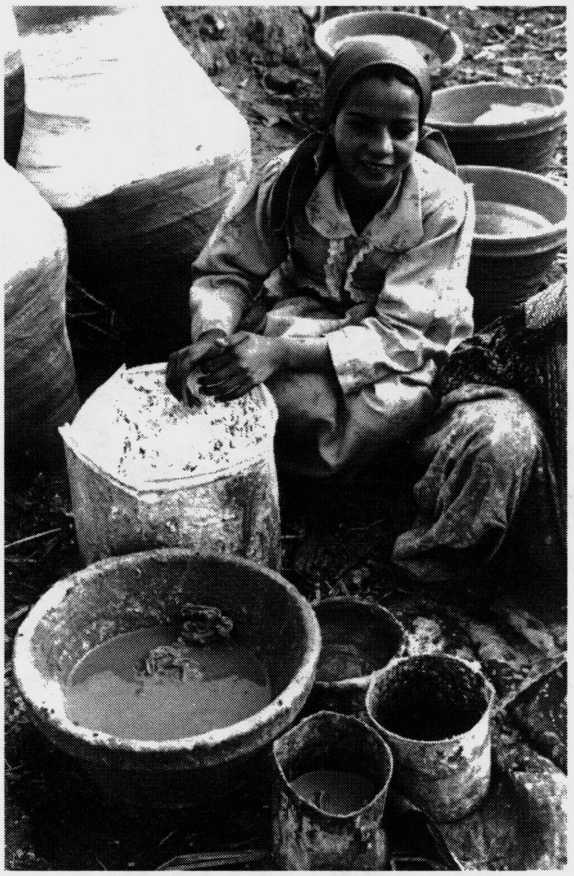


Plate 10.21 Applying post-firing wash to completed pots at Badrashein.

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

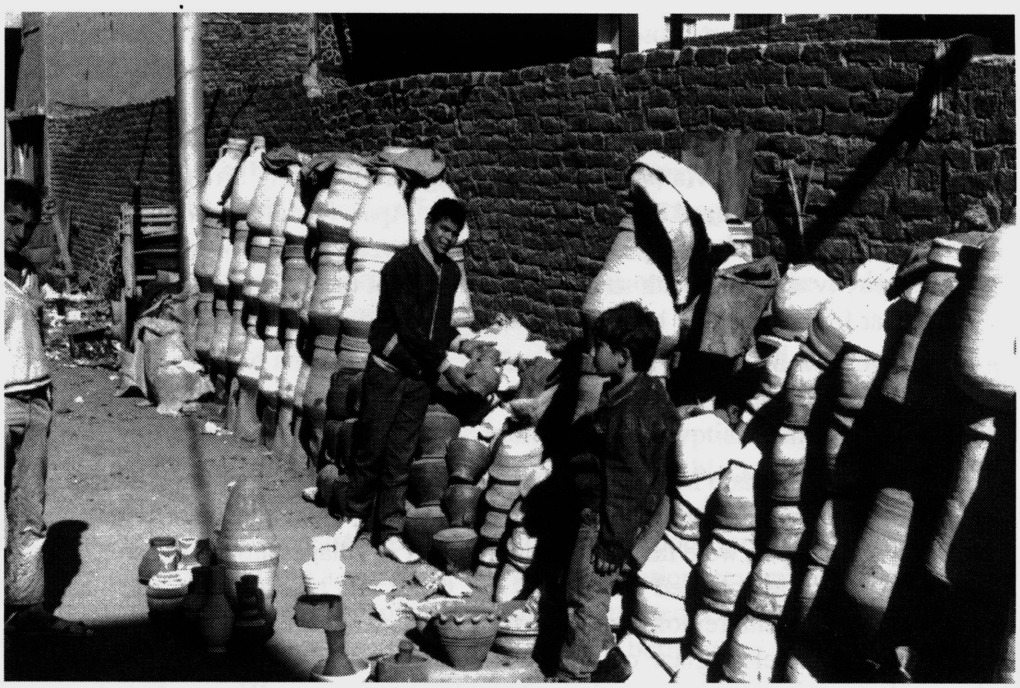


Plate 10.23 Young urban street vendor (center left) retailing pottery in El Qanatar; most of the stock was made by his family in Minouf. Note sampling of wares for sale in left foreground.

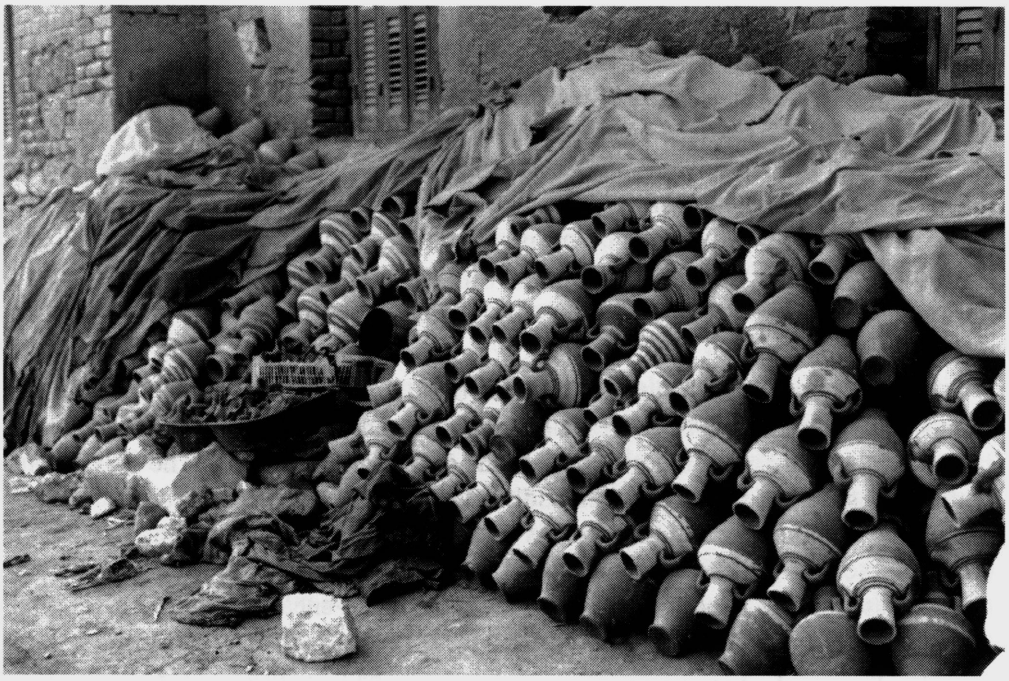


Plate 10.24 Ceramic stock of El-Qanatar retailer lining opposite side of alley shown in plate 10. 23. Pots shown are predominantly Nile silt water jugs (*ba'oša* or *mašrabeyyāt*) from Minouf.

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 car-

peted 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 semi-circular 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 *ǧibs*), red (from ocher), or rose (from a combination of *ǧibs* 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	*hağar*	pipehead	Mahalla retailer	Samannûd	pipehead
W-8	Figure 10.9.6	*hağar*	pipehead	Mahalla retailer	Samannûd	pipehead
W-9	Figure 10.9.8	*hağar*	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; meğōza*	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	*māğūr*	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	*tāğen*	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	*hağar*	pipehead	Qanatar retailer	Cairo	pipehead; black fabric
W-75	Figure 10.12.1	*māğūr*	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	*'asreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.7	Figure 10.16.5	*'asreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.10	Figure 10.16.11	*'asreyya*	flowerpot	Minya	Minya?	flowerpot rim
1.12	Figure 10.16.4	*'asreyya*	flowerpot	Minya	Minya?	flowerpot rim
2.1	Figure 10.16.22	*'asreyya*	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	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.4	Figure 10.16.14	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.5	Figure 10.16.20	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot base
5.6	Figure 10.16.7	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.9	Figure 10.16.3	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.10	Figure 10.16.16	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
5.13	Figure 10.16.21	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot base
5.15	Figure 10.16.6	*'asreyya*	flowerpot	Cairo	Cairo?	flowerpot rim
7.12	Figure 10.16.15	*'asreyya*	flowerpot	Hurghada	?	flowerpot rim
9.3	Figure 10.15.20	*'bila*?	jug?	Gerzeh area	Gerzeh?	ring base; closed form; lt yellowish fabric
10.8	Figure 10.15.13	*'bila*?	jug?	Gerzeh area	Gerzeh?	neck, sieve; hold liquid; lt greenish fabric
10.35	Figure 10.16.2	*'asreyya*	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	*'asreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.2	Not drawn	*'asreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.3	Not drawn	*'asreyya*	flowerpot	Qanatar potter	Qanatar	flowerpot rim
15.4	Figure 10.16.8	*'asreyya*	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	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.2	Figure 10.18.1	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.3	Figure 10.16.9	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.5	Figure 10.18.4	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.6	Figure 10.14.14	?	cookpot?	Sinai	?	cookpot rim, handmade
13.8	Figure 10.17.7	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.10	Figure 10.17.5	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.11	Figure 10.16.19	*'asreyya*	flowerpot	Sinai	Egypt?	flowerpot base
13.13	Figure 10.16.1	*'asreyya*	flowerpot	Sinai	Egypt?	flowerpot rim
13.14	Figure 10.16.18	*'asreyya*	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	*'asreyya*	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	*'bila*?	jug? bottle?	Sinai	?	neck; hold liquid?
13.28	Figure 10.15.14	*'bila*?	jug?	Sinai	?	neck; hold liquid?
13.30	Figure 10.17.3	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.31	Figure 10.14.15	?	cookpot	Sinai	?	cookpot rim, handmade
13.34	Figure 10.17.4	*'asreyya*	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	*'asreyya*	flowerpot	Sinai	Egypt?	flowerpot, complete profile
13.58	Figure 10.16.17	*'asreyya*	flowerpot	Sinai	?	flowerpot base
13.59	Figure 10.18.3	*'asreyya*?	flowerpot?	Sinai	?	ring base
13.60	Figure 10.18.6	*'asreyya*?	flowerpot?	Sinai	?	ring base
13.61	Figure 10.18.2	*'asreyya*?; *tabla*	flowerpot?, drum?	Sinai	?	flowerpot?, drum?
13.63	Figure 10.14.9	?	krater?, bowl?	Sinai	?	rim; open form
13.67	Figure 10.17.9	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.68	Figure 10.17.8	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.69	Figure 10.17.12	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.70+73	Figure 10.17.11	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.71	Figure 10.17.13	*'asreyya*	flowerpot	Sinai	?	flowerpot rim
13.72	Figure 10.17.10	*'asreyya*	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	*'bila*?	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	*'asreyya*	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	*'bila*?	jug?	Sinai	Egypt?	body; whitish fabric
13.204	Figure 10.15.11	*'bila*?	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 review-

ing 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]).

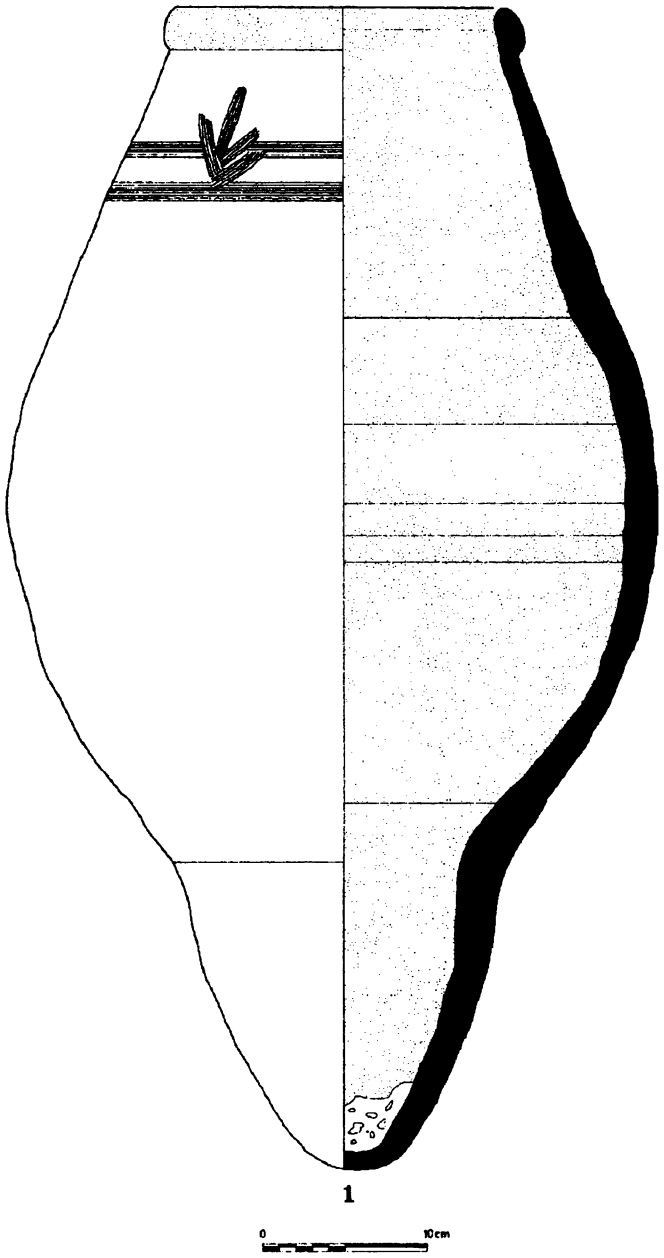


Figure 10.2 *Zīr* water jar from the Fayum.

