ANCIENT AMMON

EDITED BY

BURTON MACDONALD AND RANDALL W. YOUNKER

BRILL
LEIDEN BOSTON KÖLN
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CHAPTER THREE

CENTRAL JORDANIAN CERAMIC TRADITIONS

Gloria London

Burke Museum of Natural History and Culture

Introduction

Pottery of Iron Age date in central Jordan demonstrates both continuity with Late Bronze Age traditions as well as significant changes in form, finish and fabrication techniques. As the manufacturing technology changed, so did the vessel shapes and surface treatment. These developments occurred throughout the area of ancient Jordan and Israel at different times in different places during the span of the Iron Age. In common with most areas, the general region known as Ammon presents a challenge to characterize in terms of ancient ceramic traditions and political boundaries. The two do not invariably overlap or co-vary. Although there have been numerous archaeological excavations in the region yielding large quantities of pottery, a relatively small number of sherds has been sampled mineralogically or otherwise to determine if the material was made in the region or brought from afar. Pottery production locations evade detection.

For these reasons, it remains unknown which pottery types can be considered made in Ammon before or during the era of an Ammonite entity mentioned in the Hebrew Bible. Archaeologists often assume that the bulk of pottery excavated at a site was of "local" origin, but the term is ambiguous, at times implying that the pottery was made at the site, at a nearby site, or some place in the region as opposed to articles of long distance trade. In the absence of adequate mineralogical testing to confirm local origin, the following discussion addresses only the broader regional ceramic traditions of central Jordan. One advantage of not attributing specific wares to the Ammonite area and treating the central Jordanian region rather than Ammon specifically, is that we avoid associating and identifying pottery with people and political or social entities.

Pottery starts, of course, as clay in the ground. It is first excavated and prepared, then shaped into containers, dried, fired and distributed. The goal here is to follow the work schedule of a potter rather than present a typological treatment of the final forms. The ceramic potential, traditions and technologies precede evidence of the manufacturing techniques in use during the Late Bronze and Iron Ages in central Jordan.

Ceramic Potential of Central Jordan

Raw Materials for the Potter: Clay, Water, and Fuel

For the geologist, the characterization of clay differs dramatically from a description of clay offered by a potter. For the latter, the primary concern is whether or not he/she can fashion pots from a particular clay rather than the mineralogical analysis of the clay components preferred by the geologist and archaeologist. Designation as a "good clay" implies that the potter possesses a technique suitable for shaping the clay into pots. A "bad clay" refers to a material unworkable for a particular potter, although it may well be suitable for another potter who uses a different manufacturing technique.

A variety of local clays, available in central Jordan and elsewhere in the country, still supplies Jordanian potters to this day (London and Sinclair 1991). Clays amenable for wheel-thrown pottery are used by professional crafts people who sell pottery at markets and road side stands (Homès-Frederiq and Franken 1986: 249; London and Sinclair 1991). Other potters work with local clays to fabricate wares for household use (London and Sinclair 1991: 421; Merschen 1985). McQuitty (1984) documents the use of local clay for constructing ovens. At least some, if not all, of these clay sources were available and exploited at different times in antiquity. It was not imperative to import clays or pots to Jordan.

Clays in both Jordan and Israel tend to be in secondary deposition; that is, rather than finding clays adjacent to their parent rocks, the clay beds predominate along stream beds and depositional pockets far from their origins. As a consequence, wind blown and water lain clay deposits create a raw material mixed with an assortment of rocks and debris. The latter can be detrimental to pottery production and at times required potters to exert special effort in preparing the clay prior to its use, over and above the normal removal of unwanted large rocks, leaves, roots, etc. Potters will usually carefully prepare the raw material, but to create a clay suitable for wheel throwing often requires more work than for clays used in hand building techniques. To create a clay for throwing pots on a fast moving wheel for example, it was necessary to clean the clay by extracting most of the non-plastic inclusions. More often, rather than investing in elaborate time and water consuming cleaning procedures, potters in Israel and Jordan learned to work with the clays almost as they found them in nature. Although potters and their assistants would have always removed the largest of the undesirable elements, their primary strategy was to develop pottery making techniques suitable for lean clays, i.e., those rich in non-plastics (rocks and minerals). Among the advantages in using the heavily tempered clays are relative ease in attaching accessories, drying, firing, and a durable product. Disadvantages include thick walls often lacking decoration.

Painting the surfaces of untreated or marginally prepared clays is risky since the pigment cannot be absorbed by the non-porous rocks and minerals. The solution to this problem involves the application of a slip layer to cover the surface prior to painting. This simple measure or precaution succeeded as long as the slip adhered to the vessel wall, which was not always the case. To adhere well, a slip should ideally consist of the finest clay particles identical or similar to the clay of the pot. Coloring agents can be added judiciously to the slip. Even if the slip is a good match for the pot, if the clay and water used by the potter during the manufacturing contain salt, the slip can flake off, removing the overlying painted pattern as well. As pottery dries, the molecules of water migrate to the surface of the pot where they evaporate. Along with the water, salts naturally present in the raw material also reach the surface where they are deposited rather than evaporated. Salt creates a barrier layer know as scum, or bloom, which separates the slip from the clay wall. To prevent a salt deposit from interfering with slip adherence, potters had no choice but to scrape away the surface salt-rich thin layer of clay.

This extra procedure both enhanced slip adherence and provided a suitable surface to paint. To scrape the surface of the vessels without removing so much clay that the walls of the vessel were weakened, required a skilled potter. Excessive scraping resulted in a collapsed pot. In contrast, almost anyone could paint the surface.

Consequently, in place of fine, well executed designs, if a sloppy pattern covers a large part of the vessel surface and if quantity of decoration exceeds the quality of the design, it is possible that marginally skilled painters were responsible rather than professionals. Such a situation characterizes exported Cypriot White Slip milk bowls (London 1986). In contrast to earlier examples displaying well executed and fine line patterns, later White Slip wares made for export exhibit crowded, busy, and thicker lines painted by inexperienced learners. Painted pottery was not the norm in ancient Jordan and Israel, but given the nature of the raw materials and the society, the potters worked with what was available to create usable, durable, low-cost, utilitarian pottery and luxury wares.

Importance of Water

Without a reliable water source, potters cannot work. Ancient potters in Jordan, Israel, and throughout the Levant, had no alternative but salt-rich clays and water. They overcame the shortcomings of the local material by scraping the surface of drying pottery to remove the salt deposit. In removing the salt deposit, potters simultaneously scraped away excess clay and created a thinner walled pot and a surface receptive to paint. By scraping away excess clay, the potters resolved several problems simultaneously: thinner walls create a lighter, more elegant form, less likely to crack during drying and firing; and removable of the salt or scum deposits allows a slip and painted decoration to adhere and be visible. When the potters failed to remove the excess clay and salt deposit from a pot, their problems multiplied since each step of the manufacturing process influences the next stage of work. Unless the salt deposit was removed, the slip and paint could not adhere well. Even if the paint adhered, the presence of salts on the surface create an overall whitish or graying background which masked the painted pattern by reducing its visibility or making it less sharp and colorful. In addition, by scraping drying pots at precisely the right time, the clay particles on the surface become aligned in such a manner that when fired correctly, a burnish sheen can result.

Given the problems potters confronted, there is little wonder that much of the terminal Late Bronze and Iron Age pottery lacks painted decoration. Nor is it by chance that a manufacturing technique involving scraping or "turning" to thin the walls coincides with the return to burnished surfaces. In contrast with earlier pottery, Late

Bronze Age wares are often described in negative terms as heavy, thick, and poor in shape and decoration. In the absence of scraping and thinning the walls, heavy, thick pottery, lacking graceful lines and decoration, results.

In view of the above, the most significant problem with the Late Bronze Age pottery was the failure to thin the vessel wall. Failure to do this led to a number of undesirable consequences, including: (1) thick "s" cracked bases; (2) heavy walls; (3) salt accumulation on the surface; (4) poor slip adhesion; and (5) poor paint adhesion and low visibility (Franken and London 1996). The end result was an industry in need of improvement.

Outside impetus was not essential for potters to eventually learn to resolve the problems presented by the raw materials. One benefit from scraping away excess clay is that the surface becomes compacted due to the pressure of the scraping tool. If the clay is neither too wet nor too dry when scraped, and if the pot is fired to an appropriate temperature in the kiln, the result will be a burnished sheen due to the compacting and aligning of the clay particles. Although initially the burnished sheen was an unintentional bonus, the act of turning or scraping the exterior wall created a surface suitable for slip and paint adhesion or it created a burnished shiny veneer. Perhaps once the potters realized that both outcomes were feasible, they chose burnished surfaces over painted slips. At the time of paint application, the pattern may have been well executed in sharp crisp lines, however, carefully rendered lines can melt into drip lines if the kiln temperature becomes too high. Burnished surfaces are always compacted, but they are not necessarily shiny. To achieve the sheen requires a kiln temperature which is high enough to cause it to appear, but not so high as to eradicate the sheen.

