# The Archaeology of Mobility

## Old World and New World Nomadism

EDITED BY
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The picture on the cover was taken in 1998 by pastoral nomad Mohamed Eid, with one of the cameras provided to the Ababda tribe by the Eastern Desert Antiquities Protection Project. It shows his family living in the Eastern Desert, between the Nile and the Red Sea in the border area between Egypt and Sudan.

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CHAPTER 19

# SUGGESTIONS FOR A *CHAÎNE OPÉRATOIRE* OF NOMADIC POTTERY SHERDS

HANS BARNARD[1]

AMONG THE MORE enigmatic, and sometimes controversial, aspects of a nomadic, mobile lifestyle are the desire and the ability of people that have not (yet) settled to manufacture, or even use, ceramic vessels. Current, well-balanced opinions on the subject of pottery production by mobile people are reflected in several other contributions to this volume.

> There has been a common wisdom or stereotype among many archaeologists that sedentism, agriculture and pottery technologies are necessarily positively correlated. Indeed, some archaeologists use the presence or absence of pottery in the archaeological record as an independent measure of residential mobility. The presence of potsherds at a site would indicate sedentism and a lack of pottery some degree of seasonal transhumance. Although examples of pottery in sites occupied by mobile hunter-gatherers are known . . . in such cases the pottery is usually defined as 'crude' and 'technologically unimpressive' thereby relegating it to a lesser or unimportant status and reinforcing the stereotype (Eerkens, this volume).

[1.] I would like to thank David Verity for sharing some of his vast experience with me; Steve Sidebotham, Roberta Tomber, Pamela Rose, Anwar Abdel-Magid, Richard Pierce, Knut Krzywinski, Eugen Strouhal, Jana Součková, Jitka Barochová, Manfred Bietak, Elfriede Reiser-Haslauer and Roswitha Egner for making the necessary material available; John Bintliff and Steve Rosen for their stimulating remarks; Jelmer Eerkers and Paul Nicholson for their comments on earlier versions of this chapter; Anna Barnard-van der Nat for her financial and logistical support; and Willeke Wendrich for her unending encouragement. The license to excavate the site of Tabot was issued by the Department of Antiquities and National Museums, Khartoum, Sudan, to Dr. Anwar Abdel-Magid. Test excavations carried out by the license holder in 1994 and 1995 were sponsored by the Committee for Development Research and Education (NUFU) of the Norwegian Council of Universities within the framework of their Sudan Program (Phase II: Archaeology Project). The license holder authorized Hans Barnard to study and publish the pottery from Tabot.

There seems to be consensus, among the authors contributing to this volume, that a fraction of mobile people will produce their own pottery and that this pottery will usually be of poor quality.

> These observations suggest that even when mobile groups do manufacture pottery, their product is technologically and aesthetically inferior to those produced by sedentary peoples. Arnold (1985), while suggesting that less than a third of mobile societies make and use pottery, argues that a number of practical, logistical and economic (economies of scale) problems are involved in the production of pottery by groups with high residential mobility (Alizadeh, this volume).

The relative low quality and inferior aesthetics of the vessels produced by mobile people usually extends to a lack of decoration of the vessels. This adds to the difficulty of identification, in an archaeological context, if remains of such vessels are found at all.

> Pastoral people are often less concerned with decoration on their vessels than are agriculturalists, who imbue their pots with symbolic significance . . . The ceramics that seem to have the strongest association with the earliest pastoralists are usually small, thin-walled vessels (10 cm in height), possibly used for sheep milking, which break up into tiny pieces, making them even more difficult to find on small open sites (A. B. Smith, this volume).

Over time, the character of residential mobility may have changed, slowly losing some of the properties of hunting-gathering or herding-gathering, including the production of pottery, and growing more dependent on the surrounding settled communities.

> It is difficult to measure this directly, but to measure trade, for example, petrographic analyses of Early Bronze Age ceramic assemblages from Negev nomad sites shows high proportions of local pottery produced by the nomads themselves, in addition to some imports. In contrast, by classical times (Nabatean, Roman, Byzantine and Early Islamic), 90% or more of the pottery found on the nomad sites was imported, produced by specialists in the towns and sites of the empires of Late Antiquity. By recent and subrecent times, virtually all pottery used by the Bedouin, the famous black Gaza Ware, is imported, along with a vast array of other manufactured goods (Rosen, this volume).

Despite these intricacies, the pottery used and left behind by mobile people can, in specific circumstances, be recognized and used to show, and even date, their presence.

> Sherd scatters of coarse gray pottery identified as 'Gaza Ware' have been found at many abandoned Bedouin tent camps in the Negev and Sinai. Such sherd scatters

> at archaeological sites in the Negev Highlands constitute the only evidence that these settlements were re-used by Bedouin . . . Dating Gaza Ware is problematic because it has not been the subject of systematic typological and chronological research. Current studies indicate that the production of Gaza Ware may have begun as early as the second half of the 17th century CE, or the beginning of the 18th century CE, and that it continued to be manufactured until the end of the 20th century CE . . . This suggests that the abandoned Bedouin tent camps situated in the Negev Highlands should be dated between the 17th-20th centuries CE (Saidel, this volume).

In this chapter I will deal with the production aspect of a corpus of ceramic vessels, Eastern Desert Ware, that does not fully fit the above characteristics. Although these vessels are believed to have been handmade by pastoral nomads in the arid landscape between the Nile and the Red Sea, during the 4th-6th centuries CE, most vessels are not only rather well finished but also distinctively decorated (Figure 19.1). This makes it possible to identify even small sherds of Eastern Desert Ware among many sherds of 'imported' wheel-thrown


**Figure 19.1.** Examples of Eastern Desert Ware, believed to have been made by pastoral nomads, during the 4th-6th centuries CE, in southeastern Egypt and northeastern Sudan (Figure 19.2). EDW 17 is from Berenike (on the Red Sea coast); EDW 234 is from Wadi Sikait (in the *Mons Smaragdus* area); KHM 76918 is from Sayala (in the Nile Valley, courtesy of the *Kunsthistorisches Museum* in Vienna); and P 840 is from Wadi Qitna (just west of the Nile Valley, courtesy of the *Náprstek Museum* in Prague).

vessels. This special case may indicate that the production of pottery less recognizable than Eastern Desert Ware may have been more common among mobile groups than is usually suggested.