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

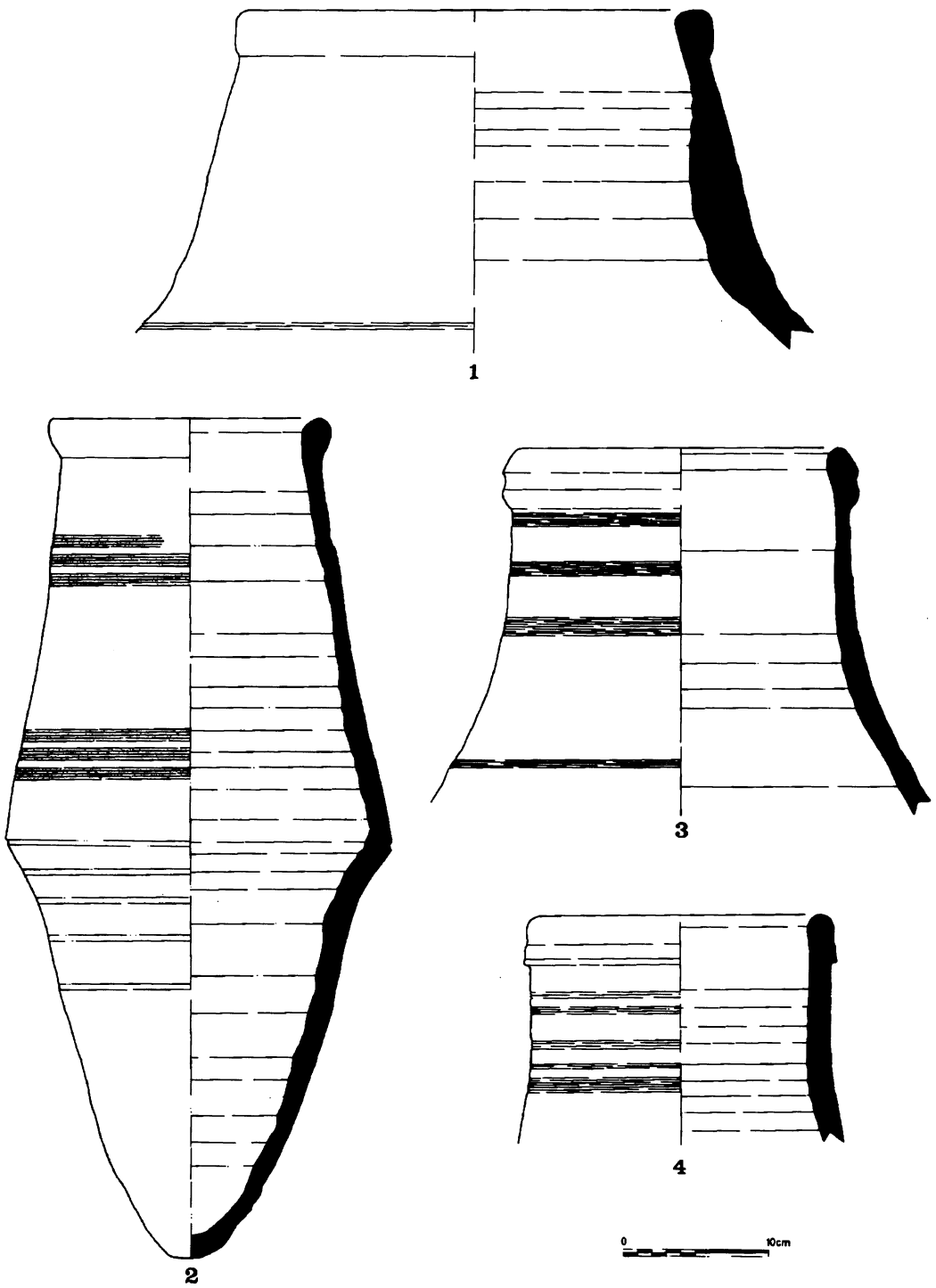


Figure 10.3 *Zīr* water jars: 1. From Badrashein; 2. From Minouf; 3-4. From Abu Raguan

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

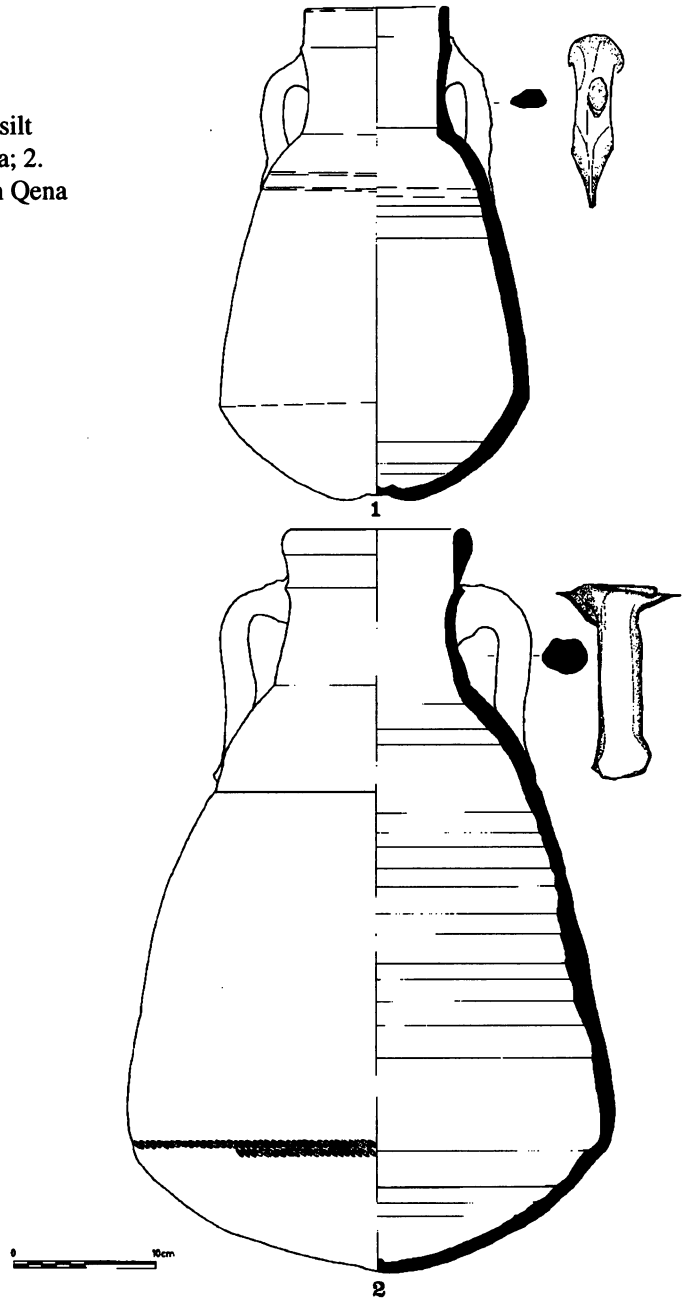


Figure 10.4 Ballās jars: 1. Imitation *ballās* jar of Nile silt from Samannûd in the Delta; 2. *Ballās* jar of marl clay from Qena region of Upper Egypt.

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.

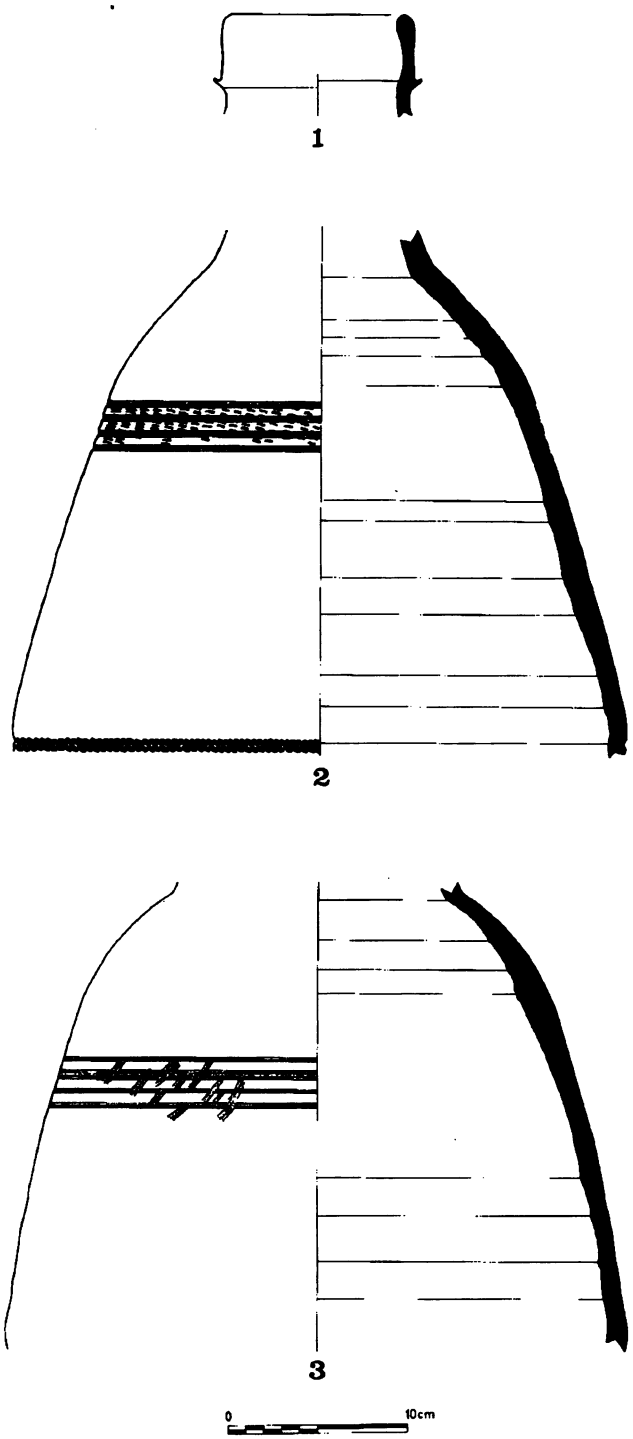


Figure 10.5 Ballās jar pieces of orange marl clay collected in the Gerzeh area: 1. Rim; 2-3. Neck, shoulder, and body. Note incised decoration on body, 2 and 3, and rope impressions on 2.

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,

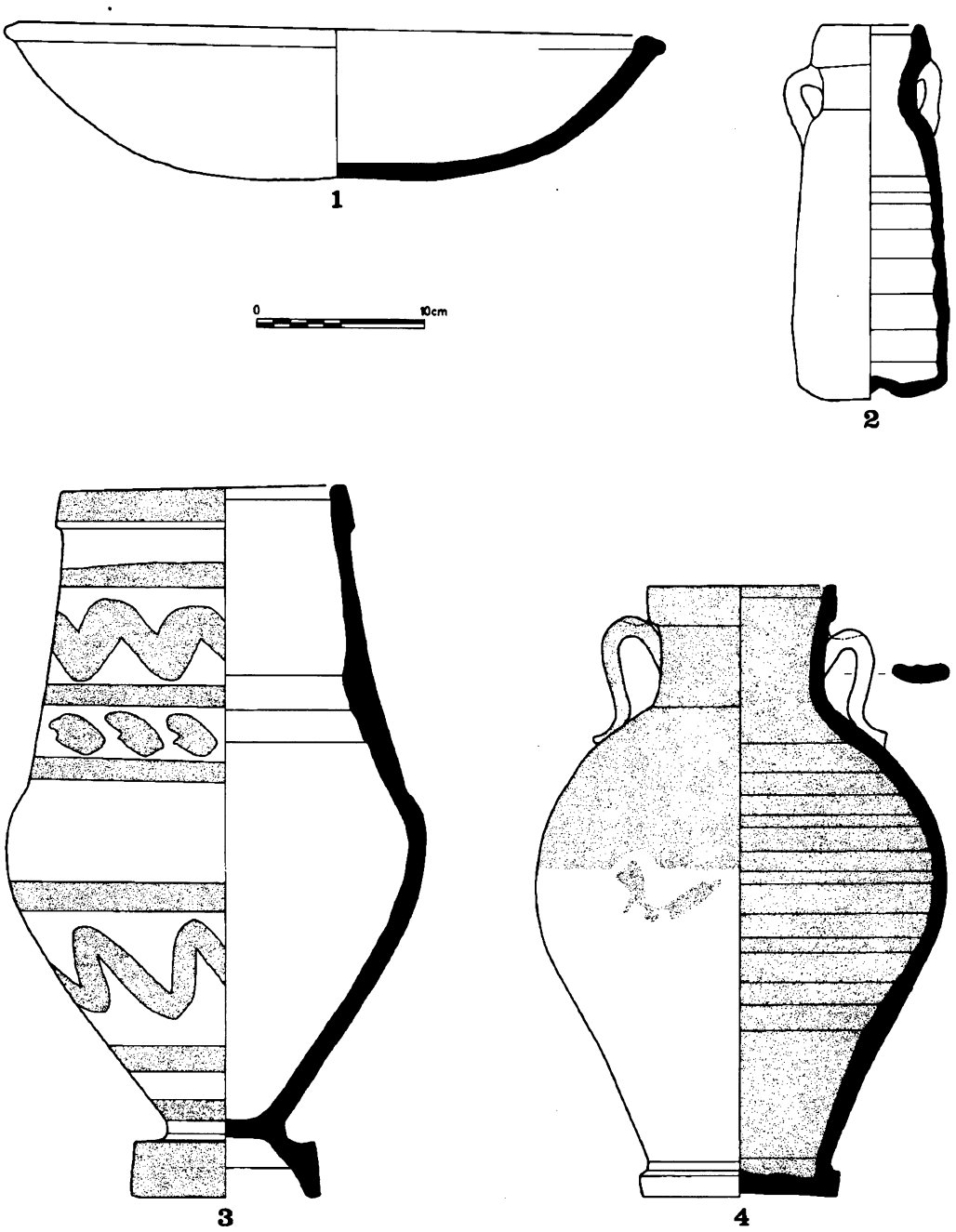


Figure 10.6 1. *Sahfa* bowl from Minya; 2. Molasses jar purchased at Giza; 3. "Small *zīr*" from Abu Raguan; 4. *Zarawiyya semna* jar from Samannûd.