Fuel for the Kiln

Fuel availability to fire pottery in ancient Jordan was not necessarily problematic since kilns can be fired using a variety of organic materials, such as pine cones, wood, dung, bark, etc. In northern Jordan, a rural potter still uses dung cakes to fire her pit kiln (London and Sinclair 1991: 421) as is commonly done elsewhere in the world (London 1981: 194). Dung may have been collected and used for kiln fires in antiquity. Rather than burning large quantities of fuel, kiln firing can be a 12 hour process which maximizes small amounts of precious fuel. In Cyprus, for example, among traditional rural potters who fire jugs, cooking pots, etc., wares are stacked in the kiln at 7:00 a.m. and left there for 24 hours. The big roaring fire, however, is of short duration, based on observations of over 30 firings. Initially the fire is a drying fire, comprised of the smallest twigs, for several hours until the pots are thoroughly dried. Gradually, slightly larger pieces of wood are placed in the firebox. Not until between eight and ten hours later are a few large logs, *ca.* 15 cm in diameter, added for two or three hours only (London 1989c: 224).

Just as the Cypriote potters wisely utilize limited fuel resources, so did the ancient potters. Since traditional potters are responsible for collecting and transporting their fuel, often on their backs, it is most advantageous to maximize fuel use. Potters prefer to transport clay to make more pots instead of fuel. As a result, vast quantities of wood were not required to fire most wares. This is perhaps evident in the firing colors of the ancient wares. Archaeologists often describe pottery as "poorly fired." Fuel conservation could be one cause of the darkened cores found in the walls if the potters chose to stop the firing once the pottery was durable but not fully oxidized. Other factors contributing to the darkened core and partially fired wares, are the inclusion type as well as the surface treatment (Franken and London 1995: 218). Burnished wares lose their sheen when fired too high for too long, thereby limiting firing time and temperature. Finally, painted designs can drip and discolor as a result of overly high firing. As a result, there were numerous reasons for the potters to minimize the heat.

Another efficient use of fuel involves maximization of the kiln space for each firing. This requires that potters store drying pottery until there is enough to fill a kiln. Normally potters make and accumulate pots of all sizes and shapes to fill every part of the kiln interior. Alternatively, one potter might share a kiln with another potter. An arrangement of this type happens regularly during the pottery-making season, especially between potters who specialize in a single category of pots. For example, potters who concentrate on labor intensive small composite decorative pieces share a kiln with a potter who produces large quantities of ordinary, less time consuming utilitarian forms for daily use. At the end of the season, when no potter has enough dry pots to fill a kiln, but the autumn clouds threaten, several potters might share a kiln. Another space saving practice involves stacking small pots inside larger containers to maximize space (London, Egoumenidou and Karageorghis 1989: 62).

Transportation and Distribution of Pottery

Rather than the lack of fuel or clays, transportation of pottery to Jordan was both a problem and an inspiration. Although fragile pottery can be transported over considerable distances, geography did not facilitate easy access to Jordan. Throughout the Levantine coastal strip, pottery production was a feature of the economy, as was the importation of the decorated and specialty wares from Cyprus, Greece, and Egypt. Ornamental ceramics, especially from the Aegean which specialized in painted pottery, provided ancient Israel and Lebanon with a source of luxury wares on a regular basis, at least until the end of the second millennium B.C.E., when the local "Philistine" painted pottery replaced the Aegean imports. Throughout Cyprus and Greece, clays of vastly different qualities contribute to a thriving local ceramics industry (Matson 1972). In contrast, the clays of the Levant and Jordan, found largely in secondary deposition, do not offer the versatility of the Aegean raw materials.

Neutron activation and petrographic analyses confirm the presence of imports to Israel, where pots could arrive by ship and then be dispersed to their final destination on land. However, the geographic location of Jordan required a long, arduous land route for the friable pottery and its contents. As a consequence, there was considerable incentive to create a local ceramic tradition of fine wares as well as utilitarian forms. To access Jordanian markets, merchants not only transported the wares from considerable distances, but also sustained the increased risk and cost of moving a highly breakable commodity of relatively low intrinsic value. There is no question that some imported pottery did reach Jordan from the Mediterranean, Egypt, and Saudi Arabia. Evidence for this includes the well-known luxury wares found at the ʿAmman Airport (Hankey 1974; Herr 1983), Sahab (Dajani 1970; Ibrahim 1987: 76), Madaba (Harding and Isserlin 1953), Pella (Smith, McNichol and Hennessy 1983: 65; Knapp 1989), Tall Abu al-Kharaz (Fischer 1991/2; 1995: 103), Dayr ʿAlla (Franken and Kalsbeek 1969: 245; Franken 1992: 112), Tall as-Saʿidiyya (Pritchard 1980; Tubb 1988) and elsewhere. Leonard (1987: 261) notes that the Mycenaean pottery in Jordan is 1000 km from its source.

This is not a complete list nor does it include all of the wares brought from Israel. For example, petrographic analysis of a biconical jug found at ʿUmayri suggests that it differs substantially from the rest of the repertoire and could represent an import from Israel where biconical vessels are more common (London, Plint and Smith 1991: 430). Imported pottery from the east, such as the "Assyrian Palace ware," has been recorded at numerous sites throughout Jordan (Yassine 1984: 68), and other wares were probably brought from this direction as well. In his assessment of the distribution of painted "Midianite" ware made in northwest Arabia and found sparingly in Jordan, Parr (1982: 129) concludes that this pottery was not "deliberately and methodically traded." This is despite the natural north-south route through Jordan to Arabia. The relative dearth of imported decorated wares implies that geography encouraged or necessitated local pottery production in Jordan.

At times, ancient potters in ancient Jordan excelled. Wares belonging to the chocolate-on-white tradition represent some of the finest local products of the mid-second millennium B.C.E. in Jordan and Israel. Several hundred years later, if not the pottery itself, the Iron Age I cooking pot tradition known in Israel was transmitted from Jordan (Franken and Kalsbeek 1969: 119 22). To compensate for the geographic constraints limiting the importation of pottery, the local ceramics industry met the challenge by creating both luxury and common wares. At present, we are just beginning to learn about the movement of material culture across the Jordan River in both directions (Knapp 1989; Goren 1996: 63). There is no reason to assume that the movement and exchange of technology and communication was entirely in one direction or dominated by either.

Ceramic Traditions

At any given time in antiquity, it is likely that more than one pottery making technique was in practice for the construction of pots found within individual assemblages. The presence of different manufacturing techniques in excavated pottery from a given site does not necessarily imply competition among potters or workshops. Diverse potting techniques co-exist for many reasons these can include: different properties of the clays; special demands of cooking versus table and fine ware; unique requirements for large versus small containers; and requirements for finishing techniques.

Franken (1995: 99) describes a single ceramic tradition within any archaeological period as comprising all aspects of contemporaneous pottery production—from clay procurement to manufacture, decoration, drying, firing and distribution. An archaeological assembla can consist of more than one tradition, as is the situation for coo ing pots which often differ from the rest of the repertoire in cl inclusions, fabrication, firing, and distribution. A single tradition c be widespread or restricted to a small number of people or wo shops. More than one tradition can co-exist. Specific types can fashioned using more than one technique within an archaeologi period and ceramic tradition, as is the situation for bowls, cooki pots, juglets, etc. Each technique, possibly representing different wo shops and raw materials, can facilitate the identification of regio production centers. For our purpose, the goal is to identify a describe the numerous co-existing pottery making techniques a traditions used by potters working in the central Jordanian plate during the Late Bronze and Iron Ages. Most techniques continu in use throughout the period, although towards the end the pra tice of turning pottery became less prevalent than previously. It the coincidence of fabrication technique, shape, clay, and surfa treatment that allow one to identify the work of different conte poraneous production sources.

To define the central Jordanian Late Bronze and Iron Age ceran traditions requires the assessment of complete or reconstructable p and sherds. The analysis of whole vessels enables one to search evidence of all aspects of manufacture. Several detailed studies a available or in progress for pottery excavated from the region central Jordan and Jordan Valley. Such studies include those fr Pella (Knapp 1989), Tall al-ʿUmayri (London 1991a; 1995), T Dayr ʿAlla (Franken and Kalsbeek 1969; Franken 1992; Vilders 198 1992a), Baqʿah Valley sites (Glanzman 1983; McGovern 1986), a Tall as-Saʿidiyya (Vilders 1991; 1992b; 1992c; and 1993). All si are within a distance of 100 km or less. The preliminary techn logical studies of pottery excavated at Lahun and Busayra, south the central Jordanian plateau, especially contribute to the basic und standing of Late Bronze and Iron Age techniques of fabricati within the region (Homès-Fredericq and Franken 1986: 154–71; v As and Jacobs 1995). Given the current state of research and pu lication, one cannot know precisely which pots were made in t region of Ammon. It is, however, possible to document what h been found in the region and describe the manufacturing techniqu and clay whenever possible, as well as the contemporaneous potte found outside the Ammonite region.