Given the dearth of additional archaeological finds and the ambiguous historical sources (Burstein, this volume; Barnard 2005) Eastern Desert Ware may remain our only source of information about its producers, the dwellers of the Eastern Desert (Figure 19.2). Next to a careful study of the ancient artifacts, currently undertaken from the macroscopic to the molecular levels (Barnard and Strouhal 2004; Barnard et al. 2006), additional insights may be acquired through experimental and ethno-archaeological studies (Shepard 1976; Rye 1981; P. J. Arnold 1991; Arnold et al. 1991; Stark 1991; Gosselain 1992; Longacre and Stark 1994; Schiffer et al. 1994; Rice 1996; Kramer 1997; Deal 1998; Arthur 2002).[2] At present the inhabitants of the area do not produce any pottery, rendering an ethno-archaeological study pointless. Therefore, this chapter reports on my experimental work trying to reproduce vessels similar to Eastern Desert Ware, in a setting as close as possible to that of the ancient pastoral nomads. Based on these experiments, I put forward a *chaîne opératoire* (operational sequence) with an archaeological rather than an ethnographic perspective (Table 19.1). Archaeologists typically deal with sherds rather than vessels and usually do not attribute separate meanings to sherds or whole vessels. The chaîne opératoire that I suggest, therefore, aims to explore the processes resulting in the sherds of handmade burnished and decorated vessels recently found in the Egyptian and Sudanese Eastern Deserts. In no way is it meant as proof that Eastern Desert Ware vessels were indeed made by pastoral nomads rather than by settled desert dwellers or inhabitants of the Nile Valley; it serves only to show that it would have been feasible for them to do so.

## EASTERN DESERT WARE

During the first survey and excavation season at the Greco-Roman harbor Berenike, on the Egyptian Red Sea coast, in 1994, a number of remarkable potsherds were found (Figure 19.1). These were of handmade cups and bowls with burnished surfaces and incised decorations (Rose 1995). The closest parallels for this pottery are described at sites in the Nile Valley, most notably in Kalabsha, Wadi Qitna and Sayala (Kromer 1967; Bedawi 1976; Strouhal 1984:157–177; Barnard and Strouhal 2004; Barnard and Magid 2006; Barnard et al. 2006; Barnard and Rose, in press), a considerable distance across an arid landscape to the west. Since then, similar sherds have been recognized at sites

[2] An excellent overview of the recent literature on these related, and sometimes confused, subjects can be found in Stark 2003.

in southeastern Egypt and northeastern Sudan (Luft et al. 2004; Nordström 2004; Sidebotham et al. 2005; Barnard and Magid 2006; Barnard, in press; Barnard and Rose, in press), always in small quantities among many sherds of late-Roman (Byzantine) Egyptian or Meroitic (X-group) vessels (Figure 19.2). These, combined with a few other datable finds (like coins) and radiocarbon

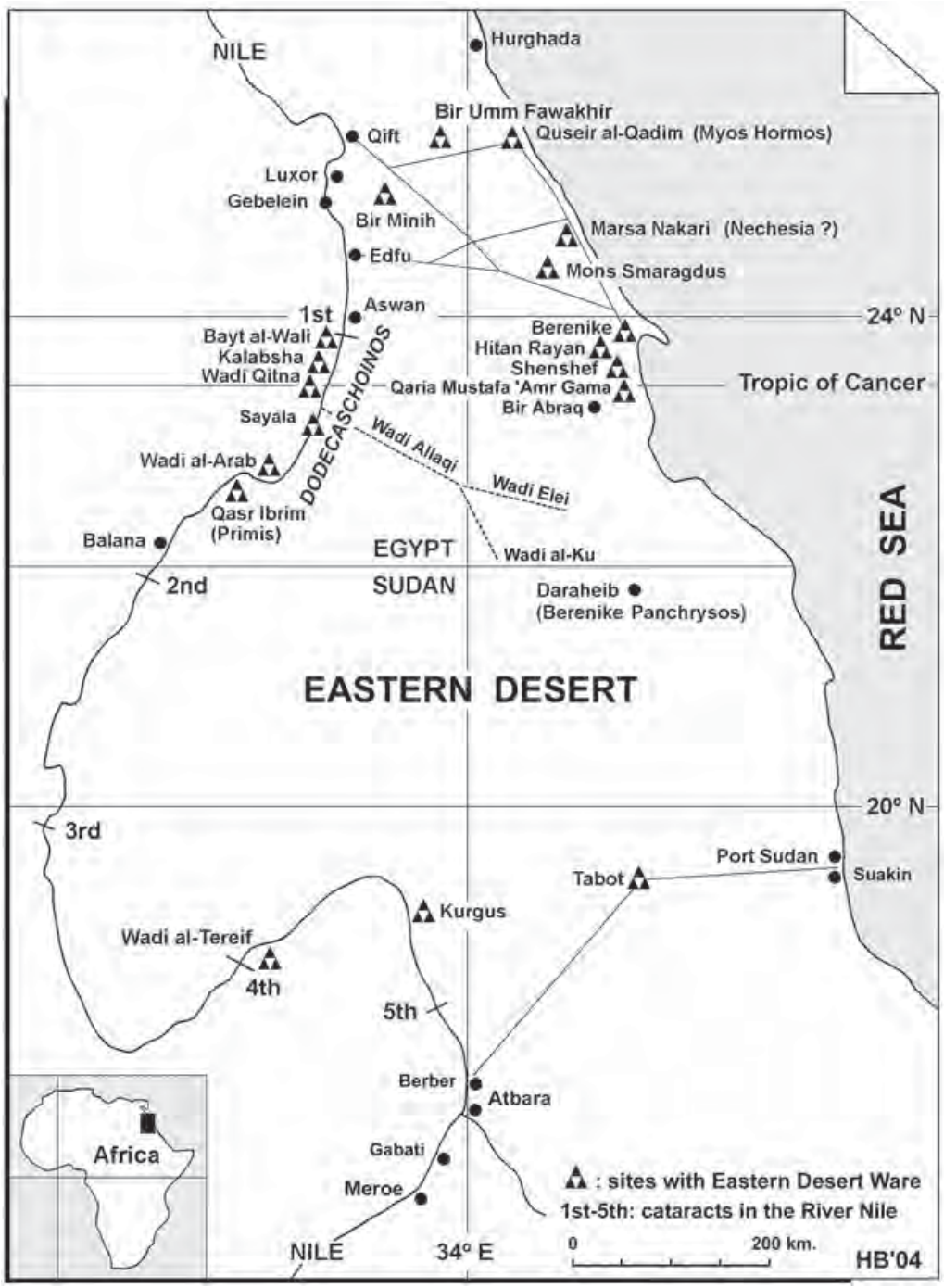


**Figure 19.2.** Map of the border area between Egypt and Sudan, showing the places where Eastern Desert Ware has been described.