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.

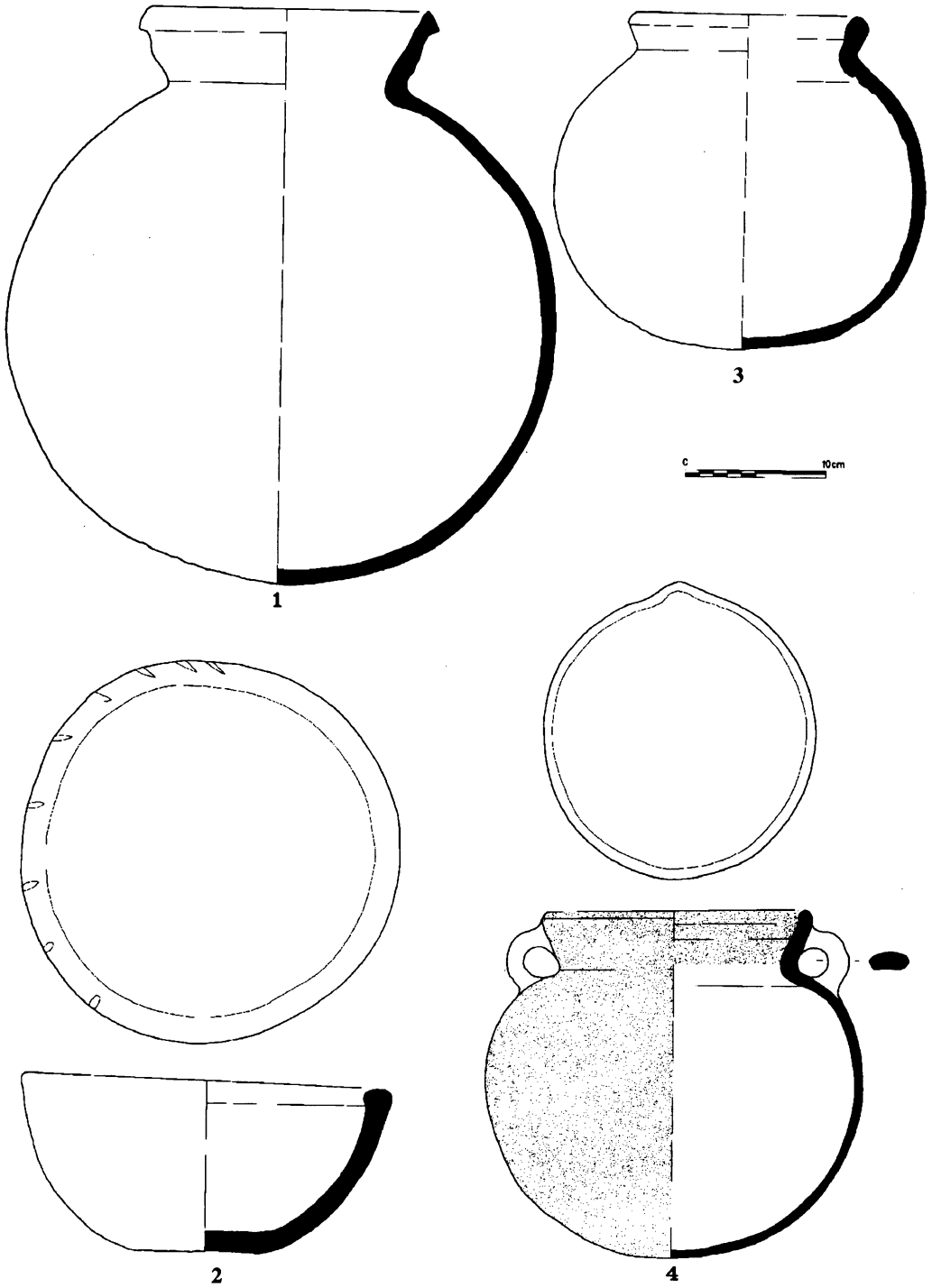


Figure 10.7 1. *Bokla* jar from Fayum; 2. *Hanāb* jar from the Fayum; 3. *Sahfa* jar from the Fayum; 4. *Qist* pitcher from Minya.

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

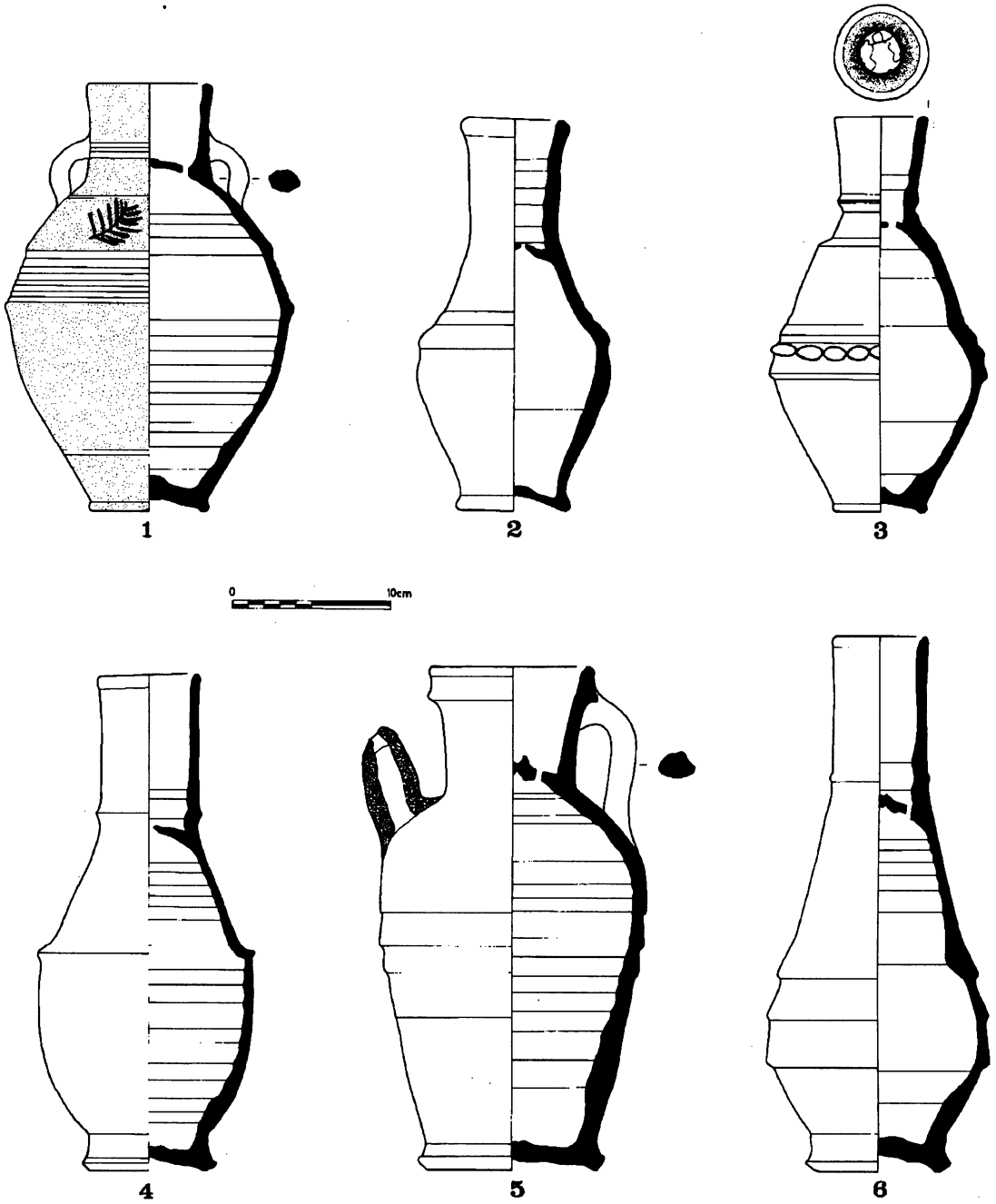


Figure 10.8 1. *Ba'oša* jug from Samannûd; 2. *'Olla* jug from Minouf; 3. *'Olla* jug from Samannûd; 4. *'Olla* jug from Cairo; 5. *Abrī'* pitcher from Cairo; 6. *'Olla* jug from Cairo.

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

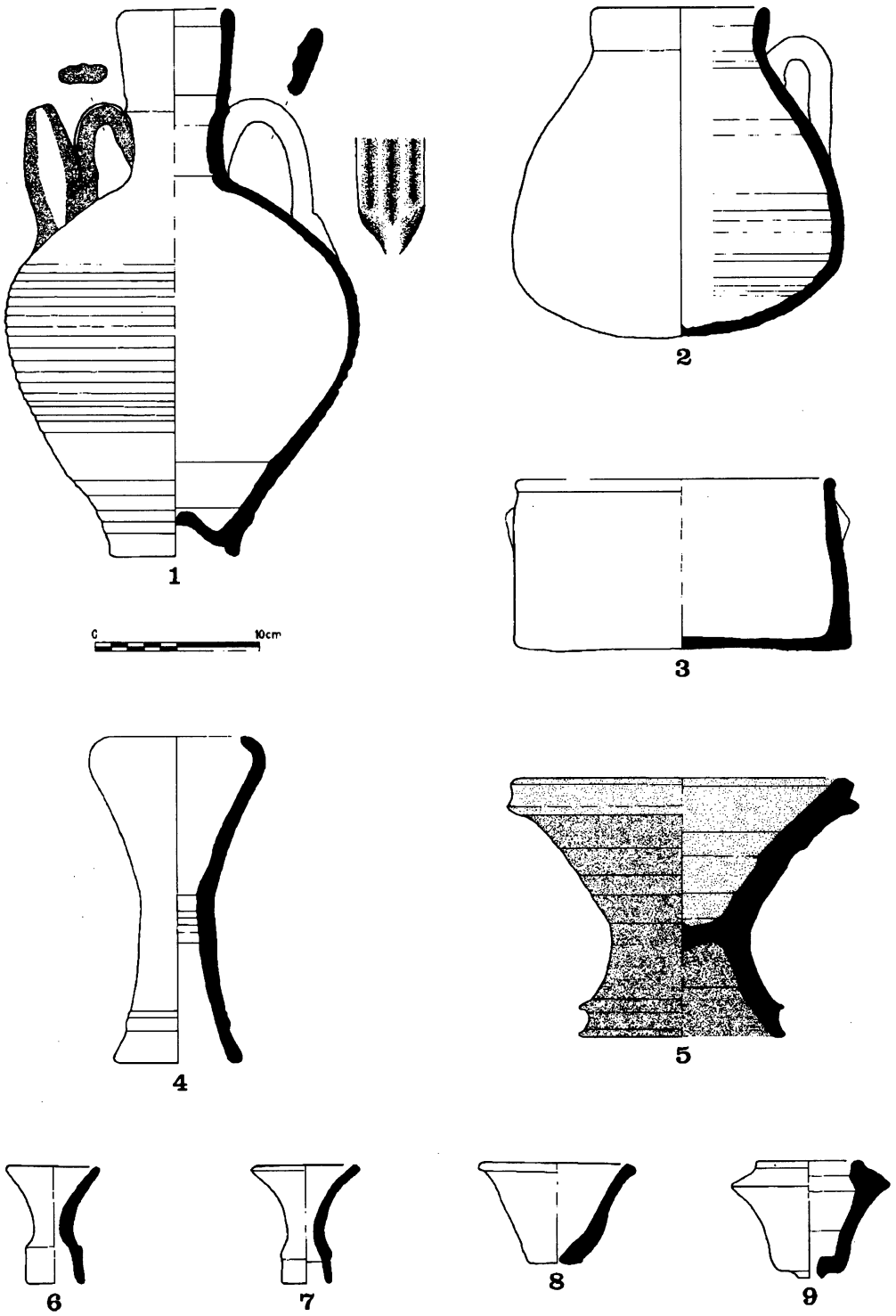


Figure 10.9 1. *Abrī'* pitcher made in Sharqiya (?); 2. *Būša* cookpot made in Sharqiya; 3. *Berām* casserole cookpot made in Alexandria (?); 4. *Tabla* drum made in Minouf; 5. *Bahūr/man'ad* brazier made in Samannûd; 6. *Hağar* pipehead made in Samannûd; 7. *Hağar* pipehead made in Cairo; 8-9. *Hağar* pipeheads made in Samannûd.