During the Late Bronze and Iron Ages, similar pottery making techniques were in practice in both Jordan and Israel. This was due to the dictates of the raw materials, the demands of the clientele, and the desired repertoire. Regional variations potentially arise in particular rim forms, overall vessel proportions, potters' marks, and details of the surface treatment. How then can one distinguish between regional variations and minor temporal differences, especially given the practice of comparing and contrasting superficial attributes of vessel form by subjective means? Rather than chronological differences between pots found in the Jordan Valley and the central Plateau of Jordan, rim and handle shapes could reflect different regional workshops. Sparse imported objects, which may or may not have been curated for decades or more and therefore represent an earlier time frame, cannot provide an accurate date. For this reason, it is difficult to compare pottery found at different sites in terms of precise chronological distinctions.

It is more useful to note similarities or differences between entire assemblages found at different sites. In doing so, the Tall Dayr ʿAlla late second and early first millennium pottery has links with pottery in Israel (Franken and Kalsbeek 1969: 176, 245). Dornemann (1983: 31) concurs for tomb and other deposits from the central plateau. For Iron II pottery from Tall al-ʿUmayri, Herr (1995) notes that while certain forms find parallels in Israel, others are restricted to the plateau and Jordan Valley and still others are more limited to the plateau alone. One element of the research is to note similarities region wide, but the chronological significance of the similarities and, especially the differences, remains open to speculation.

In dealing with Late Bronze and Iron Age pottery traditions covering hundreds of years, the borders of Ammon were not necessarily constant or well defined as demonstrated by Kletter (1991) and MacDonald (1994: 52 and 59). While the northern boundary of Ammon is the Wadi Jabbok/az-Zarqa, the eastern boundary is the desert, and the western boundary is the Jordan River and Dead Sea based on generalized biblical accounts (MacDonald 1994: 9). These borders may have shifted in terms of political and economic entities. It is feasible that pottery used in the Jordan Valley sites, while made in a manner similar to that used on the plateau, was the product of different workshops than those supplying the plateau sites. To move utilitarian pottery made in the central plateau area down to the Jordan Valley sites seems impractical given its fragility and the nature of the terrain. Sites located in the extremities of the region may have economic ties with their neighbors and received pottery from adjacent communities. For the Late Bronze Age deposits at Tall Dayr ʿAlla, 70–75% of the pottery was made of a local clay, i.e., the banded clay containing quartz sand, iron oxides (Franken 1992: 106–8; 113), and does not come from the central plateau, the later center of Ammon.

Before assigning chronological significance to the presence/absence of a specific technique and vessel form, it is useful to characterize the manufacturing techniques represented in different sites and then compare the techniques from site to site. This approach allows one to incorporate manufacturing techniques in assessing assemblages rather than relying on form and finish alone. One eventually can learn where a technique originated or at least whether it appears earlier in one region than another. There is little reason to assume that any single new technique will suddenly replace all others. For an unfamiliar method to dominate, it first must be proven effective. The range of choices available to potters is not unlimited since potters are closely restricted by the available raw materials. A newly introduced manufacturing technique initiated at one site will not necessarily appear simultaneously at a nearby site, especially if it involves a different clay recipe from that in use. The same applies for wares found in Jordan versus Israel. While it is possible that separate and distinct ceramic traditions characterized Israel and Jordan, ceramic traditions might have overlapped despite topographic barriers, while not appearing in each region simultaneously.

Raw Materials: Clays and Inclusions

The limited nature of published reports of clay and inclusion analyses only allows one to conclude that clays were available to ancient potters. These clays, largely in secondary deposition, normally included non-plastic inclusions. The latter were part of the clay. Potters had the option of extracting some or all of the non-plastics and then working the clay or, conversely, they could add inclusions. Often it is difficult to determine if the non-plastics were native to the clay or added. An exception is grog, made by crushing pottery into small pieces for use as an inclusion. Very fine grained voids from organic material suggest that plants and/or dung were added intentionally.

The angular carbonates found in cooking wares were purposely combined with the clay to create a ware suitable for reheating as evidenced by the sharp angles and recent ethnographic evidence (Crowfoot 1932).

Other inclusions include quartz, chert, basalt, calcite, limestone, foraminifera (fossils), shell, shale, grog, and organic materials. And iron oxide. This list will undoubtedly be expanded as future tests are conducted. The precise combination of manufacturing technique and clay recipe will help to define individual ceramic traditions.

Pottery Production Locations

Archaeologists rarely find evidence of pottery manufacture. Without chemical or mineralogical tests, they cannot characterize pottery as "local" unless one assumes that the bulk of pottery found at a site was of necessity made at or near the site. This argues for the presence of pottery workshops at or near every sizable site. Were this the situation in antiquity, one might expect archaeologists to find and excavate kiln sites regularly, yet this is not the case. Where are the kilns, and why have archaeologists identified so few pottery production locations given that pottery is the single most abundant artifact found in excavations?

One explanation for the dearth of manufacture sites relies on the location of industry outside the major tall sites and inside the confines of rural settlements. Since excavations tend to concentrate at large sites, the paucity of kiln sites can be attributed to the choices archaeologists make in selecting sites for field work. Until small sites in rural settings are investigated in detail, pottery production locations will remain scarce, especially if pottery was produced solely in villages rather than in major settlements. Whereas talls are usually thought to be cities of large size and, therefore, inappropriate locales for pottery production, for the most part the latter is not valid. The majority of excavated sites in both Israel and Jordan are small (although there are a few exceptions) and contain a minimal area devoted to domestic structures in contrast to the space allotted to public buildings, royal enclaves, religious structures, and open spaces (London 1992). The implication is that under normal conditions, few people lived at the tall sites and as a result, pottery production may not have been part of the regular work carried out there, especially if pottery was produced in or near the household courtyard.

To make pottery, one needs clay and water readily available. Since water is a necessity for any community, villagers living near water as well as clay could have produced pottery during the dry summer months. Seasonality of the ceramics industry contributes to its invisibility in the archaeological record. Pottery can be made by craft specialists working in the courtyards of their homes where they shape the forms and fire the kiln (London 1989b: 76–8). It is feasible that pottery was produced in many domestic rural settings, yet the remains are minimal or invisible due to the multi-functional use of courtyard space. During the wet season, there might be no trace of pottery making tools or raw materials in the courtyard where pottery is produced for only part of the year. Once pottery production ceases all together and the pottery production location changes, kilns can be dismantled for the reuse of the stones and bricks, thereby eradicating evidence of a once thriving industry (ibid.).

Manufacturing Techniques

Equipment: Work Surfaces, Turntables, Wheels and Clays

When compared with pottery of the 16th century B.C.E., many wares of the late second millennium B.C.E. lack the elegant lines, thin walls, and sophistication characteristic of certain Middle Bronze Age ceramics. To a large extent this reflects the return to the use of a slower moving work table in contrast to the fast wheel. For whatever reasons, society could no longer accommodate a labor-intensive, pottery industry which required highly skilled potters using a clean plastic clay to throw pottery on the wheel.

From the perspective of making pottery, to throw pots on a fast wheel requires a clay with minimal inclusions, preferably very small in size. Throwing enables a potter to make pots faster. It, therefore, can be more cost efficient than the use of a slow turning work surface. The difference between fast and slow rotating wheels or work surfaces involves the use of either one or two hands on the clay and not simply rotational speed. To throw a pot requires that two hands are free to form the shape and create a thin walled vessel from the start. The heavy weight of the wheel used to throw pots allows it to continue to rotate due to momentum rather than continuous pressure applied to the wheel. Once the wheel starts rotating, it spins due to the combined weight of the clay and wheel. The speed of the fast wheel, which can rotate around its axis some 60 times per minute (Franken 1992: 149), necessitates the use of a plastic clay devoid of large inclusions.

Table 1

Clay	*Manufacturing Technique*	*Surface Treatment*	*Drying and Firing*
Lean clay	Pinch pot Coils Slabs Molds Turning Cone/hump throwing	Accessory pieces Slips Paint Burnish Applique (Incised patterns)	Protected area, but less care than plastic clays needed
Plastic clay	Throwing Cone/hump throwing	Paint Incised patterns Rouletting	Controlled, draft-free space for slow drying

Potential uses of lean versus plastic clays. Although accessory pieces, such as handles, spouts, molded decorations, etc. adhere best to lean clays, at times potters applied them to plastic clays. For example, Iron Age thin-walled small bowls and cups with an almost vertical wall known from a tomb in Madaba, thrown from a cone of plastic clay, have splayed handles on the rims to minimize detachment from the thin rim (Homès-Fredericq and Franken 1986: 164). Although feasible, incised patterns on lean clays run the risk of dragging large inclusions along with the tool.