**Table 19.1.** A Possible *Chaîne Opératoire* for Archaeologically Recovered Sherds of Eastern Desert Ware:

| Phase | Tools | Skill[a] | Time[b] |
|---|---|---|---|
| *Vessel as concept* | | | |
| obtaining raw materials (clay, temper, water, fuel) | receptacles (shovel, axe) | + | ++ |
| preparation of the paste (sieving, mixing, levigating?, drying) | receptacles, sieve? | ++ | ++ |
| shaping the vessel (coiling, pinching) | none | + | + |
| surface treatment (wiping) and decoration (impressing) | cloth, pointed tool | + | + |
| drying until leather hard | none | - | + |
| *Vessel as creation* | | | |
| surface treatment (smoothing) and decoration (incising) | abrasive, blade | ++ | + |
| drying until bone dry | none | - | ++ |
| decoration (slipping) and surface treatment (burnishing) | brush, slip, pebble, oil? | ++ | + |
| heating, prefiring | none | ++ | + |
| firing, refiring | saggar? | ++ | + |
| *Vessel as object* | | | |
| first use, seasoning | sealant | + | + |
| intended use | none | - | +++ |
| re-use (for instance as grave gift) | none | - | +++ |
| *Vessel as tool* | | | |
| breaking of the vessel | none | - | + |
| repair and re-use or utilization of (some of) the sherds | drill, thread, adhesive? | +/++ | + |
| discarding the remains of the vessel | none | - | +++ |

[a]Skill levels: - = no skills required; + = limited skills required; ++ = expert skills required.
[b]Time estimates: + = phase may take 0–6 hours; ++ = phase may take 0.5–7 days; +++ = phase may last years.

dates (Strouhal 1984:265; Sadr et al. 1995:227; Magid 2004:157–159), allow the conclusion that these vessels must have been produced between at least the end of the third and the beginning of the 8th century CE. Given its distribution the corpus is now identified as Eastern Desert Ware (Barnard 2002).

The majority of Eastern Desert Ware vessels are made of an orange to rusty-red fabric with few organic but abundant poorly sorted mineral inclusions (identified in petrographic thin sections as angular quartz and feldspars). Macroscopic and microscopic inspection of this fabric places it outside the 'Vienna System' that classifies the common clay sources used for pottery in Ancient Egypt (Arnold and Bourriau 1993). The technology, shape and decoration of the vessels also make it unlikely that they were produced by the permanent inhabitants of the Nile Valley as the pottery is very different from that usually encountered. Preliminary interpretation of the elemental composition of more than 140 Eastern Desert Ware sherds, obtained by laser ablation

inductively coupled plasma mass spectrometry (LA-ICP-MS),[3] indicate that these vessels were made in several geologically different areas, all most likely outside the Nile Valley. A comprehensive discussion of the origin of Eastern Desert Ware falls outside the scope of this chapter, but based on the technical research summarized above, the distribution of the finds (Figure 19.2), and the fact that the Eastern Desert at the time was inhabited by pastoral nomads (Burstein, this volume; Magid, this volume; Barnard 2005), as it is today (Magid, this volume; Wendrich, this volume; Murray 1935; Paul 1954), it is now assumed that Eastern Desert Ware was made and used by the pastoral nomads roaming the area in the 4th-6th century CE (Rose 1995; Barnard 2002, 2005). When used, most likely as serving vessels as suggested by their shape and size, the vessels, so different from those used by the settled people in the region, must have also acted as cultural, and possibly even ethnic, markers (S. T. Smith, this volume). The identification of these ancient nomads is elusive because of the lack of material remains other than the pottery and because historical sources on the area are both scarce and ambiguous for this period (Burstein, this volume; Barnard 2005). Several explanations can be proposed for the occurrence of such small numbers of remarkable potsherds, always mixed with large numbers of sherds from imported vessels, in such a large area. These explanations range from a demand-driven production, by settled or traveling professionals, to a household production taking place where and when the need arose or the opportunity presented itself. The validity of the latter explanation depends on whether it is feasible for mobile people to produce pottery as well made and finished as Eastern Desert Ware. The aim of this chapter is to investigate this feasibility for which I tried to reproduce Eastern Desert Ware, giving particular attention to the problems and possibilities likely to be encountered by mobile people.

## EXPERIMENTAL POTTERY PRODUCTION

The pastoral nomads in the region today, the Ababda and the Bisharyyin,[4] do not produce any pottery but instead use imported ceramic cups and coffeemakers (*djabana*) alongside metal and plastic containers (Wendrich, this

[3] This research was done on the GBC Optimass Orthogonal Time-of-Flight ICP-MS, with attached New Wave LUV Laser Ablation System, owned by the Institute for Integrated Research in Materials, Environments, and Society (IIRMES) at California State University, Long Beach, and sponsored by Dr. Hector Neff (IIRMES) and the Cotsen Institute of Archaeology at UCLA.

[4] Both groups claim to be among the many tribes of the Beja (Paul 1954), along with the Hadendowa (Magid, this volume) and the Beni Amer.

volume). Modern pottery most like Eastern Desert Ware, in technology and appearance, is at present regularly manufactured in the southwestern United States and northwest Mexico (LeFree 1975; Bell 1994; Wisner 1999).[5] For a while I therefore joined longtime amateur potter David Verity in his endeavor to master the ceramic techniques that are most famously practiced in Mata Ortiz (Chihuahua, Mexico). Using this experience, and data obtained in some more experimental settings, I suggest the following archaeologically focused chaîne opératoire for the sherds of Eastern Desert Ware (Table 19.1),[6] assuming the presence of the necessary tools, skills, and time (Shepard 1976; Rye 1981; Bourriau et al. 2000). Not all sherds or archaeological vessels, which are the end products of this sequence, necessarily see all phases or go through the phases in the exact order as given, as will be explained below. Both in Arabic, the language currently spoken in the area where Eastern Desert Ware is found, and in English, *clay* means different things to geologists, potters and archaeologists; this is even more so for *temper* (Rice 1987; Hertz and Garrison 1998). A prospective nomadic potter in a familiar landscape, however, will need to see how the raw materials present themselves only once or twice to be able to find and recognize them. In the desert (Figure 18.3), clay and materials that can be utilized as inorganic temper are usually found in the same area, and they are frequently naturally mixed in adequate proportions. As these areas are often devoid of water and fuel, it will be necessary to either bring those or to carry out clay and temper. Settled potters typically do the latter (P. J. Arnold 1991; Gosselain 1992; Deal 1998; Wisner 1999), while mobile people may do the former as they will usually be carrying water and fuel for other purposes.

Although clay and potential temper are relatively easy to recognize, their behavior when shaped and fired is impossible to predict. It is therefore very likely that mobile people, like their settled counterparts, returned to sources that had proven to yield good raw materials, or at least raw materials with known properties (P. J. Arnold 1991; Arnold et al. 1991; Gosselain 1992; Deal 1998; Wisner 1999). They may have included such valued sources in their routes, as they will almost certainly have done with sources of special supplies, such as temper rich in mica or clay suitable for slips. After collecting clay, water and temper, these are combined into a paste that can be shaped and fired. One way of doing this is to break up the raw clay, which will be a mixture of

[5] The closest local, but ancient, parallels are the vessels of the C-Horizon, produced by Nubian groups that inhabited the Nile Valley from the first to the third cataract between 2300–1500 BCE.

[6] A *chaîne opératoire* is typically used as a way to describe the production process of a class of objects. I use it here as one of many tools to study the sherds or complete vessels of Eastern Desert Ware found in archaeological context.