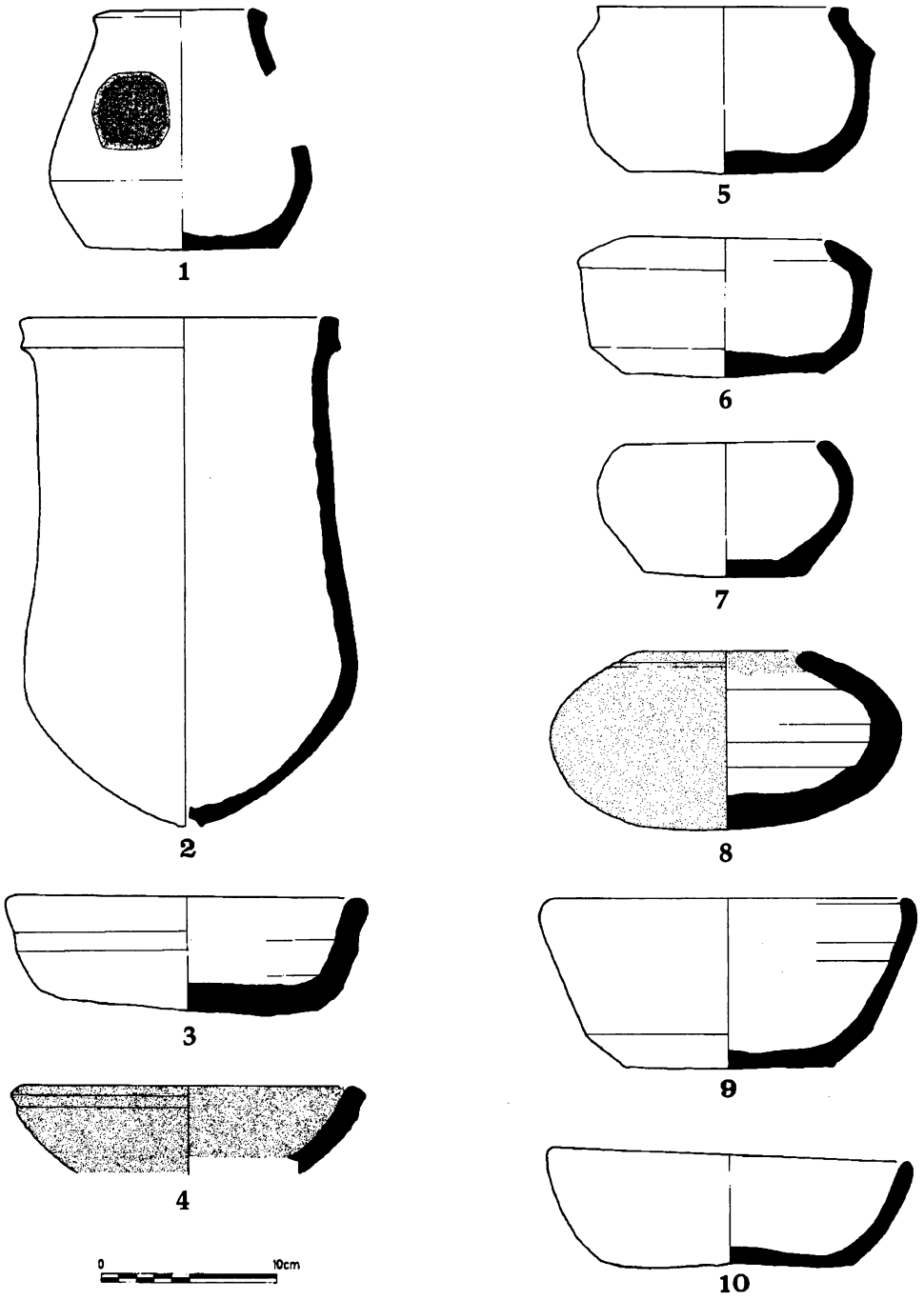


Figure 10.10 1. Small animal refuge/feeder from Samannûd; 2. *Gadūs* pigeon pot from Samannûd; 3. *Taba'* bowl from Minya; 4. Bowl from the Fayum; 5-6. *Misa'a* bowls from Samannûd; 7. *Misa'a* bowl from Minouf; 8. *Misa'a* bowl from the Fayum; 9. Bowl from Samannûd; 10. *Misa'a* bowl from Minouf.

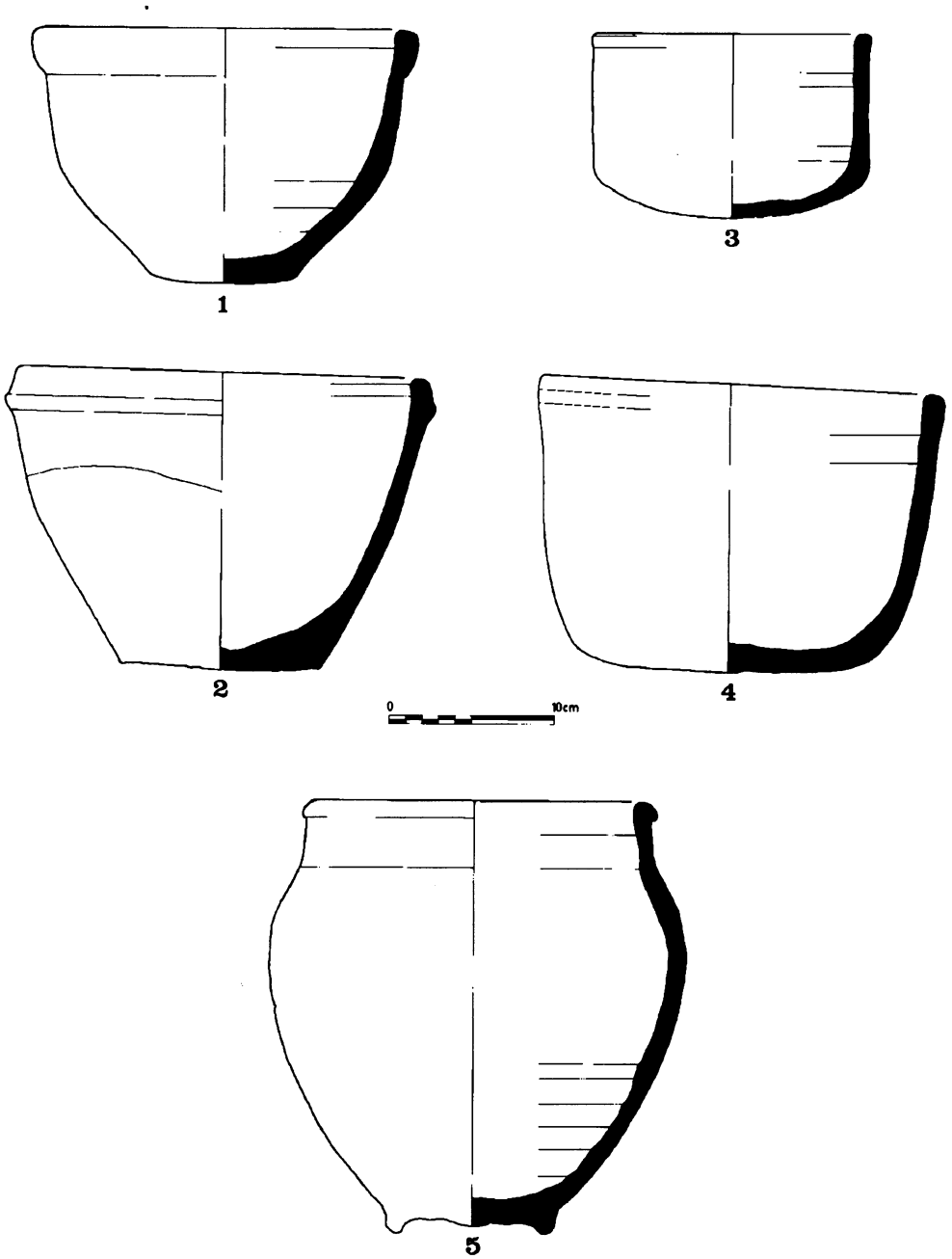


Figure 10.11 1. *Hōd* bowl from Minouf; 2. Bowl from Samannûd; 3. *Berām* bowl from Minouf; 4. A *šalya* bowl from the Fayum; 5. *Hōd* bowl from Abu Raguan (?)

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.

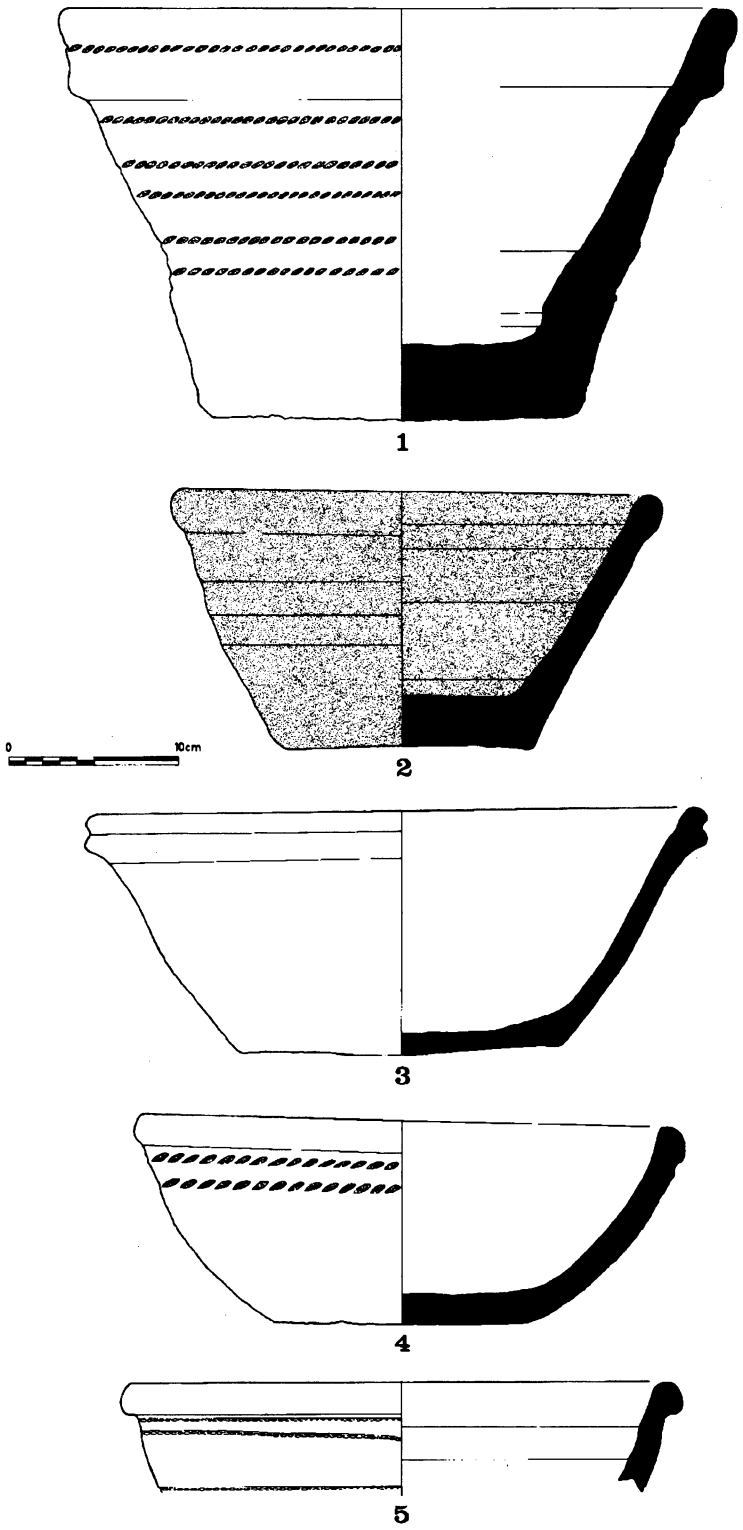


Figure 10.12 1. *Māǧūr* bowl from Badrashein; 2. *Māǧūr* bowl from Minya; 3. A *šalya* bowl from Minouf; 4. *Tāǧen* bowl from Abu Raguan; 5. Bowl from Abu Raguan.