In contrast, the slow-moving turntable lacks momentum and is unsuitable for throwing a pot. Once the potter stops pushing it, the turntable will soon stop rotating unless a potter or assistant applies constant force to the turntable with one hand. Most clays in Israel and Jordan are lean or short clays containing abundant rocks and minerals. Such clays would be ripped apart if worked on a fast moving wheel, although some lean clays can be rendered suitable for wheel throwing by partial elimination of the inclusions. Clays treated in this way would not necessarily result in a plastic clay, but one suitable for wheel-thrown manufacture.

Since every decision made by the potter influences each successive step in the production of a pot, the use of plastic clays has its consequences with regard to the drying, firing, and final appearance of the vessel. Plastic sticky clays can be painted, but are less amenable for the application of accessory pieces such as handles and spouts. Accessory pieces tend to detach during the drying and firing stages. This reflects, in part, the drying properties of plastic clays. Inherent in a clay body with minimal inclusions is a dense wall that can inhibit an overall, even drying process. As a clay pot dries, it shrinks. Plastic clays shrink more than lean clays. The surface of plastic clays can dry faster than the interior wall thus causing warping, cracking, and detachment of handles and spouts. The latter can occur if the accessory and vessel dry at different rates. Franken (1993/4: 48) presents numerous solutions for handle attachment problems. Use of lean clays avoids this risk because of the rock, mineral, and organic inclusions that serve to open the vessel wall and provide a conduit for the evaporating water thereby making drying relatively uncomplicated. However, to dry pottery made of a plastic clay requires ideal conditions, namely, a sheltered space devoid of drafts, sun, and severe temperature changes. To successfully use plastic clays almost necessitates a workshop organization that provides space for preparing the clay, shaping the pots, drying the pots and storing them before they are fired. An organized industry of craft specialists who could afford the luxury of ample storage space would have been responsible for the production of wheel-thrown wares.

Table 2

First Stage	*Second Stage (if necessary to create a desired shape)*
Pinch pot	Add another pinch pot bowl to create a closed vessel
Slabs	Coils
Molds	Coils; join 2 molded pieces Turning Throwing
Coils	Turning
Turning	
Cone or hump-throwing	
Wheel throwing	

Late Bronze and Iron Age manufacturing techniques and production stages prior to final surface treatment.

To avoid the risks and requirements of plastic clays, potters could work with a lean clay, either as found in the ground or altered in some way, for example, as by removing the largest inclusions. Other rock and minerals could then be added (known as non-plastics, tempering material, inclusions or grits) or the clay could be used without further manipulation. Special case wares, such as cooking pots, required the addition of suitable inclusions to accommodate vessel use and repeated heating and cooling of the pots while in use. Most ethnographic accounts of traditional potters worldwide reveal a preference to use clay unaltered from the earth. Traditional potters add only water after extracting the largest rocks (London 1991b: 189). This was probably the most common situation in antiquity. Van As and Jacobs (1995: 24) conclude that the ancient potters of Lahun, just north of Wadi al-Mujib in Jordan, used unaltered clays from Wadi Lahun to coil and turn pots on a turntable. Another possibility that allows potters to work with available clays with minimal preparation is to mix two clays together, one lean and one plastic, to benefit from the properties of each, as is the situation among traditional Filipino potters of Gubat (London 1991b: 189 and 204).

In Jordan and Israel during the Late Bronze Age, wheel-thrown pottery was replaced by wares made by several different techniques (as opposed to a single technique). During the MB II zenith of wheel-thrown wares, there were potters who continued to work with a slower moving turntable to create specific forms. The use of the turntable was never lost. The same wheel capable of momentum for throwing pottery can function for techniques requiring a slower moving work surface. A thrower's wheel can be rotated slowly, but a small, light-weight turntable cannot function as a thrower's wheel. Late Bronze Age "Midianite ware" of Northwest Saudi Arabia was possibly made on a large wheel capable of momentum, but without fully utilizing the fast wheel to its potential. Instead, it was used as a slow moving turntable to create small and large containers (Kalsbeek and London 1978: 54). Foster (1959: 112) presents ethnographic data that offers parallel instances of potters who possess a kick wheel, but use it to coil-build pots. Similarly, in ethno-archaeological studies of traditional craft specialists in the Philippines and in Cyprus, potters presented with the possibility of working with a fast wheel, chose not to use it. The wheels were brought in both instances to the communities by well-intentioned potters from other countries. In the Philippines, the foreign potters demonstrated the use of the wheel, but the vast quantities of time and water needed for clay preparation hindered its use once the foreigners left (personal observation, London 1981 and 1986).

In the literature, the term "hand-made" contrasts with "wheel-thrown" pottery, but these distinctions are ambiguous and misleading for several reasons. It can be argued that all pottery is handmade, perhaps with the exception of mold-made forms. To differentiate between hand- and wheel-made wares by macroscopic observations, is often beyond the means of non-potters and those not trained in ceramic technology. Fine concentric striations are insufficient evidence to identify pots as wheel-thrown. Similar lines can be achieved on a slow moving turntable or even by rotating a pot in the hand. Wares described as "hand-made" can include any technique other than thrown pottery, such as the use of molds, coils, slabs, turntables, or pinch pots. In addition, potters often work with a technique comprising more than one method. For example, traditional Cypriote potters work with coils and a slow moving turntable (London, Egoumenidou, and Karageorghis 1989: 52–56; London 1989c: 222). Instead of working directly on the ground, a table, or wheel head, potters often use a work surface, or "bat" made of stone, bark, wood, ceramic, cork, etc. With the exception of the pinch pots, making a pot entirely in the hand is a technique normally reserved for the smallest containers.

The shift from wheel-thrown to turntable made pottery is not simply a deterioration of the ceramics industry. Wheel-thrown, thin-walled wares have disadvantages other than stringent drying and firing requirements. They are less practical given the ease with which they break. Experimental attempts to break thick-walled, coil-built jars provides an immediate appreciation for the solidity and durability of the containers. Pots made on a turntable of a lean clay could withstand the various falls, knocks, and drops.

However, in other aspects, the Late Bronze Age wares constitute a decline in the ceramics industry in terms of surface treatment and overall workmanship. Painted patterns carefully rendered during previous periods vanish entirely. Thick, heavy wares replace the thin-walled, elegant shapes of the Middle Bronze Age. However, darkened cores in the walls resulting from incomplete oxidation during the kiln firing do not signal a deterioration of the industry. Rather, it represents the prudent use of fuels and manpower (Franken and London 1996: 218). A higher than necessary firing temperature could at times result in a pocked surface appearance due to the decomposition of lime found in the clay such as in terminal Late Bronze Age wares from Lahun (van As and Jacobs 1995: 17). Whereas, heavy, white firing slips provided an adequate surface for painted potters at the beginning of the Late Bronze Age, towards the end of the Late Bronze Age, the slips became thinner and, if the temperature exceeds 825 degrees Centigrade, the lime in the clay under the thin slip popped, thereby creating a pocked surface. Similar circumstances have been documented previously for the Late Bronze Age wares found at Dayr 'Alla (Franken and Kalsbeek 1969: 172 74). Many factors contributed to the decision of potters to eventually stop painting pots and reduce kiln firing time (Franken and London 1996).

Techniques of Fabrication

Most Late Bronze and Iron Age ceramic assemblages include pottery made in more than one manufacturing technique ranging from the use of coils, slabs, pinch pots, molds, and throwing. A technique can coincide, at times, with a particular pot type and/or size. The pinch pot technique, although best exemplified by the Neolithic wares such as found at Jericho, remained a useful technique for small pots throughout antiquity. Molds are always ideal for round bottomed and/or large open forms. Slabs best accommodate rectangular containers. Coils and throwing are among the more versatile techniques.

Coiling: To coil-build a pot involves the use of rolls of clay which are added one on top of another, gradually increasing the height of a pot. Often a potter is obliged to wait until one coil dries sufficiently, but not entirely, before the next coil can be added. Coil joins can be smoothed away, but many remain visible on the interior of closed vessels. Potters can also use coils as one step of a manufacturing technique which also involves "turning" or thinning. After creating a flat-bottomed form from clay coils on a turntable, the incomplete pot dries slightly. At the appropriate time, the pot could be returned upside-down to the turntable to scrape away excess clay from the lower body and for base shaping (Figure 3.1, and see below).

Coils can also be applied in a solid mold in a spiral pattern emanating from the center of the mold. Alternatively, potters can place a large circular flat slab of clay in the bottom and up to the edge of a mold and then add coils to increase the height above that of the mold. The latter technique characterizes late second millennium cooking pot manufacture.

Pottery made of coils can sometimes be identified by the coils' joins visible in the cross section of a pot. In such instances, one can measure coil size to compare with other pots from the same site and elsewhere. Direction of the coils can also be ascertained and compared when possible both for pots within and between sites. Coiled pots often have an irregular overall feel when handled. Some coil-built pots break along the coil lines, thereby, providing evidence of their manufacture. Coils are often added to an open form made on a turntable, as described above. The result is a combination technique useful to create open and closed forms. In such vessels made by a combination technique, coil breaks are discernible only on the upper part of the bowl. Coiled shapes include almost all pottery forms, such as jars, bowls, juglets, cooking pots, etc.