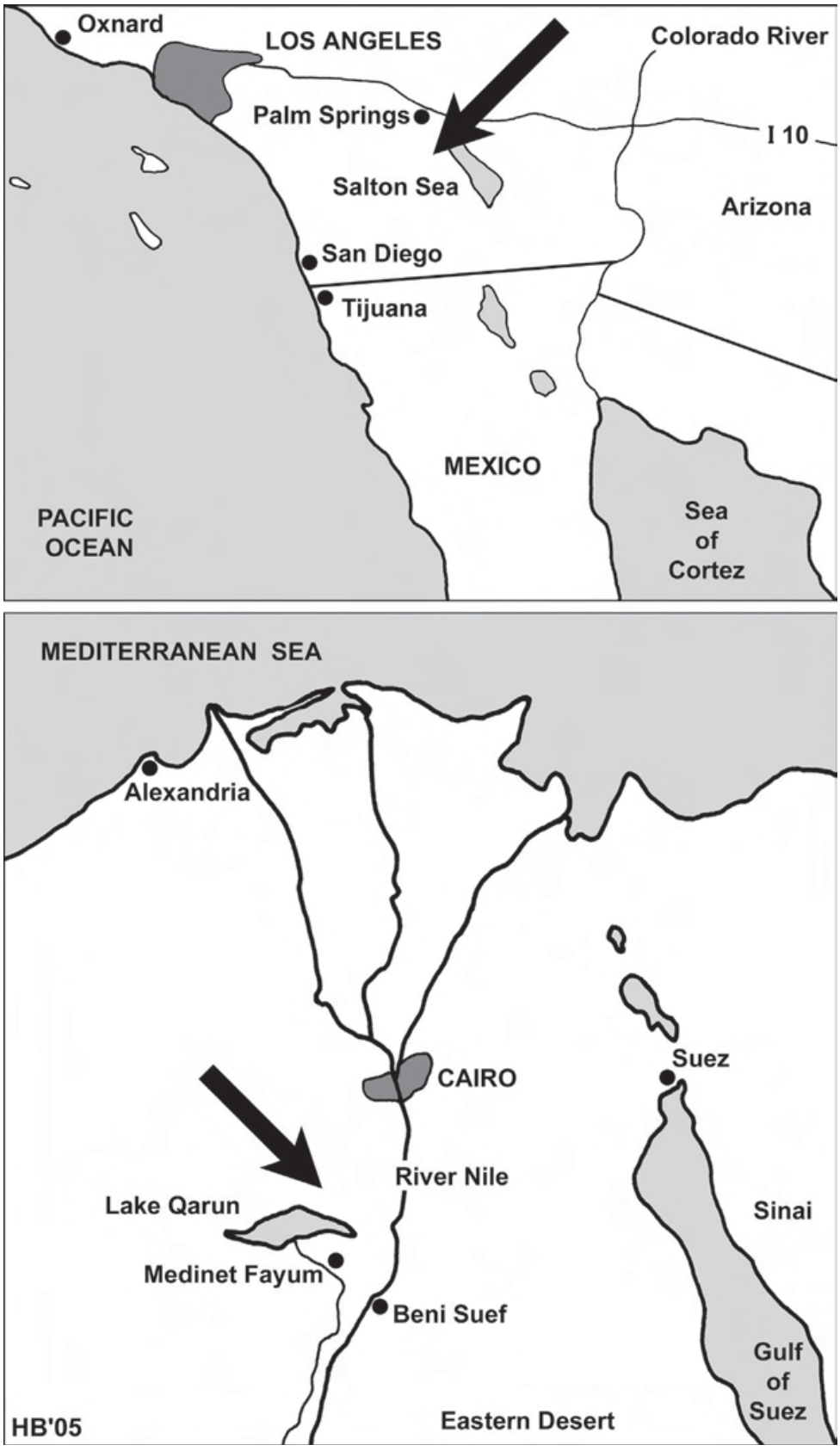


**Figure 19.3.** Maps of southern California and northern Egypt, indicating the places where clay and (inorganic) temper were collected for the experiments described in this chapter.

clay, silt and other inclusions, and suspend the actual clay particles in water. As these particles are very small, by definition,[7] they will remain suspended for hours while larger particles will quickly sink to the bottom. After a while the suspension is carefully decanted into a second receptacle through a sieve, if available, or cloth and allowed to settle. As this technique requires much time and water, naturally levigated clay sources (at the bottom of dry lakes or ponds) would have been preferred and may have been used exclusively. Pure clay, however, is not suitable for the production of pottery because it will shrink dramatically while drying, causing cracks and breaks. Therefore, not all inclusions should be removed from the raw clay, or some 'filler' should be added to the paste. These nonplastic materials will be cemented by the clay particles, forming a network that will sufficiently reduce, but not completely eliminate, shrinkage. Many materials can be used as filler, including silt,[8] dung, volcanic ash, chopped straw, crushed shells or pottery (grog), each with its own effect on both the technological process and the appearance of the vessel (Shepard 1976; Rye 1981; Arnold et al. 1991; Schiffer et al. 1994; Bourriau et al. 2000). I chose to add about one part of silt (Figure 19.4), by volume, to four parts of clay and allowed them to settle together. It is unclear whether some of the inclusions in Eastern Desert Ware were added in a similar way, as necessary in Santa Clara, New Mexico (LeFree 1975), or if they were naturally present, as in Mata Ortiz, Mexico (Wisner 1999). Experience would have shown which sources naturally produced clay and temper in a favorable ratio. These would have attracted mobile people to return, especially as such raw material required much less preparation.

After clay and silt have settled, which may take several days, the water is removed and the paste dried to a workable plasticity. This is best done on a slab of plaster of paris (Figure 19.4), or by wrapping the paste in cloth, to slow down the drying process, but can also be done in the sand and probably even on the move. Once the paste is fit to be shaped, which can again take several days, it can be modeled into the desired form by connecting two, or more, rings to a base (coiling) or by pinching a ball into the right shape (Figure 19.5). The surfaces can be smoothed with a wet finger, or a damp wad of cloth, and decorations can be impressed into the wet surface. Impression can be made with, among many other things, a fingernail, a blade, a shell, an animal bone or a potter's 'comb' (Shepard 1976; Rye 1981). Experiments have shown that many of the decorations on Eastern Desert Ware were made with thorns of a

[7] Depending on the scientific context, clay is defined as platy particles weathered to smaller than a 2–4 μm (0.002–0.004 mm) diameter.

[8] Again depending on the context, silt is defined as particles weathered to a diameter between 2–4 μm (0.002–0.004 mm) and 0.05 mm.

**Figure 19.4.** Preparation of potter's clay (by David Verity).

date palm (*Phoenix dactilifera*), which are the underdeveloped leaves at the base of a palm frond (Barnard, in press). In the Nile Valley, palm fronds are often used for fuel, and their thorns would have been readily available to potters. In the desert, where there are no palm trees, they may have been imported. The shaping and decorating of a vessel takes 30–60 min, after which the vessel is allowed to dry until it is 'leather hard:' when the paste has lost its plasticity but still holds 20–30% free water (Shepard 1976; Rye 1981; Bourriau et al. 2000).