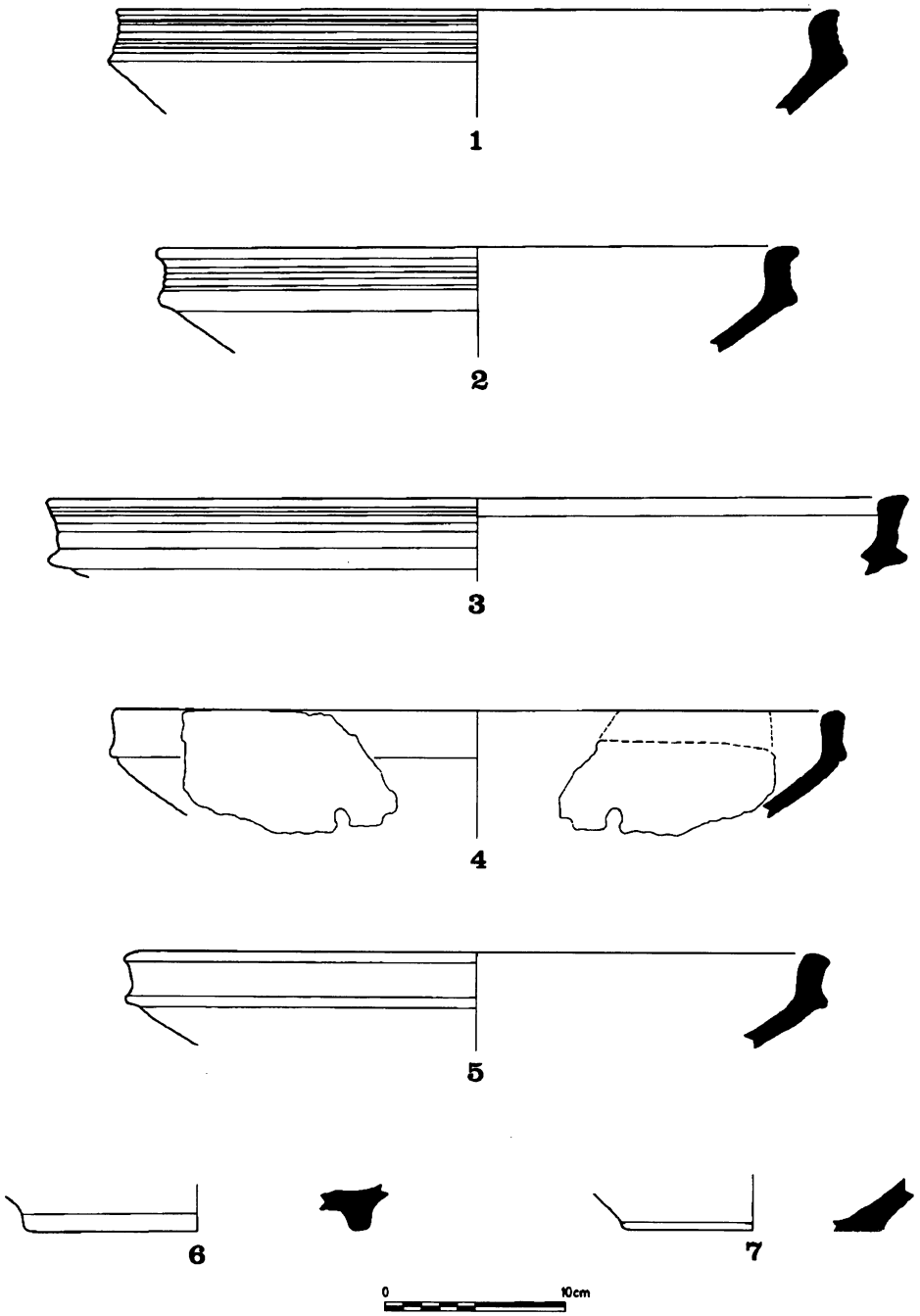


Figure 10.13 Large, dark grey bowl fragments from the Sinai Bedouin camp.

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.

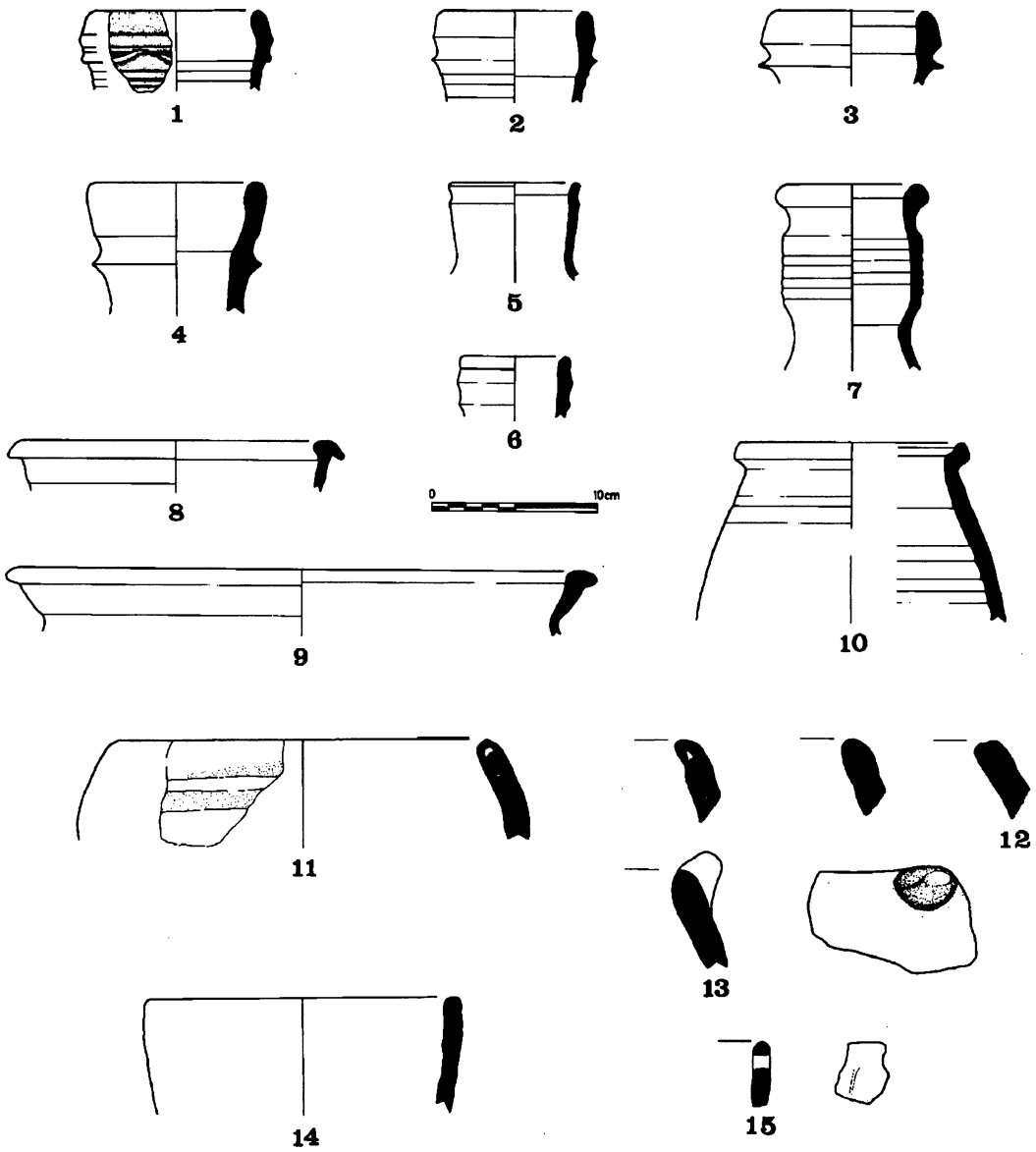


Figure 10.14 Fragments of jars and jugs (1-7), bowls (8-9), and cookpots (10-15). All were collected from the Sinai Bedouin camp except no. 4, which came from a roadside near Gerzeh.

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 (*narǧīla* or *šīša*) bowls or heads (*haǧar*, plural *heǧāra*) 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,

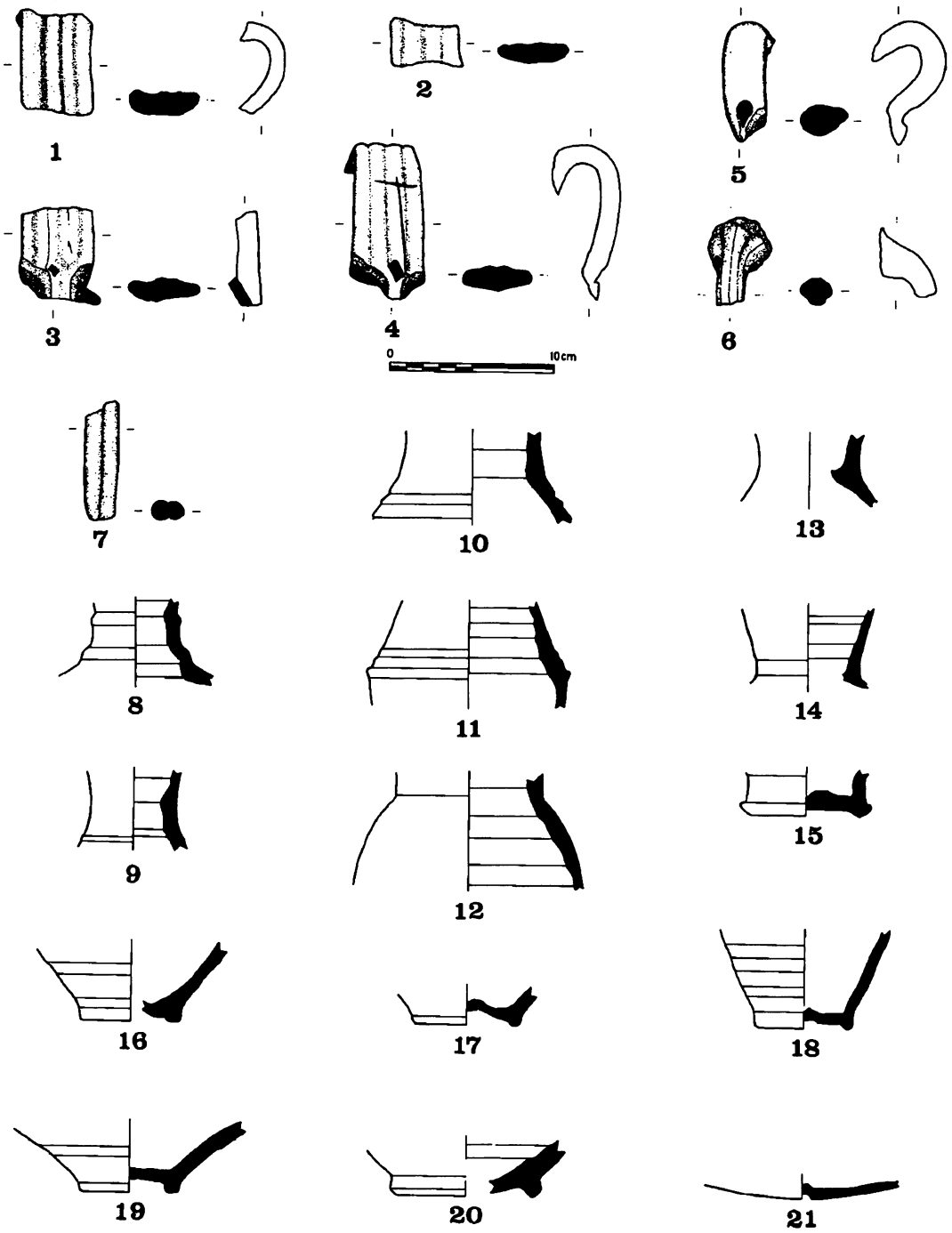


Figure 10.15 Probable *abrī'* pitcher and *'olla* jug handles, necks, shoulders, and bases.