Pinch Pots: A ball of clay opened by inserting a thumb in the clay creates an open form in the shape of a hemispherical bowl. To work the clay and open and thin the wall, the potter rotates it in the palm of one hand. The maximum size of the bowl corresponds with the hand size of the potter. This technique is most suitable for small open forms, including miniature vessels, votive offerings, and toys. In the pinch-pot technique, the clay expands outwardly into a bowl form, but it is problematic to control the clay to close the shape. To create a closed pinch pot, such as a juglet, normally requires joining two bowls together and then adding a separately made neck.

Slabs: Similar to coil manufacture, slabs are used to construct large, oversize, and/or rectangular forms. This technique involves the use of individually-shaped rectangular slabs of clay rather than coil rings. Large vats, coffins, storage jars, and baths, given their size and intended use, are most suited for slab manufacture. In a photograph of the coffins from the Raghdan Royal Palace Tombs in 'Amman, the almost straight pattern of vertical and horizontal cracks vividly reveals slab manufacture (Yassine 1988: 43, Pl. 1). Coffins associated with the Philistine material culture often display rectangular break patterns typical of slab manufacture.

Molds: External and internal supports or molds are useful for the manufacture of large open and closed forms. Mold manufacture is also an efficient way to construct vessels with rounded bottoms. Another advantage is that the mold can serve as a rotating work surface as well. Potters can spin the mold with one hand and work the clay simultaneously.

Cooking pots of the terminal Late Bronze Age were made in a mold and, in contrast to most other shapes, maintain their integrity into the Iron Age despite developments elsewhere in the ceramics industry. Potters completely lined a fired clay or stone bowl with a thin circular slab of clay. The clay, disc-like shape came up to the rim of the mold. To increase the height and to shape the cooking pot, the potter added a coil(s) and formed into the rim (Fig. 3.2). The point of carination of cooking pots, a natural point of breakage, marks the end of the mold and the first coil join.

Another mold-made form is a wide and heavy bowl of Iron Age I. It has been identified at Dayr 'Alla and runs from Phase F up to the eighth century when it disappears from the repertoire. Rim diameters range from 40–60 cm and the bowls are twice as wide as their height. A thick circular slab of clay was placed into a mold above which a coil was positioned and shaped into the rim. At first, the bowls were completely burnished, but subsequently this laborious practice was limited to the interior vessel alone. Franken associates this large vessel with the traditional "mansef" or feast bowl used for special occasions (Franken and Kalsbeek 1969: 157–60). Platters of Early Bronze II were constructed in a similar fashion (London 1988: 119). Mold manufacture is one of the best ways to shape large, wide open vessels regardless of time or place.

Turning on a turntable: The technique of turning pottery involves creating an initially thick form that will be thinned or "turned" down at a later stage in the manufacture. In this type of interrupted manufacture, different parts of the pot are completed throughout the course of hours, days, or weeks, depending on the weather and rate of evaporation of the water from the clay. To shape a pot on a turntable versus throwing a pot on a wheel, requires procedures that would leave different evidence in the wet clay.

Potters start by positioning a cylinder of clay on the turntable work surface. They insert a finger or knuckle into the clay to open it and then expand the hole with one hand, while rotating the turntable with the other. During this initial stage of manufacture, *the vessel rim receives its final form*. After cutting off and removing the pot from the turntable, it is set aside to dry. After the walls dry somewhat, the pot is replaced upside-down on the turntable to allow the potter to very carefully scrape away the excess clay. This task requires the skill of an experienced potter to avoid excessive scraping, thereby making a hole in the wall or creating a pot of uneven thickness. The latter would impede the drying stage and result in cracking during the subsequent firing stage. Once the lower exterior body has

been thinned or "turned," a small coil is added to the base to create a ring base. Disc bases are carved directly from the excess clay of the lower body. In the event that the potter accidentally removed too much clay while scraping the walls, the entire base at times was cut away and replaced by a wet clay, heavily tempered with organic material such as dung (Franken 1992: 153). A clay rich in organic material would dry faster than a more dense clay. In order to be worked into the base, wet clay was required. To enable it to dry as fast as the rest of the pot, the use of a heavily tempered material was necessary. For a higher trumpet base, a cylinder was shaped on the turntable to create either an open or solid form that was then applied to the lower body.

Lamps were made from a small lump of clay on the turntable or perhaps from a cone of clay affixed to the turntable. After shaping the body while rotating the turntable, the nozzle was pinched and the lamp was cut off with a thick lower body and set aside to dry. Once the rim was dry enough to allow handling, the potter scraped away excess clay while holding the lamp in the hand. Irregular striations across the base resulted from this operation. They were smoothed away or occasionally left as evidence of the workmanship.

Turned or thrown from a cone: A satisfactory technique to quickly create small vessels, open and closed, or to shape part of a pot made in an interrupted technique, involves positioning a large cone of clay from which a series of pots could be shaped. This best accommodates small bowls, juglets, and accessory pieces that can be shaped one after another without the need to center small amounts of clay for each pot. Another advantage is that the weight of the clay on the wheel helps to maintain momentum between each pot. In this case, a turntable not normally used to throw pottery acts as a thrower's wheel. After shaping a vessel, potters cut it from the cone with a knife or string and allow it to dry.

Throwing: To throw pots on a fast-rotating heavy wheel capable of momentum, requires that two hands be free to manipulate the clay to create the desired shape. This technique, known from earlier times, did not persist into the Late Bronze Age in the region of 'Amman or, for that matter, throughout most of Jordan and Israel. Rather than the thin-walled thrown pots of the Middle Bronze Age, thick-walled heavy wares predominated as potters returned to the use of coarse lean clays in place of more plastic clays. Not until the Iron Age II did the art of throwing reappear on a large scale, perhaps as a result of Assyrian influence (Franken 1991. 75 and 80). It was at this same time that cooking pots were first thrown rather than mold and coil built. Throwing involves the use of support potters and assistants who devote extra time to clay preparation. Ultimately, throwing allows a potter to increase production, which can reduce costs in the long run.

With the thrown pottery came changes in the clays and non-plastics. Heavily-tempered, lean clays were replaced by those with smaller inclusions, even for cooking pots which had remained unchanged for millennia in terms of the preferred tempering material. Coarse calcite tempering in cooking pots, a tradition known for thousands of years in the region (Beynon et al. 1986), was replaced by fine grained quartz and calcite when for the first time cooking pots were wheel-thrown and no longer depended on the mold which had influenced the shape for centuries (Franken and Steiner 1990: 107). Cooking pot shape changed from wide and open (mold made) to high and narrow mouthed (wheel thrown). At the present, a precise date for the return to wheel-thrown wares would be misleading. Detailed studies of seventh century B.C.E. wares from central Jordan will eventually provide a date.

Following the general description of pottery production, attention turns to specific aspects of central Jordanian Plateau Late Bronze and Iron Age pottery: the re-emergence of burnished surfaces; collar rim store jars; the return to wheel throwing; and the repertoire, itself. Each of these subjects is briefly discussed below.

Burnished and Slipped Iron Age Wares

Burnished, compacted and shiny surface treatment characterizes certain Iron Age pottery. When did burnish begin, and when did it become a prominent feature, are issues debated in the literature (Holladay 1991) and are of chronological concern for those involved with the construction of pottery typologies. There are no simple answers to these questions because burnished surfaces include many categories. Burnishing, as part of the surface treatment, can be the intentional compacting of the pottery surface that is fired to an appropriate temperature resulting in a sheen.

Kelso and Thorley (1943: 105) record the loss of burnish sheen at 970 degrees Fahrenheit for Tall Beit Mirsim Iron Age wares. My experiments with a European clay resulted in a high sheen when

fired to 750 or 800 degrees. At 850 degrees the surface became less shiny and by 900 degrees the sheen had almost disappeared.

As part of the shaping process, unintentional burnish, as noted above, is a product of surface compacting due to scraping away clay to thin a partially dry pot. If fired correctly, a surface sheen will result. Intentional or not, in both instances a compacted surface will lack a sheen if the pottery is under or over fired. Nevertheless, the pottery was burnished, i.e., the surface particles were rubbed, compacted and aligned in one direction. Intentional or otherwise, the burnish can cover the pot or be limited to a pattern, either on interior or exterior. Interiors might be burnished intentionally to create a smoother, harder surface against which utensils would scrape. Alternatively, the exterior might be intentionally burnished to enhance its aesthetic appeal. Burnishing limited to the mid- and/or lower-exterior surface suggests that it represents a final phase in the shaping and thinning of a pot to remove unwanted clay. Given the wide range of possibilities, variation, and sources of burnishing, it is difficult to pinpoint a date at which it started.