Once a vessel is leather hard, which may take several hours, its shape can no longer be changed, but small repairs and additional decorations can be made (LeFree 1975; Shepard 1976; Rye 1981). It is also possible to further smooth the surface with a piece of damp cloth or leather (Bell 1994:53). It is likely that the potters who made Eastern Desert Ware did either of these, but I worked on my vessels only in the plastic and in the 'bone dry' stages. This latter stage is reached after all the free water has evaporated from the fabric. This can take several days but may be accelerated by carefully warming the vessel, for instance by placing it in the sun and regularly turning it around (Shepard 1976; Gosselain 1992; Kramer 1997; Deal 1998; Wisner 1999; Bourriau et al. 2000). Between the leather-hard and the bone-dry stages the vessel is susceptible to damage from handling and spontaneous cracking. Until firing, the production process can be completely reversed by adding enough water. Minor repairs can be made, or the paste can be completely recycled. It also means that the drying vessel must be shielded from water and sweat. When bone dry, the vessel can be smoothed, with sandpaper or another abrasive, slipped and burnished (Figure 19.5). If they did not do so when the vessel was still leather hard, the potters working on Eastern Desert Ware may have smoothed their bone-dry vessels with sand or an abrasive stone, like pumice or vesicular basalt, a technique reminiscent of burnishing. Slipping is the application of a thin suspension of clay with a distinctive color (naturally or because of an added pigment) by pouring or brushing this on the desired areas (Shepard 1976:67–69). Clays that make a good slip, bonding securely while delivering a bright color, are rare and would have been collected when encountered, or even warranted a detour, and carried around until needed. Burnishing is the polishing of a vessel by rubbing it with a hard object, like a pebble or the back of a spoon, after wetting the surface with slip, water or oil. The frequent combination of the slipping and burnishing of Eastern Desert Ware makes it likely that these were joined actions. The high luster of many Eastern Desert Ware vessels indicates that these were fired at relatively low temperatures (below 750–800°C or 1400–1500°F) as such luster tends to fade on exposure to higher temperatures.

The next stage of pottery production, the firing of the clay vessel, is the shortest and most dramatic. When the paste reaches sufficiently high

**Figure 19.5.** The shaping and smoothing of vessels.

temperatures, it will mature: the clay minerals irreversibly lose their ability to turn back into a plastic paste. Another important effect, depending on the conditions during the firing, is the burning off (oxidation) or deposition (reduction) of carbon, which greatly influences the color of the vessel (Rye 1981:114–118). At higher temperatures the iron oxides in the clay can also be reduced or oxidized, changing between black and red, respectively (Bourriau et al. 2000). If Eastern Desert Ware was indeed produced by nomadic potters, it was most likely fired in an open fire, unless space and time were negotiated in kilns belonging to settled potters in the Nile Valley. As is apparent from their results, several undesirable effects of firing vessels in an open fire were evidently circumvented by the nomadic potters. An important difference between a kiln and an open fire is that the temperature in a kiln can be better controlled and reach a higher maximum. As the water bonded to the clay minerals needs to be driven out gently, to prevent blistering, cracking or even exploding of the vessel, an open fire needs to be carefully monitored. The choice of fuel can facilitate this: dry wood will burn swift and hot, while animal dung or charcoal will take longer to heat up. At present, the pastoral nomads in the area use camel dung for cooking when wood is scarce and burn charcoal where wood is plentiful. The former is possible since the spread of the camel in Egypt during the last centuries BCE, and I saw the latter still done in the late 1990s. The dung of donkeys or sheep and goats may also have been used. A method to prevent the vessels from being destroyed by the firing is to force most of the water out first, by heating the vessel to a moderate temperature for a prolonged period. One or two summer days in the desert sun may be hot enough to do so (Shepard 1976; Wisner 1999). Alternatively, the vessels may have been buried in heated sand, as is currently the way that the nomads in the area bake their unleavened bread (Wendrich, this volume).

Another crucial difference between an open fire and a kiln is the contact between the vessel and the fire (flames and ashes). In a kiln the fire is separated from the vessels, which are heated by the hot gasses released by the fire. Allowing more or less air into the kiln generates an oxidizing or a reducing environment, respectively. Placing a clay vessel directly into an open fire allows the flames to create color differences on the fired surfaces, leaving so-called 'fire clouds,' while the collapsing fire will create a reducing environment. This will induce the paste to take up carbon, released by burning organics outside and inside the fabric, turning the vessel black. As most Eastern Desert Ware vessels do not show fire clouds or reduction, the ancient nomadic potters must have found ways to prevent them from appearing. The simplest way to reverse some of the fire clouds and most of the reduction is to take the hot vessel out of the fire, before it collapses, and allow it to cool in the open air (Rye 1981). A better method is to protect the vessel with a 'saggar' or *quemador* (Wisner 1999). A

**Figure 19.6.** Saggars used in California (above, photograph by W.Z. Wendrich) and in Egypt (below, photograph by the author).

saggar can be interpreted as a very simple kiln. It consists of a metal or ceramic container, holding the clay vessel, which is placed in or on top of the fire. I have successfully used an upturned terracotta flowerpot, an old paint drum (with a few holes to secure an oxidizing environment) and a perforated cookie tin (Figure 19.6). Ancient potters could have separated their vessels from the fire with larger vessels, such as cooking vessels, or may have constructed ad hoc saggars with the sherds of broken vessels or slabs of stone (LeFree 1975). Like the receptacles used for the preparation of the paste, such items would have been relatively easy to clean and to re-employed for their original function.

For this study I made about a dozen vessels and fired them using a variety of techniques. Put directly into an open fire, vessels did not survive, and vessels buried below an open fire did not mature (they failed to lose their ability to suspend in water). Clearly the temperature must be raised slowly, to gently drive out the water and reach a maximum above 360°C or 680°F (Figure 19.7). The vessels fired in a saggar in a slowly started open fire did mature without cracking or reducing but lost some of their luster. The same was true for vessels fired in the controlled environment of an electric kiln set to switch off at 866°C or 1591°F (using pyrometric cone 012). The optimal temperature for Eastern