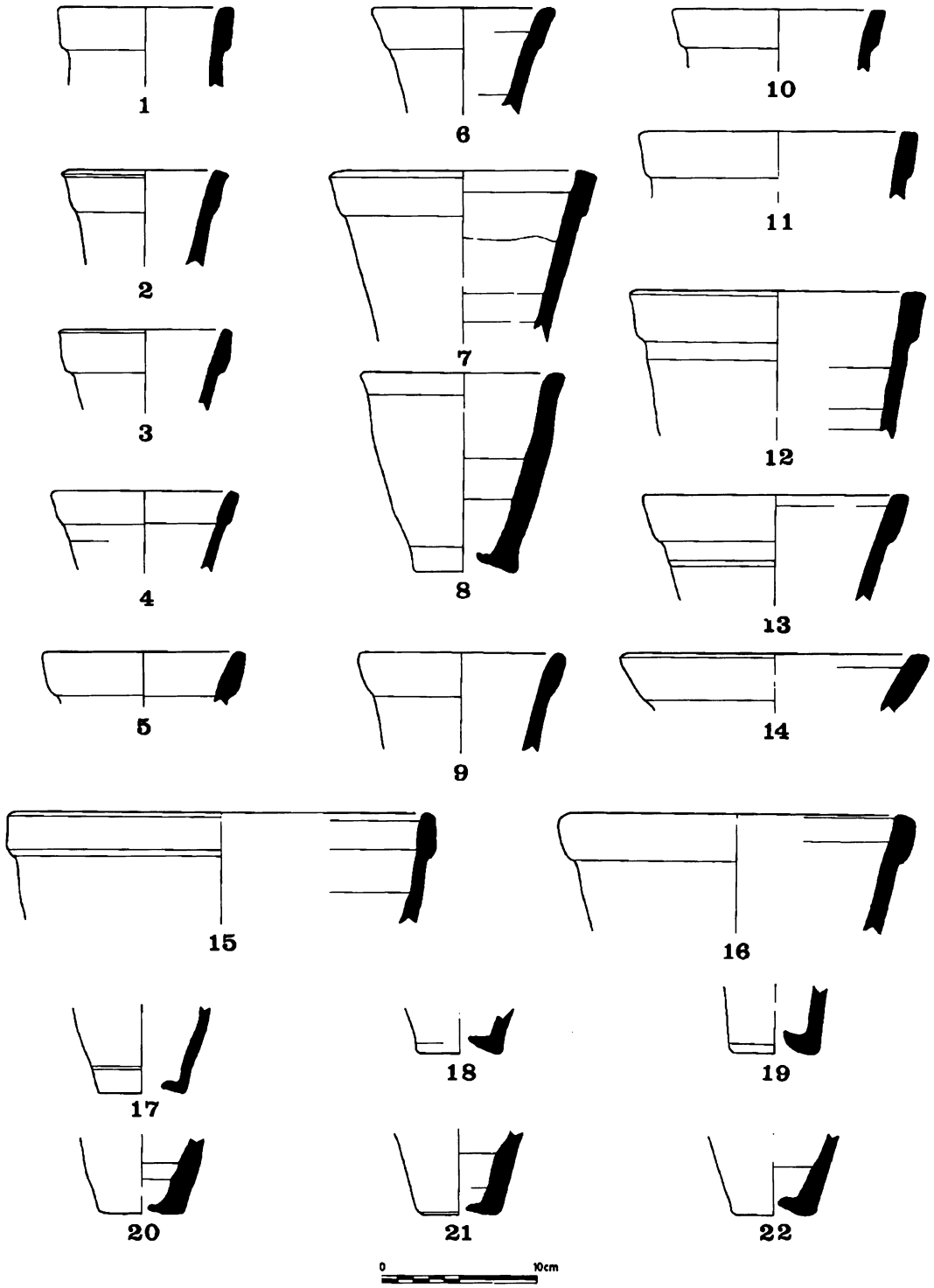


Figure 10.16 Flowerpot rims, bases, and profiles.

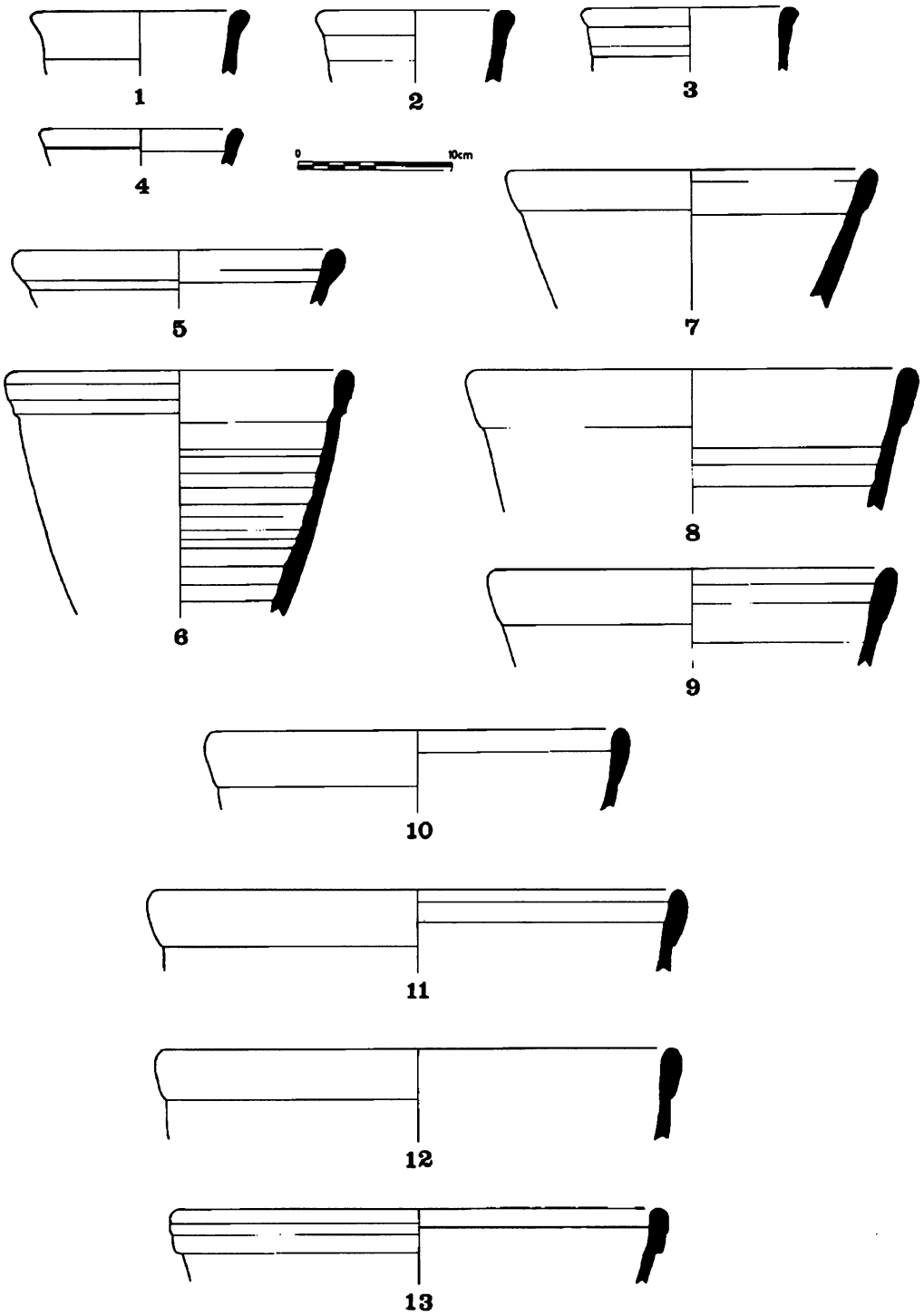


Figure 10.17 Flowerpot rims collected from the Sinai Bedouin camp.

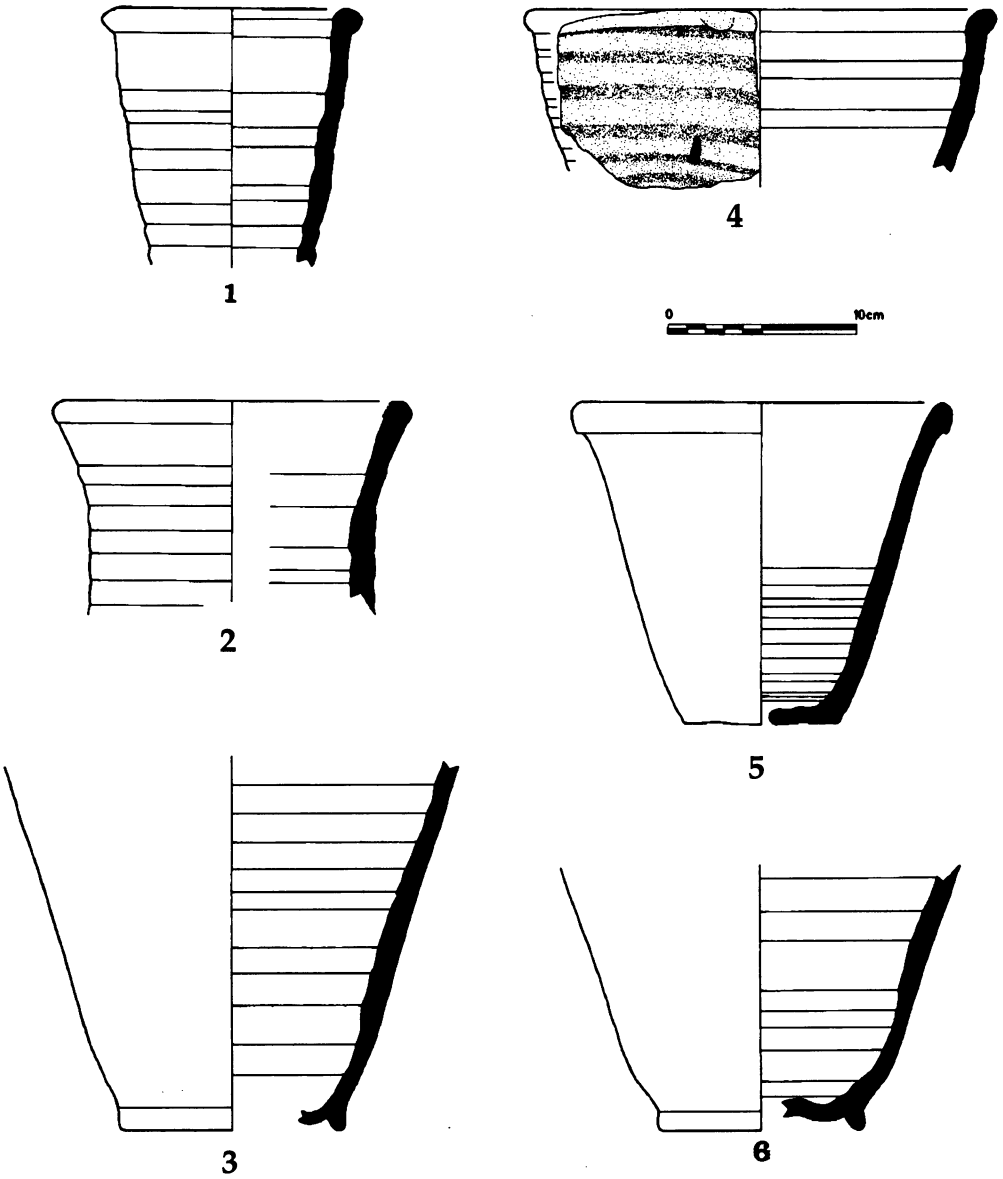


Figure 10.18 Flowerpot rims, bases, and a profile collected from the Sinai Bedouin camp.

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
abrī'	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
balīs	jar	10.4-5		X	X				X	X	X	X	X	sell mollasses
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				
gadīs	jar	10.10.2	X				X							pigeon house
hanāb	globular jar	10.7.3		X		X			X	X	X			
haǧar	pipehead	10.9.6-9	X					X						smoke tobacco
hōd	bowl	10.11.1,5		X		X								
maǧūr	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
tīǧen	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		ANON
Soft Fired	Hard Fired	Coarse	Chaff	Orange	Greyish	Powder	Fine Buff	Orange-Brown Sandy	Hard Sandy	Handmade Beds	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	Sand-Made Beds	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..
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.:
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.:
	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.!
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.!
		W-31	W-17	W-55			13.13	5.9		*T=4*	13.61		*T=4*		*T=4*		13.109	13.119	13.'
	T=5	W-52	W-28	W-57	*T=5*		13.14	7.12			13.67						13.121		13.'
		W-68	W-29	W-58			13.81	13.34?			13.68							*T=6*	13.!
		W-70	4.1?	W-59			13.200	15.1			13.69						*T=7*		13.:
		W-75	5.10	W-61			13.204	15.2			13.70								13.:
		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	PoreCaCO3			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	PoreCaCO3			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	Silt80 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 Ragaan	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	06	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			xxCalche					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			xxCalche					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-76	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	Hughada	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	Manufacture	Fabric	Paste Type	Inclusions	Inclusions:	Quartz	Qtz&Fold	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
10.85	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	PoreCaCO3			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	PoreCaCO3			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.Cre&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-CreSand	xx						x		xx	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	Cre-MedSand	xx				H		x	x		xx	R		x		high
13.011	Sinai	NM	Silt98 Marl02	26	Cre-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
13.017	Sinai	SK	Clay-Silt	65	V.Cre-CreSand	xx						x			xx			x		high
13.019	Sinai	SS	Silt	33	V.Cre-CreSand	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	49	Cre-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	55	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	39	Cre&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	39	Cre-MedSand	xx						x			xx	x				low
13.040	Sinai	SS	Silt	45	Cre-MedSand&CreSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-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.Cre&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	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	69	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.112	Sinai	SS	Clay-Silt	45	Cre-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	65	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	Silt90 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
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	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xx Mudstone	M		x		x	xx Powder	x		x		high
15.02	Qanatar	NM	Silt90 Marl20	33	Crs-Med&V.FineSand	xx	x		xx MudLimestone	M		x		R	xx Sparite,Powder			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	Bedrashein	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	Greg	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.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	PoreCaCO3			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	PoreCaCO3			low
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-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.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-66	Fayum	N	Mud	27	V.FineSand	x			xxCalicite					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			xxCalicite					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-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
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	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
5.10	Cairo	N	Silt	61	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
10.35	Gerzeh	N	Silt	05	MedSand	xx		x		M	A				xx Powder	x				low
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
14.03	Abu Raguan	N	Silty Mud	28	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
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.CreSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			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