Often an intentionally burnished surface is first slipped. Although one might conclude that it would therefore be easy to distinguish between unintentional and intentional burnishing, i.e., the presence of a slip reveals purposeful burnishing, slips are just as difficult as burnish to discern with the unaided eye. Slipped and burnished (rubbed and compacted) surfaces might lack the burnish sheen due to improper firing. To assess the presence or absence of a slip is not always readily apparent unless the slip is thick and of a different color than the pot. Like burnishing, slips are both unintentionally and intentionally applied. They consist of the finest clay particles, usually made of the same clay as the rest of the pot or another clay that adheres well to the surface. Coloring agents can be added. Slips, thick or thin, can be applied in a number of ways.

Unintentional slips are the result of the final smoothing and finishing stage in the manufacture of certain other pots. After shaping a pot, the potter might dip his/her hands into the container of slurry water used throughout the manufacture to lubricate the clay, and then cover the pot with dripping wet hands-wet with water and the finest clay particles held in suspension-thereby creating a slip layer, intentionally or otherwise. As a result, like burnish, slips present a challenge for non-potters to recognize.

Regardless of the earliest intentional or unintentional slips and burnishes, there is little reason to assume that they will appear simultaneously throughout a region. The presence of burnish in particular implies a new manufacturing technique rather than a new surface treatment. A change in slip material, for whatever reason, was one factor in the deterioration of painted designs on Late Bronze Age pottery. Without a suitable slip, i.e., with good adhesion, the paint and slip flaked away from the wall. The solution which the potters found involved a change in the manufacture rather than simply a change in the surface treatment alone. The potters thinned and scraped the thick walls to remove the salt deposit that both reduced slip adhesion and masked the true colors of the paint. The thinning process led to an unintentional burnish whose aesthetic value made it a desired feature of Iron Age pottery. While archaeologists discern a new surface treatment, burnish originated as part of the shaping process which contributed to resolving the poor quality wares of earlier pottery. However, it did not become the best solution until all factors came into play, including scraping at the right time of clay dryness, and proper firing conditions and temperatures. In every aspect of the work, each decision taken by the potters influences successive stages of the work. The final product is the result of repeated trial and errors, experimentation, mistakes, and luck.

Iron Age I Collar Rim Store Jars from Tall al-ʿUmayri

During excavations at Tall al-ʿUmayri, Douglas R. Clark found around 40 collar rim store jars in an Iron Age I pillared building (Fig. 3.3). This unusually large assemblage merits detailed analysis. In addition to the jars, the well-preserved building contained six bronze weapons, and the disarticulated skeletal remains of two men (Clark 1996: 241). One jar held carbonized barley (Clark 1994: 145). Although a considerable literature exists about collar rim store jars (Esse 1992), they nevertheless have remained unknown in terms of their manufacture and production. Yet, at ʿUmayri, the large number of jars enables a systematic study of their manufacture which is currently underway at Walla Walla College. This is the only late second millennium vessel type found in sufficient numbers at the site to allow an assessment of its manufacture. Aspects being examined include the details of the manufacturing techniques and variation and characterization of the clays, evidence of the work of individual potters, firing technology, and standardization of size and shape. Given its relatively wide distribution, temporal and geographic, diversity of vessel form is predictable. The immediate implication is that, at any given time, the jars were made in different places by different potters, using diverse manufacturing techniques and clays.

For the ʿUmayri collection, variety in rim forms, collar (number [1 or 2], shape, size, and position), clay, handles, marks incised in the wet clay, overall vessel proportions and volume differentiate the jars (see Clark 1994: 144; 1997: 65–75 for variety of rim and collar forms). Both, pithoi, i.e., large non-movable storage containers, and smaller jars are present. For Dayr ʿAlla, common store jars averaging 40 cm in height, van der Kooij and Ibrahim (1989: 50) conclude that, once filled with liquid or grain, they too would have been too heavy to carry or transport. Esse (1992: 96) inferred that wherever the collar rim store jars are found in quantity, they must have been produced locally given their considerable weight. He also notes that a nearly complete jar from Megiddo weighed over 32 kg when empty. Wengrow (1996), however, views the jars primarily as transport containers. Zertal (1988: 351) assessed the capacity of the jars to hold 150–200 liters of liquid which is three or four times the volume of a regular store/transport jar.

Distribution

Collar rim store jars are well documented in the hill country west of the Jordan River and in northern Israel. In Jordan, examples are known from various sties within the region under discussion. For example, Ibrahim (1978), and more recently Ji (1995), have presented a survey of the jar distribution in deposits associated with public storage or domestic structures rather than in temples, tombs, or royal residencies. For this reason, the jars are rare in the lowlands of Canaan where domestic deposits are rare (London 1989: 44). In contrast, in hill country rural settlements and at non-residential sites characterized by public rather than private architecture, examples of the jars are known. Although some jars are inevitably found in urban settings, this does not negate their primary function as storage containers in rural and public sites. Rather than diagnostic of an ethnic entity, the jars indicate the function of a site, but not the identity of the people who used them.

Characteristics of the Manufacturing Technique

Research on the characteristics of manufacturing technique is still in progress. Thus, a final description is not yet available. It appears, nevertheless, that more than one technique is in evidence. This may be due to the fact that the collection comprises both small and large jars or pithoi. A mobile work surface or turntable was used for the jars, especially during the early stages of the work. The shaping of the jars required a combination of coiling and turning in an interrupted technique of manufacture. It could have taken one or two weeks to complete each jar, but the potters could have worked on more than one simultaneously. If the potters can work on multiple pieces simultaneously, they use their time more efficiently. The lower portion of a small jar with a conical base appears to have been made of the same clay and fired to the same color as collar rim store jar #7 Perhaps this implies that while the collar rim jar was made, other vessels were made as well. The lengthy fabrication would have been necessary due to: (1) the thickness of the walls which would have required days to dry; (2) the relatively modest quantity of non-plastics which facilitate rapid drying; and (3) the step-by-step production of the base, body, shoulder, and rim. In the transitional seasons of spring or late in the fall, when there might be occasional rainfall or a hailstorm, the clay would dry more slowly than during the height of the dry summer season. Following each stage of work, the clay needed time to dry to become sufficiently hard to support the weight of the fresh wet clay added to it. More than one person was probably involved with the shaping, lifting, and moving of each pot given the heavy weight of the clay, especially when wet.

Other than coils, an alternative technique to create pithoi (if not thrown) is with clay slabs set in place in a technique similar to brick construction. Evidence of slab manufacture is normally visible in the grid-like break pattern since pots constructed in this manner tend to crack along the lines of the slab joins, much like the coffins mentioned above. In contrast to this technique, the ʿUmayri pithoi are coil-built, using a turntable. One characteristic of coil-built containers is variation of wall thickness throughout individual pots. For the ʿUmayri pots, vessel wall thickness can vary from 6–16 mm over a distance of only 12 centimeters. To control clay this thick and uneven, to ensure even firing, and to prevent collapse of the clay when wet, demanded skills and procedures not necessary for other vessel forms.

Many variations exist within coil construction. Coils can be long/short, thick/thin, applied on the interior/exterior or on top of each other, and clockwise/counterclockwise. If the adhesion is good, pots will not break along coil joins. Normally, adhesion is not a problem since lean or short clays, i.e., those containing abundant inclusions, are ideally suited for coil work. The inclusions range from fine to large in size and include rocks, minerals, grog, and the voids of organic material. For the ʿUmayri jars, the paucity of large inclusions (equal to wall thickness) and the relatively small quantity of non-plastics is striking. Mineralogical testing of the clay underway follows an initial test group which included collar rim jars among others (London, Plint, and Smith 1991 434).

The Body. Evidence that the jars were built slowly over the course of many days is seen in the wall thickness and the small size and shape (rounded, conical, and flat) of the bases. It was not possible to build a jar all at once from base to rim. Observations of the coils' break patterns, movement of the clay, wall thickness, striations and surface impressions, and finishing procedures, imply that the following steps were undertaken to construct each jar. First, the lower body was roughly shaped into a very thick solid form several centimeters high to which coils were added to increase its height as the clay stood on a turntable or rotating surface. A drying period followed before more coils could be added. This was followed by another drying period. As the jar rose in height, the clay wall tended to expand outward. To prevent excess outward expansion and to help shape the pot, ropes, fibers, and strips of anything organic were tied around the lower body to serve as a soft, exterior support. At a later stage in the work, the ropes, etc. would be removed, but their impressions would remain in the clay, even after it was fired.

The lower body wall of the collar rim jar is uneven and varies widely within individual jars. One of the thinnest areas appears to be at mid-body and/or below the shoulder. This area may well have been shaped by adding a coil that was then thinned and smoothed as the vessel rotated on a turntable. The turntable at this point may have rotated almost like a fast wheel due to the weight of the clay, thereby allowing the potter to create a thin wall of even width. After drying somewhat, another coil was added to shape the shoulder, which is one of the thickest parts of the upper body (for jar #14, the shoulder measures 1.5 cm, whereas the wall below thins to 1 cm before thickening again to 1.4 cm). As the potter forced the clay to close toward the neck, ripple marks of collaring are discernible on the interior. The potter had little control over the thickness of the shoulder wall. Of greater concern was forcing the clay inwards to narrow the opening for the neck. Additional ropes were wrapped around the upper body, just below the lower handle join of jar #14 to help prevent the clay from expanding outward. Indentations of ropes are clearly visible, as is the coil join below the upper handle attachment. After another drying period, one or two coils were added to shape the neck and rim.