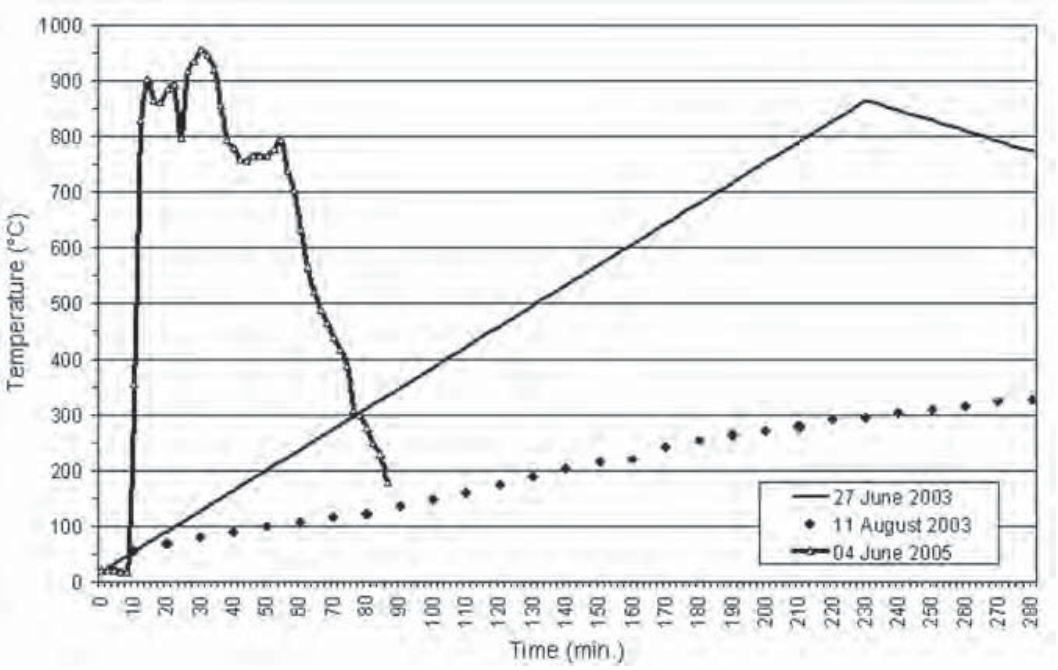


**Figure 19.7.** Temperature curves of three experimental firings, the first representing the theoretical temperatures inside an electric kiln controlled by a kiln-sitter (with pyrometric cone 012), on 27 June 2003; the second showing the measured temperatures below a slow-started bonfire failing to mature three buried vessels, on 11 August 2003; the third showing the measured temperatures in the center of a fast-started bonfire destroying not previously heated vessels, on 4 June 2005. Measurements were performed with an Omega Type K thermocouple (kindly made available by Dr. Brian Damiata, University of California, Riverside), which has a Chromel (nickel-chromium) positive and an Alumel (nickel-aluminum) negative lead, attached to a RadioShack digital multimeter. A plastic thermos flask with melting ice (0°C = 32°F) was used as external reference.

Desert Ware must therefore have been 410–810°C (770–1490°F) but probably closer to the latter (Shepard 1976; Rye 1981; Gosselain 1992; Schiffer 1994; Bourriau et al. 2000).

A vessel placed on top of a small fire of 2 kg (about 4.5 lb) charcoal, kindled with kerosene (paraffin) after the vessel was in place, also matured without cracking (Figure 19.8). This setup appeared to allow enough oxygen to reach the vessel to prevent absorption of reduced carbon released by the fuel. In places where olive oil was applied to the vessel, the surplus of carbon could not be oxidized, leaving a black surface (Figure 19.9). This carbon was later removed, turning the surface reddish brown, by firing the vessel again in a fully oxidizing environment. Some fire clouds remained, however, especially on the bottom of the vessel where it had been in direct contact with the glowing embers.

The resulting unglazed earthenware, quite similar to Eastern Desert Ware, will be more or less porous, especially when new or if used relatively little. To reduce this property, such vessels are often 'seasoned' by heating, for instance, milk, oil, butter or honey (with beeswax?) in a new vessel. This saturates its walls and diminishes the permeability of the fabric.[9] Resin or bitumen may also have been used to this effect or to repair broken vessels (Eerkens 2002). Little is known about the intended use of the vessels, but given their size and shape, they most likely functioned as serving vessels. At the same time, they probably acted as cultural, or ethnic, markers as they are markedly different, in technology and appearance, from the vessels of the settled population in and around the region (Sidebotham et al. 2002; Luft et al. 2004).

Many Eastern Desert Ware vessels were recovered from graves, where they had been placed as grave goods for the deceased, to whom they probably belonged during life (Habachi 1967; Strouhal 1984). A very similar custom is still practiced by the pastoral nomads now living in the area, despite centuries of Christian and Islamic discouragement (Barnard 1998; Wendrich, this volume). Sherds of many other vessels were found in private and public buildings in settlements in the Nile Valley and in the Eastern Desert. It takes little skill and time to break a vessel, but this should not always be interpreted as an accident. The intentional breaking of vessels can be part of a *rite de passage* or be an expression of joy or mourning, for instance during a Jewish wedding, a Greek dance, or in the context of the ancient Egyptian ritual 'breaking the red pots,' where the breaking was usually followed, and sometimes replaced, by the burial of the vessels (Ritner 1993:144–153). There are no indications that

9. This technique is still widely practiced in modern Egypt and should be taken into account during the analysis and interpretation of ancient organic residues (Bourriau et al. 2000:128; Barnard et al. 2007).