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	PoreaCaCO3	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
5.08	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&CrsSlt	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
13.105	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	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

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			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	Cre-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	Cre-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	Cre-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	Cre-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CreSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Cre-CreSand	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	CreSand	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.Cre&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.Cre&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 Calcite					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xx Calcite					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CreSand	R			xx MudLimestone			x			xx Sparite,Micrite	R				med
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CreSand				xx MudLimestone			x			xx Sparite,Micrite	R	PoreCaCO3			low
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CreSand				xx MudLimestone			x			xx Sparite,Micrite	x				low
11.09	Gerzeh	M	Mud Marl	53	Gran				xx MudLimestone			x			xx Sparite,Micrite	x	PoreCaCO3			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.CreSand	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	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-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

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
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	Cre-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	Cre-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	Cre-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	Cre-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CreSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Cre-CreSand	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	CreSand	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-09	Samannud	N	Mud	38	V.Cre&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.Cre&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-68	Fayum	N	Mud	27	V.FineSand	x			xxCalche					xx	xx Micrite					med
W-69	Fayum	N	Mud	22	V.FineSand	x			xxCalche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
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
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.CreSand	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	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-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

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	Greg	Organic Debris	Carbonate Type	Ca-Oxide Coated Pores	Burned Carbonate	Man-Made* Fragments	Over Fired	Magnetic Sed. Type
15.02	Qanatar	NM	Silt90 Marl20	33	Cre-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
13.011	Sinai	NM	Silt98 Marl02	26	Cre-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
13.083	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	Cre-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.CreSand	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.Cre-CreSand	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
Cre=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 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.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoreeCaCO3			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	PoreeCaCO3			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-66	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.Cre-CreSand	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.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
13.011	Sinai	NM	Silt98 Marl02	26	Cre-Med&V.FineSand	xx	x	x	xMudstone	M,H	A	x			R Micrite					low
5.06	Cairo	NM	Silt10 Marl90	30	Cre&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				med
9.03	Gerzeh	NM	Silt75 Marl25	30	Cre-Med&V.FineSand	xx			xxMudstone	M	A,P	xx			xx Micrite	x				med
W-51	Cairo	NM	Silt75 Marl25	31	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoreeCaCO3	x		med
15.02	Qanatar	NM	Silt80 Marl20	33	Cre-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-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	Cre&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.Cre&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.Cre&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.Cre-CreSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.037	Sinai	SS	Silt	38	Cre&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.039	Sinai	SS	Clay-Silt	38	Cre-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x	x		xx	x				med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-MedSand	xx						x			xx			x		low
13.122	Sinai	SS	Clay-Silt	42	Cre-MedSand	xx						x			xx	x		x		low
13.040	Sinai	SS	Silt	45	Cre-MedSand&CreSilt	xx	x	R		M	A	xx			xx Micrite					med
13.100	Sinai	SS	Clay-Silt	45	CreSand	xx						x			xx	x		x		med
13.112	Sinai	SS	Clay-Silt	45	Cre-MedSand	xx						x			xx	x		x		low
13.118	Sinai	SS	Clay-Silt	45	MedSand	xx									xx					med
13.067	Sinai	SS	Clay-Silt	46	Cre-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	CreSand	xx				M	A	x			xx	x		x		high
13.069	Sinai	SS	Clay-Silt	53	CreSand	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.

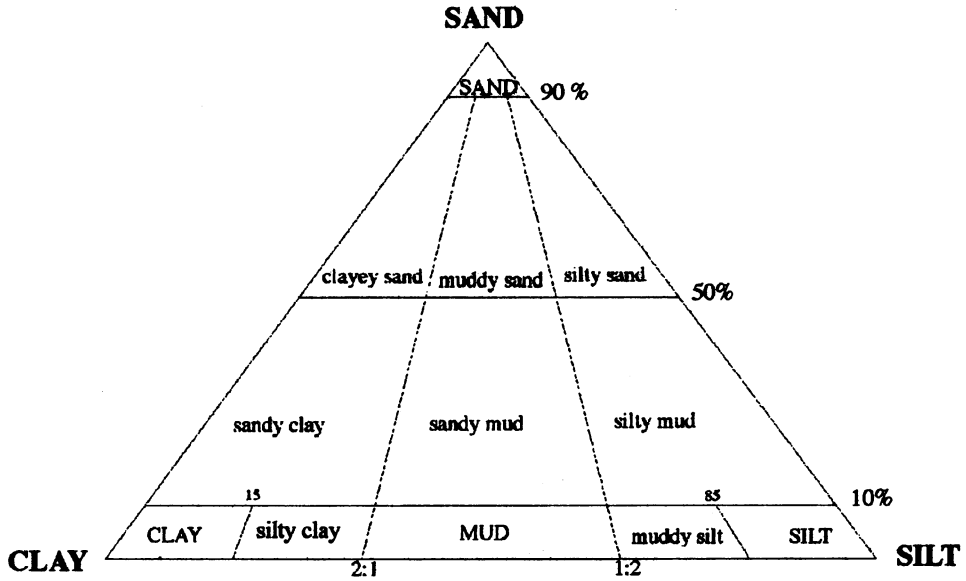
The presence of angular mineral or rock grains in a clay body often indicates a nearby clay or rock source, since the grain edges have not been blunted by extensive transportation or weathering. Alternatively, angular grains in a ceramic paste may reflect the addition of crushed temper by the potter. 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.

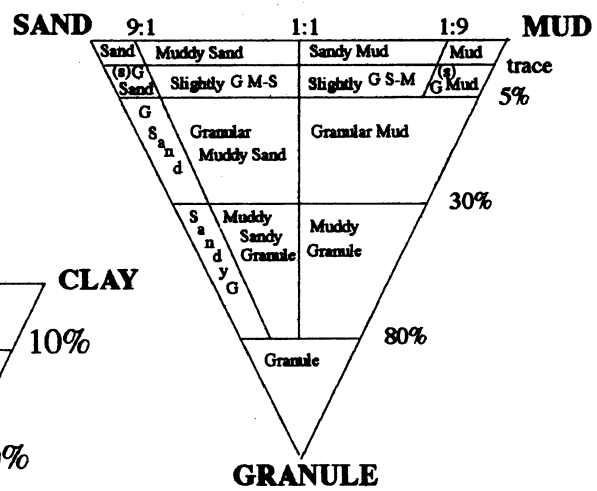
A total of 50 EMPP samples contained rock fragment inclusions derived from either igneous or sedimentary rocks (table 10.16). Rock fragments, by definition, consist of one or more minerals; they too can aid in sourcing clays and tempers. Sedimentary rock fragments occurred most frequently in the EMPP 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