The Rim. Rims are thickened on the exterior. Some collars on the shoulder appear to have been made from the extra clay available after forming the rim. Once the rim was finished and shaped as the vessel rotated, the potter pushed down the excess clay to position it on the shoulder in the form of one or two collars. Only infrequently does the collar appear to lift off the shoulder as if added separately. The last step for the upper body was to add the handles and perhaps impress a mark into them. Thumb impressions can be on the top as well as the bottom of the handles. Some handles clearly were made of clay containing extra organic material to facilitate rapid drying. The challenge was to have the thick handle dry at a rate comparable to that of the drying thinner walled body. Poorly timed drying would cause the handle to detach. One jar from the collection has a large pre-firing design on the shoulder.

The Base. The final stage in the process was to complete the base. Once the rim and entire upper body were finished, the jar was turned upside-down to enable work on the base and lower body. More than one person was needed to lift the jar at this point. Although the rim and upper body were dry enough to support the weight of the jar, the base, which remained closed from all air circulation, remained moist and wet. At the present stage of the research there appears to be evidence of more than one method for finishing the base, but further study is required to clarify the variations. Two major differences are thick versus thin bases. Potters had the option of leaving and using the thick clay of the original base and adding to it, or thinning it, or removing it entirely. For some jars, the evidence is clear that the wet clay of the initial base was cut away to create a hole and then filled with a plug of new clay heavily tempered with organic materials. As the turntable rotated, a thin walled

base was fashioned. An abundance of small rectangular voids from burned-out organics characterizes the new clay and base in contrast to the lower body. On the interior of such bases, one sees slightly irregular wide spirals coinciding with the heavily-tempered added clay. Often the clay looks as if it was worked with quite wet hands. There are significant differences in the wall thicknesses of the lower body and base. For jar #17, the area immediately above the base measures 0.8 cm, while the center point of the base measure 1.5 cm in thickness. Precisely where the wall measures 0.8 cm, there is a slight bulge and a break line representing the new clay "plug" added for the base. Certain smaller jars have a well-turned, extremely thin base, as if rotated upside-down on a turntable. However, there is still a considerable discrepancy and irregularity in the overall wall thicknesses.

To shape other bases, rather than cut through and remove all of the lowermost clay, some original clay was preserved to which additional clay pancakes were added. For yet other jars, whose bases measure over 3 cm in thickness, rather than remove clay, which perhaps had already dried in place, potters added thick layers of additional clay. Above the base, on the interior lower walls of another jar (#18), there are indications of horizontal and concentric striations and rotation to the extent that the voids of non-plastics became clearly oriented in a single direction. Yet, on the exterior, in place of horizontal striations, are oblique strokes and drag marks as if the exterior lower body was treated entirely different than the interior.

One further scenario for creating the base involves the use of a mold. For certain examples, a grainy and rough exterior surface was noted by potter T Emmerson of Walla Walla College, who suggests that this was intentional to prevent the base from sticking to the mold. The mold would have enabled the potter to rotate the pot, especially during the early stages of base and lower wall manufacture. Initial use of a mold would have allowed the potter to completely finish and smooth the interior base as appears to have been the case in some examples. A mold would also allow the clay of the base to remain thick and wet during the early manufacturing stages until the potter was ready to turn the vessel upside-down to thin and shape the base. Emmerson (personel communication 1996) also suggests that perhaps some bases remain extremely thick (5.6 cm) because the clay became too dry and it was too late to thin away the extra clay.

Significance of the Differences

Given the potentially long period of use that large jars and pithoi can have, spanning 100 years if not more (London, Egoumenidou, and Karageorghis 1989: 70), we perhaps have jars made in successive and/or overlapping manufacturing techniques. Once positioned in a depression dug into the floor, the jars probably were not moved frequently, if ever. A cracked pithos base might have remained in place while a new jar was nestled into the same space. Alternatively, pithoi of the assemblage were all made roughly in the same era, but represent nuances and distinct differences in the techniques and clays used by various potters. Esse (1992: 100) considered the jars as "most likely the product of a specific potting tradition, probably dominated by female potters and, in some cases, spread through exogamy and thus-kin based." While it is possible that diversity in the 'Umayri assemblage reflects the work of potters who were related to each other in some way, evidence regarding their gender is, at present, lacking.

Repertoire of Ceramic Containers

Late Bronze and Iron Age pottery, known initially from isolated tombs and unstratified deposits, is now better represented at more recently excavated sites (Herr 1995). The work of Lugenbeal and Sauer (1972), who published Hisban sherds immediately after the field work, had a significant impact on Iron II studies in both Jordan and Israel. Dornemann (1983) has compiled representative tomb and non-funerary Late Bronze and Iron Age sherds and pots throughout Jordan, including the 'Amman area.

Late Second Millennium B.C.E.

At the present, Late Bronze Age pottery remains less well represented in central Jordan in contrast to later Iron Age material. Imported Cypriote and Mycenean wares, the hallmark of the Late Bronze Age, are present, but not in large numbers. Certain painted shapes seem to mimic imports, especially Cypriote bilbils, and painted sherds from unstratified contexts in the 'Amman Citadel represent

local versions of the Late Bronze tradition of pottery painting (Dornemann 1983: 21–22). As for non-imports, Dornemann (Ibid.. 31ff.), relates the assemblage to that of Israel. Among the Jordan Valley Late Bronze Age material from Dayr 'Alla, the majority (70–75%) is made of local clays, while Franken attributes the "foreign" pots, which are a feature of the site throughout its history, to people coming to the site from elsewhere to celebrate its sacred significance (1992: 113–4). Characteristic forms include deep bowls, twice as wide as high with a ring base, gentle carination of the shoulder and a rim rolled to the exterior (Franken and Kalbeek 1969: 133). Small, thinner walled bowls are present in a wide variety of rim types. Cooking pots are mold-made which replace the typical Late Bronze flaring rim version.

At 'Umayri, the typological analysis of the LB I Age pottery reveals a lack of continuity with the Middle Bronze repertoire, as well as few parallels beyond Transjordan, which Herr (1997· 233) attributes to the regionalization of pottery production. He further notes that this is particularly true of the cooking pot, for which he has not identified similar forms elsewhere. Even at our preliminary stage of the research on 'Umayri Late Bronze Age wares, this supports the idea that cooking pot technology developed differently in Israel and Jordan during this period. Cooking pot rims at 'Umayri are everted with an exterior ridge and concave interior, perhaps intended to hold a lid (Herr 1997· 236). Jugs include those with flaring rims and some paint. Kraters and carinated bowls are not common, although shallow bowls, often covered with a cream to pink, streaked slip, are representative in contrast to the less often slipped deep bowls (Herr 1997· 234–35).

At 'Umayri, a painted biconical jug of Late Bronze Age type represents an import to the site, based on petrographic analysis (London, Plint, and Smith 1991. Fig. 23.1:6). This type is most frequent along the Levantine coast (Amiran 1969: 147). An Iron Age I flask with a pie-shaped painted pattern finds a parallel in the 'Amman Nuzha and a Madaba tomb collection rather than any from Israel (Herr 1991. 243). As for undecorated wares, 13th–12th century deposits which Clark (1994) exposed, include the large collection of collar rim store jars, described above. Rather than repeat the tomb finds, whose date and origin are always debatable, the reader is referred to the study of Dornemann (1983: 31ff.).

Early First Millennia Pottery

Tenth–ninth Centuries: Pottery of the tenth and ninth centuries is not as well documented as the late second millennium B.C.E., at stratified sites in the 'Amman region. However, outside the immediate region, in the Jordan Valley, at Tall Dayr 'Alla, Franken and Kalsbeek (1969) describe early Iron Age pottery which is rarely decorated other than the pilgrim flask (Franken 1991: 80).

Eighth Century: For eighth century pottery from the central Jordanian plateau at Tall al-'Umayri, Herr (1989: 302) detects antecedents from the tenth and ninth centuries ceramic traditions for certain forms. Other forms, however, display greater similarity to the late Iron II corpus designated as Ammonite. Both wide and narrow mouthed (with globular body) cooking pots are present. The former have thickened rims with a ridge below. Bowls include a category of thin, shallow fine wares which Herr (1989) defines as an "Ammonite plateau form," known from 'Umayri and the 'Amman Citadel. Another bowl type is the simple hemispherical form. Kraters with a holemouth thickened elongated rim, characterize 'Umayri and the 'Amman Citadel, as does the basin, a form found in abundance at 'Umayri. Holemouth pithoi with bulbous thickened rims have shoulder ridges (Herr 1989).