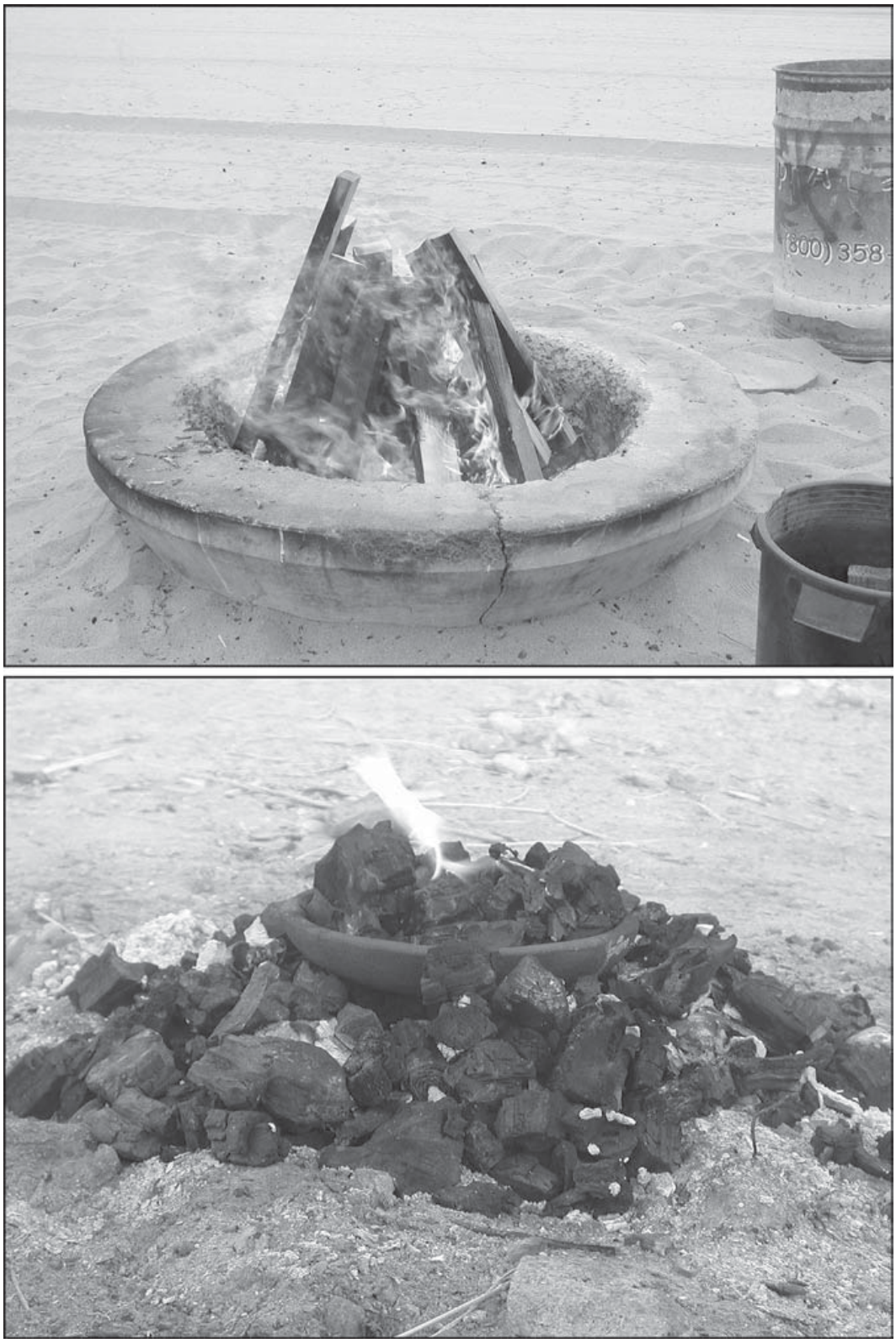


**Figure 19.8.** Firing vessels in California (above, photograph by W.Z. Wendrich) and in Egypt (below, photograph by the author).

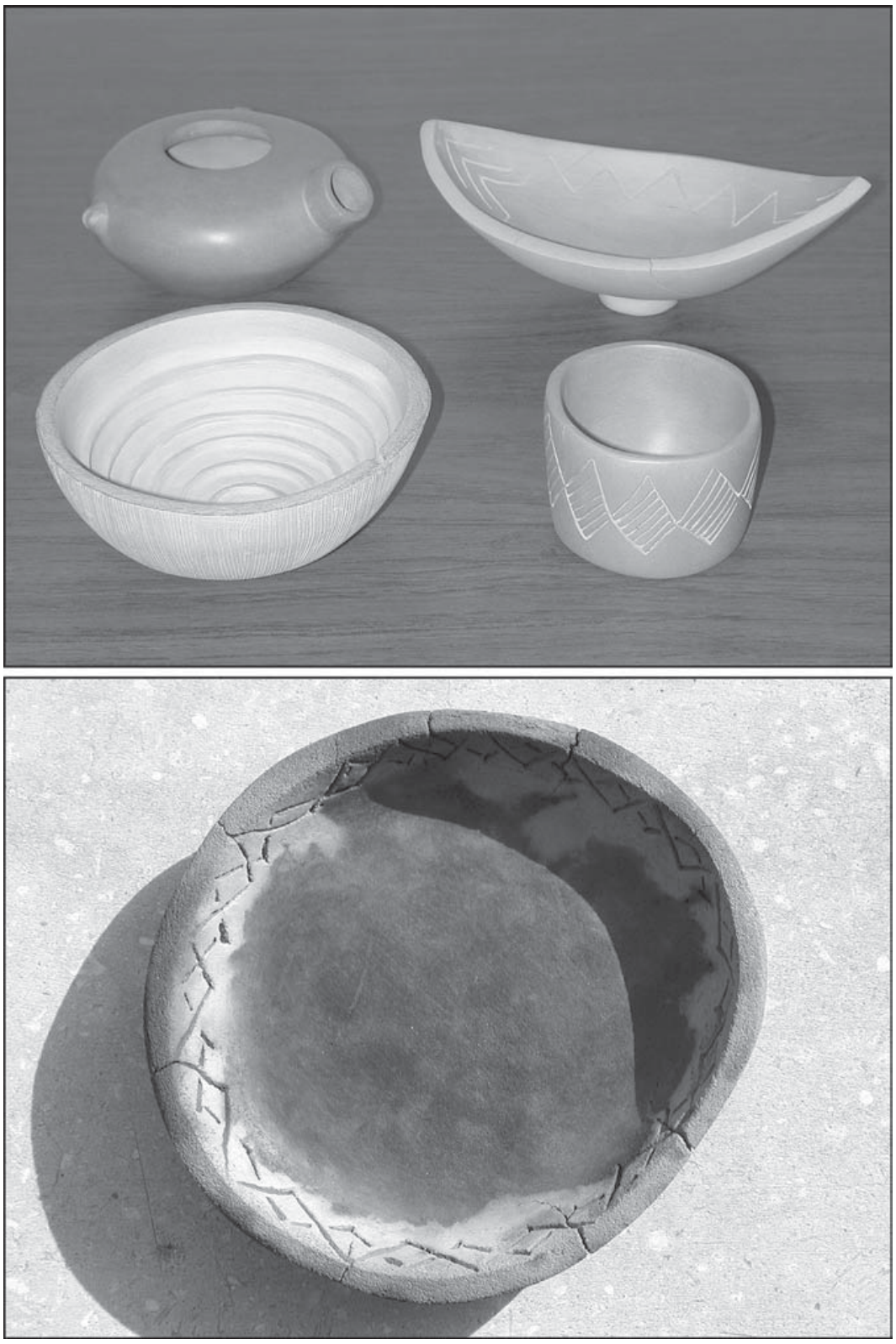

**Figure 19.9.** Examples of the vessels produced in California (above) and in Egypt (below).

Eastern Desert Ware was ever deliberately broken, but given the importance evidently attached to the vessels, it certainly cannot be ruled out.

There are indications that attempts were made to repair broken Eastern Desert Ware vessels, not by using an adhesive (such as a resin or bitumen) but rather by 'stitching' the sherds by threading holes drilled along the breaks, a technique commonly used (Eerkens, this volume). Eight of the 290 sherds that I studied in detail preserved a small hole, some of which may have been intended to suspend the vessel; others may be repair holes. No traces of adhesives, wire or string were ever seen. As the vessels must have been highly valued, it is hardly surprising that attempts were made to extend their functional life as long as possible, albeit possibly for a different task. After a broken vessel was judged beyond repair, its sherds may have been used as cover, scraper, toy, gaming piece or as a surface to receive writing (*ostrakon*). Finally, the remains of the vessel may have been crushed to serve as temper for a vessel still to be made (grog), or they may simply have been discarded to be studied by archaeologists centuries later.

## DISCUSSION

There is sufficient archaeological and experimental evidence to conclude that the production of pottery, including vessels as nice as Eastern Desert Ware, by mobile people, and certainly by pastoral nomads, is eminently possible. Apart from a substantial investment in time and resources, however, ceramic vessels are relatively heavy, fragile and uneconomical to produce in small numbers (Alizadeh, this volume; Eerkens, this volume). The discussion of whether mobile people could produce pottery, therefore, is replaced by the question of what would make them decide to do so. The value of the specific properties of ceramics, for the completion of certain tasks, is clearly appreciated by mobile people worldwide, as is apparent from their propensity to use vessels acquired from settled outsiders. Among the few things that the nomads currently roaming the area where Eastern Desert Ware is found will always carry with them are the essentials for their 'coffee ceremony,' including a terracotta coffeemaker (made by settled potters in Sudan) and several small porcelain cups (industrially made in China). These fragile, but not very heavy, ceramics are stored in custom-made containers of basketry, leather or wood to prevent breakage (Wendrich, this volume).