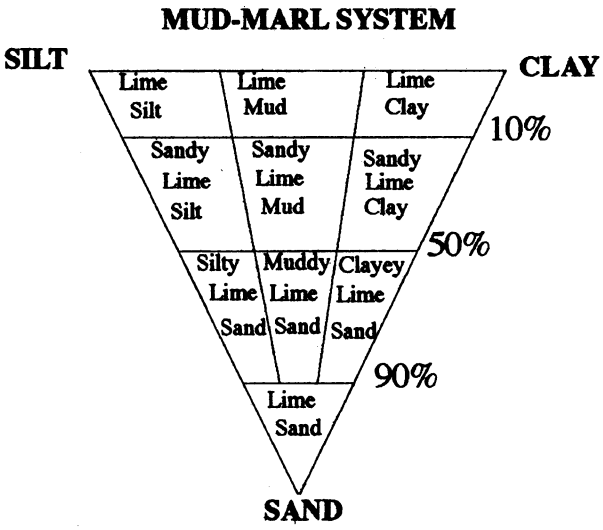
GRAIN-SIZE NOMENCLATURE FOR CERAMIC TEXTURES



SAND-CLAY-SILT SYSTEM



GRANULE-SAND-MUD SYSTEM



MUD-MARL SYSTEM

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 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-05	Fayum	N	Silt	18	V.CreSand	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.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-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-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	Cre&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		low
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-75	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	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
14.03	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
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
W-51	Cairo	NM	Silt75 Marl25	31	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoreCaCO3	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	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
13.011	Sinai	NM	Silt98 Marl02	26	Cre-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.Cre&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	Cre-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.Cre&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	high
13.019	Sinai	SS	Silt	33	V.Cre-CreSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Cre&V.FineSand	xx	x			M	A	x	R		xx Bio-CaCO3,Micrite					low
13.040	Sinai	SS	Silt	45	Cre-MedSand&CreSlt	xx	x	R		M	A	xx			xx Micrite					med
13.027	Sinai	SK	Silt	48	Cre-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	Greg	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-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.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
5.10	Cairo	N	Silt	51	V.Cre-CreSand	xx		R		M	A	x			x	x	x			high
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	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	Cre-MedSand&CreSilt	xx	x	R		M	A	xx			xx Micrite					med
W-62	Minouf	N	Silt	30	Cre&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.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-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-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-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-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.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
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
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
5.15	Cairo	N	Silt	10	CreSand	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	CreSand	xx		x				x	x	xx	xx					med
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
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.CreSand	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	Cre-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	Cre-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.Cre&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	Cre-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	SK	Silt	48	Cre-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.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
5.15	Cairo	N	Silt	10	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					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
13.111	Sinai	SS	Clay-Silt	68	MedSand	xx			R IRF**			x	x		xx	x		x		low
13.059	Sinai	SS	Silt	58	Cre-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	xLimestone		A	x	xx	xx	xx Bio-Sparite					med
W-22	Minya	N	Mud	30	MedSand	x			xLimestone			R		xx	xx Limestone					med
W-52	Minouf	N	Silt	20	Gran-V.CreSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					med
13.011	Sinai	NM	Silt95 Marl02	26	Cre-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
13.008	Sinai	SS	Clay- Silt	27	MedSand	xx			xQuartzSandstone	H	P	x			xx Sparite	x				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-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,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	PoreseCaCO3	x		med
W-72	Cairo	NM	Silt50 Marl50	25	Gran&Med&V.FineSand	xx			xxLimeMudstone	M	A				xx Sparite,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
13.063	Sinai	SM	Silt55 Marl45	65	Med&V.FineSand	xx	x	x	xxLimeMudstone	M,H	A	x			xx Micrite	R				med
1.04	Minya	NM	Silt05 Marl95	70	Med-FineSand	x	x	x	xxMudLimestone	M	A	xx			xx Sparite,Micrite	x				med
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	PoreseCaCO3			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	PoreseCaCO3			low
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	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
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
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
15.02	Qanatar	NM	Silt80 Marl20	33	Cre-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
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
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xxMudLimestone	M	P	x			xx Micrite					low
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				low
1.07	Minya	NM	Silt60 Marl40	41	Med&V.FineSand	xx	x		xxMudstone	M		x			xx Sparite,Micrite	R				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
13.014	Egypt	NM	Silt60 Marl40	35	Med&Fine-V.FineSand	xx	x		xxMudstone	M,H	A	xx			xx 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
15.01	Qanatar	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
13.002	Sinai	SM	Silt60 Marl40	50	Med&V.FineSand	xx		R	xxMudstone***	M,H	A,P	x			x Micrite					low
13.027	Sinai	SK	Silt	48	Cre-MedSand	xx	x	x	xxSiltstone	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 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
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	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-20	Minya	N	Silt	43	Gran-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		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-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		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
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			x		high
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
16.01	Badrashein	N	Silt	40	Gran-V.CreSand	xx		x		M,H	A	xx	x	R	xx Powder	x	x			high
W-50	Cairo	NM	Silt75 Marl25	46	Cre&Fine-V.FineSand	xx			xxLimeMudstone	M	A,P	x		R	xx Micrite,Powder	x				med
15.02	Qanatar	NM	Silt80 Marl20	33	Cre-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	CreSand	xx		x				R	x	x	xx	x	x	x		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	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	CreSand	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	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					high
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					high
14.06	Abu Raguan	N	Silt	10	V.CreSand	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.Cre&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.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-69	Fayum	N	Mud	22	V.FineSand	x			xxCaliche					xx	xx Micrite					med
W-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		med
13.006	Sinai	SK	Clay-Silt	30	Gran-CreSand	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
14.06	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
13.011	Sinai	NM	Silt96 Marl02	26	Cre-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.CreSand	xx	x	x		M	A	x	xx		x					low
W-14	Samannud	N	Sandy Silt	65	V.CreSand	xx	x	x		M	A	xx	R		x	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-76	Badrashein	N	Silt	10	Gran	xx	x	x		M		x	xx	x	x			Al-melted		med
5.10	Cairo	N	Silt	51	V.Cre-CreSand	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	Minoul	N	Silt	20	Gran-V.CreSand	xx		x	xLimestone	M		x	xx	x	x Bio-CaCo3,Micrite					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
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
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.Cre-CreSand	xx	x	x		M		xx	x		x Powder	R		x		low
W-54	Minoul	N	Silt	10	MedSand	x		x		M,H	A,P	x	x	x	x Powder			x		med
W-61	Minoul	N	Silt	05	MedSand	x		x		M,H	A		R	xx	x Powder					low
5.15	Cairo	N	Silt	10	CreSand	xx		x	R Granite(red)	M	A			x	x Powder					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
15.03	Qanater	N	Silt	09	MedSand	xx		x		M	A	x			x Powder					med
13.059	Sinai	SS	Silt	58	Cre-MedSand	xx		x	R Siltstone	M,H	A,P	xx			x Powder	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-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
14.02	Abu Raguan	N	Silt	20	CreSand	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.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
13.039	Sinai	SS	Clay-Silt	38	Cre-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	46	Cre-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	Cre-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CreSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Cre-CreSand	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	PoreeCaCO3	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.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoreeCaCO3			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	PoreeCaCO3			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	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
7.12	Hurghada	NM	Silt85 Marl15	35	Cre-FineSand	xx			xxMudLimestone	M		x			xx Sparite,Micrite					high
13.050	Egypt	NM	Silt10 Marl90	70	V.CreMed&V.FineSand	xx	x	x	xxLimeMudstone	M	A	x			xx Sparite,Micrite	x				med
15.02	Qanatar	NM	Silt80 Marl20	33	Cre-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.CreSand	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
Cre=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	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-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-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-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-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-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-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	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-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
W-73	Cairo	N	Silt	18	Cre-FineSand	R		x		M	P	x	R		xx Powder			x		med
5.13	Cairo	N	Silt	28	Cre-MedSand	xx	x					x	x	R	xx Powder			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
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	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoreCaCO3	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	Cre-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.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
13.038	Sinai	SS	Clay-Silt	52	MedSand	xx						x			xx Bio-CaCO3		Bio-CaCO3	x		low
13.059	Sinai	SS	Silt	58	Cre-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	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	Cre-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	Cre-MedSand	xx						x			xx	x		x		low
13.006	Sinai	SK	Clay-Silt	30	Gran-CreSand	xx						x		xx	xx	x	x	x		high
13.017	Sinai	SK	Clay-Silt	65	V.Cre-CreSand	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	Cre-MedSand	xx	x	x	xxSiltstone	M,H	A,P	x			xx (CaO&CaCO3)			x		low
13.080	Sinai	SK	Clay-Silt	65	CreSand	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.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoreeCaCO3			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	PoreeCaCO3			low
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CreSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				med
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-08	Samannud	N	Mud	36	V.Cre&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		high
W-17	Samannud	N	Silt	25	Cre&V.FineSand	xx	x	x		M	A	x	x	R	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-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.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		high
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		high
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	x			high
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
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF/	M	A	x	R	x	xx Powder					high
14.06	Abu Raguan	N	Silt	10	V.CreSand	xx		x		M	A	xx	xx	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-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-09	Samannud	N	Silt	18	V.CreSand	xx	x	x		M	A	x	xx		x					low
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-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	Cre&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	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-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-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	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	19	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-71	Fayum	N	Mud	38	Cre&FineSand	xx	x					x		xx	xx Powder					med
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
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
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					med
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				med
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	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	Cre-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	Cre-Med&V.FineSand	xx	x		xxMudLimestone	M		x		R	xx Sparite,Powder			x		high
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	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	Cre-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	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	PoreCaCO3	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
5.08	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
9.03	Gerzeh	NM	Silt75 Marl25	30	Cre-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.Cre&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
13.083	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.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
13.059	Sinai	SS	Silt	58	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.071	Sinai	SS	Clay-Silt	52	CreSand	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.Cre-CreSand	xx	x			M	A	xx	x		xx	x	x		x	low
13.037	Sinai	SS	Silt	38	Cre&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	Cre-MedSand	xx						x			xx	x				low
13.042	Sinai	SS	Clay-Silt	40	Cre-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	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	Cre-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	Cre-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	Cre-MedSand&CreSilt	xx	x	R		M	A	xx			xx Micrite					med
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
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.100	Sinai	SS	Clay-Silt	45	CreSand	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	PoreCaCO3	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	PoreCaCO3			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	PoreCaCO3			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	Qanater	NM	Silt	20	Med-FineSand	xx	x		xxMudstone	M		x		x	xx Powder	x		x		high
19.02	Qanater	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: Model 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	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-29	Samannud	N	Silt	15	CreSand	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	Cre-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	Cre-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	Silt50 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.Cre&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	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
13.037	Sinai	SS	Silt	38	Cre&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	Cre-MedSand	xx						x			xx	x				low
13.040	Sinai	SS	Silt	45	Cre-MedSand&CreSilt	xx	x	R		M	A	xx			xx Micrite					med
13.042	Sinai	SS	Clay-Silt	40	Cre-MedSand	xx						x			xx	x				low
13.047	Sinai	SS	Clay-Silt	40	Cre-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	Cre-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	Cre-MedSand	xx					P	x			xx	x				high
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		med
13.069	Sinai	SS	Clay-Silt	53	CreSand	xx						x			xx			x		med
13.070	Sinai	SS	Clay-Silt	60	CreSand	xx						x			xx	R				med
13.071	Sinai	SS	Clay-Silt	52	CreSand	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	CreSand	xx						x			xx	x		x		med
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		low
13.107	Sinai	SS	Clay-Silt	42	Cre-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	Cre-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
5c: Nile Silt Very Coarse																				
W-21	Minya	N	Silt	55	CreSand	xx		x				R	x	x	xx	x	x	x		4.8
W-64	Fayum	N	Silt	60	V.CreSand	xx		R		M	A	x	xx	xx	xx	x	x	x		6.6
5c: Nile Silt Chaff																				
14.06	Abu Raguan	N	Silt	10	V.CreSand	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	Cre&FineSand	xx	x					x		xx	xx Powder					3.4
W-19	Minya	N	Mud	40	V.Cre&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
5c: Nile Silt Coarse																				
14.05	Abu Raguan	N	Silt	12	V.CreSand	xx	x	x		M	A	R	R	R	R	x				2.9
14.02	Abu Raguan	N	Silt	20	CreSand	xx		x				x	x	xx	xx					2.9
14.09	Abu Raguan	N	V.Sandy Silt	34	V.Cre-CreSand	xx	x			M	A	x	xx	xx	x Powder	R		x		2.9
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					3.8
14.03	Abu Raguan	N	Silty Mud	26	V.CreSand	xx	x		R Granite&IRF#	M	A	x	R	x	xx Powder					7.7
W-29	Abu Raguan	N	Silt	61	V.CreSand	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	Cre-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	Cre-MedSand	xx	x					x	x	R	xx Powder			x		5.0
5.10	Cairo	N	Silt	51	V.Cre-CreSand	xx		R		M	A	x			x	x	x			12.4
W-68	Fayum	N	Silt	18	V.CreSand	xx	R	x		M	A		x	R	xx Powder	x		x		3.5
W-70	Fayum	N	Silt	40	CreSand	xx	x	x		M	A	R	x	x	xx Powder	x	x	x		5.2
W-62	Minouf	N	Silt	30	Cre&V.FineSand	xx	x	x		M	A	x			xx Powder		x	x		1.4
W-52	Minouf	N	Silt	20	Gran-V.CreSand	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-CreSand	xx		x		M,H	A	x	x	R	xx	R	x	x		3.4
W-14	Samannud	N	Sandy Silt	65	V.CreSand	xx	x	x		M	A	xx	R		x	x	x	x		1.6
W-16	Samannud	N	Silt	11	V.Cre-MedSand	xx	x	x		M,H	A	xx	x		xx Powder	x	x	x		1.6
W-09	Samannud	N	Silt	18	V.CreSand	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.Cre-CreSand	xx	x	x		M		xx	x		x Powder	R		x		2.3
W-10	Samannud	N	Silt	46	CreSand	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	CreSand	xx				M		xx	R	R	xx Powder		x			4.8
4.01	Samannud	N	Silt	15	Cre-FineSand	xx	x					R	R		xx Powder	R	x			6.2
W-17	Samannud	N	Silt	25	Cre&V.FineSand	xx	x	x		M	A	x	x	R	x	x		x		10.9
W-03	Samannud	N	Silt	38	V.Cre&V.FineSand	xx		R		M	A	xx	x		xx Powder	x	x	x	x	17.0
W-01	Samannud	N	Silt	43	Cre-MedSand	xx		R		M	A	x			xx Powder	x		x	x	17.1
13.003	Sinai	SS	Silt	23	V.Cre&V.FineSand	xx	x			M,H	A,P	xx	x		xx	x		x	x	9.8
5c: 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.Cre&V.FineSand	xx	x	x		M,H	A,P	x			xx Powder		x	x		7.3
5c: Nile Silt Fine-grain grainy																				
5.15	Cairo	N	Silt	10	CreSand	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.Cre-CreSand	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 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: Marl Clay Orange																				
11.09	Gerzeh	M	Mud Marl	53	Gran				xxMudLimestone			x			xx Sparite,Micrite	x	PoreeCaCO3			0.8
11.03	Gerzeh	M	Mud Marl	39	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	R	PoreeCaCO3			0.9
11.06	Gerzeh	M	Mud Marl	44	Gran-V.CreSand				xxMudLimestone			x			xx Sparite,Micrite	x				1.3
11.02	Gerzeh	M	Mud Marl	40	Gran-V.CreSand	R			xxMudLimestone			x			xx Sparite,Micrite	R				3.4
5c: Marl Clay Grey																				
W-65	Qena	M	Mud-Marl	62	Gran	R			xxLimeMudstone			R			xx Sparite,Micrite	x				2.5
5c: 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	Cre&V.FineSand	x	x		xxMudLimestone	M		x			xx Sparite,Micrite	R				3.5
5.09	Cairo	NM	Silt80 Marl20	25	V.Cre-Cre&V.FineSand	xx	x		xxMudLimestone	M,H		x			xx Sparite,Micrite	R				3.7
W-51	Cairo	NM	Silt75 Marl25	31	Cre-Med&V.FineSand	xx	x	x	xxLimeMudstone	M		x			xx Micrite,Powder	x	PoreeCaCO3	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	Cre-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	Cre-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
5c: Mixed Grainy																				
W-39	Cairo	NM	Silt95 Marl05	25	V.Cre-CreSand	xx		R	xxMudstone	M,H		x			x Marl Micrite	x				1.0
W-50	Cairo	NM	Silt75 Marl25	46	Cre&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.Cre&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	Cre-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	Cre-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
5c: Sinai, Orange Brown Sandy																				
13.069	Sinai	SS	Clay-Silt	53	CreSand	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	CreSand	xx						x			xx	R				4.4
13.068	Sinai	SS	Clay-Silt	34	CreSand	xx				H	P	x	x		xx	x		x		4.6
13.067	Sinai	SS	Clay-Silt	46	Cre-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	Cre-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	CreSand	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
5c: 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
5c: 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
5c: Black, Mixed Inc.																				
13.106	Sinai	SS	Clay-Silt	40	CreSand	xx						x			xx			x		2.2
13.039	Sinai	SS	Clay-Silt	38	Cre-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	CreSand	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																				
13.058	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
13.059	Sinai	SS	Clay -Silt	55	MedSand	xx						x			xx					0.4
13.077	Sinai	SM	Silt30 Marl70	50	Med&V.FineSand	xx	x		xx MudLimestone	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			xx MudLimestone	M	A				xx Sparite,Micrite	CaCO3 x				1.4
13.027	Sinai	SK	Silt	48	Crs-MedSand	xx	x	x	xx Siltstone	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	xx LimeMudstone	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 ša*) 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	*ballās*	Samannûd	Nile silt	Very hard/dense
W-12	10.8.3	*'olla*	Samannûd	Nile silt	Well-fired, hard, dense
W-31	10.12.4	*tāǧen*	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	*ballās*	Ballāš	Marl clay	Ochre wash interior; removed
W-71	10.7.2	*sahfa*	Fayûm	Nile silt?	Heavy chaff temper
W-73	10.9.7	*haǧar*	Cairo	Nile silt?	Black, soft
11.3	10.5.3	*ballās*	?	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 ǧazzāwī	cookpot, storejar'
fūl	fava beans
gadūs, pl. *gawādīs* (*'adūs*, *'awādīs*; *qadūs*, *qawādīs*)	jar
'adūs hamām	jar used for pigeon nest
'adūs laban	milking jar
gibna adīma	old cheese
ǧibs	plaster of Paris ($CaSO_4$)
ǧir	powdered $CaCO_3$ and/or lime
ǧoza	waterpipe
haǧar, pl. *heǧāra* (*haǧar 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
māǧūr, pl. *mawāǧīr*	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**: *haǧar*
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**: *haǧar*
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**: *haǧar*
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 multi-colored 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 *ǧir*, calcium carbonate or lime or both, or *ǧibs*, 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; *ǧir* 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 *ǧir*, whereas I am virtually certain that the white powder mixed with water for the post-firing wash was *ǧibs*. Nevertheless, these attributes need to be re-checked in the field, and samples of both the *ǧir* and the *ǧibs* 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 "'*ādūs*, *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 *mawāğir*. Products manufactured irregularly included "diverses petites cruches, petites coupelles, des bols (ressemblant souvent à des *māğūr* 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 *māğûr* 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 *ğidr*, 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 1×10^{-5} SI units or 0.8×10^{-3} cgs. One (1.0) SI unit (or a volume susceptibility of about 3×10^{-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.

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