One reason for mobile groups to produce their own pottery may be a limited availability of imported vessels. Settled potters, or other possible sources of pottery, may be far away or difficult to reach. These will likely be associated with other cultural, religious, or ethnic groups, which may obstruct the necessary contacts, and the available material can be of limited practical use or too

expensive, in terms of currency, barter or otherwise. Any of these factors may prompt members of the mobile group to produce some of their own pottery. Modern developments have decreased the need to produce pottery, replacing it with metal or plastic containers and providing access to ceramics produced in places as distant as China. During the 4th-6th centuries CE there was certainly no shortage of imported ceramic vessels in the Eastern Desert. The number of vessels that passed through as containers for trade items can only be guessed, but an abundance of vessels is found at the ancient harbors, road stations, mines and quarries throughout the region (Sidebotham et al. 2001, 2002). Some may have been intended for long-distance trade but remained behind because they were damaged or appropriated; others would have contained supplies for those temporarily working and living in the desert. It seems unlikely that the pastoral nomads could not somehow have obtained a sufficient number of vessels from this copious source, and they must have had other, and obviously important, reasons to produce their own.

Mobile potters can try to emulate vessels produced by settled potters, especially when they are already using their imported products, or develop their own type of vessels. The technology will be similar, but nomadic potters will have to develop their own techniques to adjust to their specific environment and needs. Such adaptations are likely to differ from place to place, according to the local situation and the availability of the necessary materials. Features that are not essential, like micaceous temper or red slip, can be omitted, and decorations preferably made with the thorn of a date palm can be made with the thorn of an acacia instead. Several acacia species, such as *Acacia nilotica* and *A. raddiana*, occur in the region where Eastern Desert Ware is found, and several Eastern Desert Ware vessels appear to have been decorated with a round tool. This has left less distinctive marks than the triangular thorn of the date palm but may well have been another thorn, for instance one of the *Acacia* species mentioned above.

The apparent use of date palm thorns on many Eastern Desert Ware vessels is remarkable. As palm fronds are often used for fuel by potters in the Nile Valley, their triangular thorns are readily available to them.[10] In the desert there are very few palm trees, and the use of palm thorns seems therefore indicative of production in the Nile Valley. However, this is not concurrent with the origin of the

[10.] Fronds of the doam palm (*Hyphaene thebaica*), rather than those of the date palm (*Phoenix dactylifera*), can also be used for fuel. Doam palms were more abundant in the Nile Valley in ancient times; they have been slowly replaced by date palms because of climatic changes and human intervention. Doam palm fronds carry real thorns on their stem, reminiscent of a rose or bramble branch, with an oval rather than a triangular cross-section.

clay matrix, outside the Nile Valley, as suggested by petrographic and chemical analysis of the fabric. Furthermore, the use of palm thorns to apply incised or impressed decorations on pottery is rarely attested for vessels originating in the Nile Valley after the C-Horizon (2300–1500 BCE). Like Eastern Desert Ware, vessels of the C-Horizon are handmade, partly burnished and decorated with incised decorations, but there is no evidence to suggest continuous production during the 1800 years that separate them, nor of a revival of the C-Horizon culture after Lower Nubia had been under more or less long-lasting Egyptian, Napatan, Meroitic and Roman influence. We must therefore assume that either the clay for Eastern Desert Ware was brought into the Nile Valley, where the vessels were subsequently made and fired, or that palm thorns were taken from the Nile Valley into the desert, to be used for the decoration of Eastern Desert Ware and probably primarily other chores. Many of the current inhabitants of the Eastern Desert live, at least part of the time, in dwellings made of rugs and mats over a dome-shaped wooden frame (Magid, this volume; Wendrich, this volume). These mats are made of palm leafs (from *Phoenix dactylifera* or *Hyphaene thebaica*), to which inhabitants obviously have access, held together by wooden pegs not unlike date palm thorns. Such dwellings appear to be mentioned in Egyptian Middle Kingdom and Late Kingdom texts, while Strabo reports, in the 1st century CE, that the nomads in the desert live in dwellings made of interwoven split pieces of palm leaves (Magid, this volume).

In the period during which Eastern Desert Ware was produced, the 4th–6th century CE, there was a substantial influx of outsiders into the arid landscape between the Nile and the Red Sea. A network of trade routes connected the Mediterranean Basin and the Nile Valley with the Red Sea coast, Arabia, sub-Saharan Africa and India (Sidebotham and Wendrich 1996; Wendrich et al. 2006). Next to these transient traders, the Eastern Desert was more permanently inhabited by numerous quarrymen, miners and early Christian hermits (Sidebotham et al. 2001, 2002, 2005). The resulting infrastructure of settlements, tracks and supplies, not equaled until the development of the Red Sea coast for tourism in the 1990s, allowed the pastoral nomads to settle temporarily when they accepted employment as laborers, guards, guides or prostitutes. Even more fleeting contacts, including those with a hostile nature, must have introduced the indigenous inhabitants of the Eastern Desert to the pottery of the more recent immigrants. Both groups would have benefited from the large volume (attested by the quantity of recovered sherds) of pottery imported into the region. That the mobile inhabitants of the Eastern Desert apparently chose this period of relative plenty to produce their own pottery may be attributed to the following three points.

Being in the same place for a longer period than they probably would have been previously may have enabled the pastoral nomads to see the pottery

production process, as reflected in Table 19.1, through for the first time (Eerkens, this volume). The infrastructure that allowed this would also have provided them with the necessary surplus of water and fuel.

Some of the immigrants (traders, miners and quarrymen) may have given more or less detailed instructions, suggestions or inspiration to the nomadic potters. Despite the possibility that they were educated by outsiders, the nomadic potters decided to create their own corpus rather than imitate imported vessels. This decision seems to have been based on their desire to separate themselves from the more recently arrived inhabitants of the Eastern Desert. The growing number of immigrants and their increasing influence, partly fueled by the changing politics of the Roman Empire toward ethnic and cultural minorities, would have increased this need, which sometimes gave rise to violent confrontations (Eide et al. 1998; Barnard 2005).

Finally, sherds of Eastern Desert Ware will necessarily be concentrated near the settlements of its producers and users. The more significant settlements, like those associated with mines, quarries and harbors, will attract the attention of archaeologists prior to the ephemeral campsites of pastoral nomads. Many isolated sherds of Eastern Desert Ware vessels may lay scattered unobserved over the vast stretches of arid landscape between the places where it has so far been found (Figure 19.2; A. B. Smith, this volume). These could date from periods well before and after the time of contact between the indigenous nomads and the immigrant traders, miners and quarrymen. More research, including a more systematic survey of the area, will be necessary to understand the relation between Eastern Desert Ware and the pastoral nomads of the Eastern Desert between the 4$^{th}$-6$^{th}$ centuries CE.

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