Franken characterizes eighth and seventh centuries pottery from Dayr 'Alla as international in character and strongly related to West Bank ceramic traditions (Homès-Fredericq and Franken 1986: 171–74). Burnished pottery is abundant until throwing became common. Throwing not only produces in a thin-walled vessel, it is also faster than turning and often results a form pleasing to our sensitivities. Potters who did not throw pottery would have not been able to compete with the new technology. But even before the appearance of wheel-thrown pottery, small burnished bowls and cups with straight, nearly vertical walls and handles attached to the cup rims were excavated at Dayr 'Alla (Phase G). Burnish strokes on the interior and exterior obscure all evidence of turning, and Franken is not convinced that they were thrown despite the thin walls and plastic clay. Made of clays not typically of the Dayr 'Alla region, Franken notes the abundance of such pots in a Madaba tomb, implying a workshop perhaps in the region of ancient Ammon (Ibid.: 163–64).

Another collection of small, wheel-thrown cups recently excavated at Tall al-'Umayri consists of seven stackable cups which were thrown

from a hump and date to the sixth century (Herr et al. 1996: 65; London and Clark 1997· Fig. 16). The cups were cut from the hump with a piece of string, leaving concentric circles clearly visible. Along with the cups were thin walled bowls with triangular-shaped rims, hemispherical bowls, and flat-based lamps. The small ridge below the rim characterizes all of the bowls and cups. Although small in size, the cup walls are thicker than those of the bowls. The flaring-walled bowls display wide-spaced, narrow burnish strokes on the interior.

The first wheel thrown cooking pots at Tall Dayr 'Alla were excavated in Phase G onwards. In addition, there were wheel-thrown jars and lamps which were thrown from the cone (Franken and Kalsbeek 1969: 145). However, terminal Late Bronze and Iron I–II cooking pots from Tall as-Sa'idiyya were always made from a slab of clay which was pressed into a mold to which coils were added (Vilders 1993: 149–50). In contrast to the Late Bronze Age cooking pot, a turntable was used to finish and smooth the exterior of the Iron Age cookers. This erased evidence of the manufacture (Vilders 1993: 149–50). One consequence of the smoothing procedure is a rounding of the shoulder area, resulting in a less distinct point of carination between neck and shoulder regions. The co-existence of more than one way to make cooking pots implies multiple contemporaneous sources. Vilders (1992c: 77) concludes that four different fabrics and four technological types are represented among cooking pots varying in rim and body shape, with both wide and narrow mouthed versions.

Seventh Century: Excavations in progress at 'Umayri have enabled Herr (1991; 1995) to identify an Iron Age II assemblage as "Ammonite," in that it seems to predominate within the seventh century boundaries of ancient Ammon as defined in the literary sources. Herr presents a corpus that includes necked jars and holemouth jars with thickened rims curving inward sharply from the body, similar in form to those known in Israel of late Iron II date (Herr 1991. 303; Fig. 3.4:1–7; 8–10). In fact, the seventh century repertoire as currently known, while most comparable to early Hisban pottery, also displays similarities with Tall as-Sa'idiyya in the Jordan Valley as well as sites farther away in Israel. However, another type of necked jar with a narrow opening, triangular thickened rim, and grooves on a nearly vertical neck, known from both 'Umayri and Hisban, is limited to the Ammonite plateau of the seventh century (Lugenbeal and Sauer 1972: #428). A similar necked jar, now with a markedly sloping neck, again is characteristic of the Ammon plateau sites in particular (Lugenbeal and Sauer 1972: #433). A handleless small jar with pointed base and thickened rim from 'Umayri, corresponds to mid-late seventh century material from the Adoni-Nur tomb in 'Amman. Jars with triangular folded rims of narrow diameter and a larger body than the rim characterize seventh century 'Amman sites. A short pot with a squat body, triangular rim, high handles and rounded base is another jar form (Fig. 3.4:11). Narrow and wide mouthed jugs have crescent shaped and thickened rims. Cup-like rims are present (Fig. 3.4:12). At 'Umayri, painted amphoriskoi with incurving rims, a long neck and a single ridge at the upper handle attachment have the stepped base typical of this period (Fig. 3.4:13, 14). The paint, consisting of three sets of three horizontal lines at the rim, neck, and below the handle, compares with a jar known from an 'Amman tomb (Herr 1991 304). Dipper juglets with cylindrical bodies, high necks, and slightly thickened rim are of a type known throughout Jordan and Israel (Fig. 3.4:15). Juglets with globular bodies, flat simple rims and everted necks are similar to those from the Jordan Valley sites (Ibid. Fig. 3.4:16). Two more unusual forms from the "Ammonite" citadel at 'Umayri include a sloping necked decanter and a rhyton in the shape of an animal's head (Fig. 3.4:17, 18).

Along with bowls in a variety of shapes and rims, certain shallow bowls with inset or stepped rims known (Fig. 3.4:19–26) from 'Umayri, Hisban and 'Amman are thought to characterize the region of 'Amman, but not the Jordan Valley sites (Herr 1989; 1991). Another small fine ware bowl with a simple rim and exterior ridges (Fig. 3.5:1–7) is known from the Ammonite sphere, both the plateau and the Jordan Valley ('Amman, Hisban, 'Umayri and as-Sa'idiyya). A bowl with an out-flaring rim and grooves above a slight carination is found exclusively on the Ammonite and Moabite plateau at 'Amman, 'Umayri, Dhiban (Ibid.. 305; Fig. 3.5:8). Bowls with a holemouth type of thickened rims are present. A black-burnished, shallow carinated bowl with everted rim and stepped base found at 'Umayri, is comparable to an example found at Tall Batash in Israel (Kelm and Mazar 1985: 100:4). The latter is considered to be an import from the region of 'Amman, Herr (1989: 329 no. 25). Plates typical of the Ammonite area display outflaring, simple rims with identical overall wall thickness of rim and body (Fig. 3.5:9–15). Knobs adorn both kraters and bowls (Herr 1991: 241; Fig. 3.5:16, 17).

Cooking pots are of three types with the majority retaining the wide mouth, thickened rim and ridge below, a form that disappears at the end of the seventh century (Herr 1991: 306; Fig. 3.5:18, 19). Two handles extend from the rim to the point of carination or shoulder. Herr (1991. 306) finds comparable shapes throughout Jordan and Israel. A cooker with a smaller mouth, globular body, and two handles rising above the rounded rim, is known from Transjordan only (Ibid.). Finally, necked cooking pots (Fig. 3.5:22, 23) like those found in Israel, lack precise parallels in Jordan. This has led Herr to conclude that local variations co-existed. Further, toward the end of the seventh century repertoire, wide or narrow mouthed hole-mouth cooking pots with multiple grooved thickened rims continue in use (Fig. 3.5:24, 26). Local parallels are found in 'Amman. Absent during this period is the cooking pot with a marked ridge below the rim. Although common throughout Israel and Jordan from the ninth to seventh centuries, this form vanishes by the close of the seventh century (Herr 1989: 306). The closed, round bottomed, cooking pot with upright rims are less frequent now and in their place is a more squat, wide-bodied pot with a rounded rim lacking a neck and two handles which rise above the rim (Fig. 3.5:27, 28). These pots are known from 'Amman, Hisban, Sahab, and the 'Amman Citadel. The disappearance of the open-bodied cooking pot signals the beginning of wheel-thrown cooking pots. The round, closed bodies of the new forms were no longer pre-determined by the shape and size of the mold. Along with the change in shape and method of manufacture was the necessary change in tempering material. Rather than the age-old use of coarsely-ground, angular, large calcite inclusions, finely-grained non-plastics, both carbonates (such as calcite) and quartz were suitable. Another signal of the change in manufacturing technique and inclusions is the firing color. For the first time, cooking pots can achieve the fully oxidized red color. For Iron II cooking pots with fine tempering from Jerusalem (excavated by Kenyon), Franken and Steiner (1996: 106–7) document the "liberation" of cooking pots from coarse calcite tempering. In the Jerusalem sherds, they have traced the shift to wheel-thrown cookers that initially have a thickened rim resembling the old fashioned pots. However, the ridge below the rim was pulled up to the lip to the extent that a small groove remained between the ridge and lip (Ibid.. 1996: 107). As a final change, thin rims became the norm.

Lamps display one pinch, a wide sloping rim, thin walls and a worked ring or disc-like base (Fig. 3.6:1). In addition, possible examples of closed lamps have been found at 'Umayri (Herr 1989: 309 and 1991; Fig. 3.6:2, 3).

Flat bottomed basins with straight sides and everted rims continue, as do the black-burnished bowls often referred to as "Ammonite" ware (Herr 1995: 618). According to Herr, examples from Tall al-'Umayri illustrate the "Ammonite corpus" representing the Transjordanian plateau and southern Jordan Valley (1991: 214). The earliest appearance of this repertoire, and its demise, remains unclear (Ibid.). Perhaps it did not present itself all at once, but involves the combination of pot types from previous times. Certain forms do continue from the ninth and eighth centuries, while others are new. Although Herr finds parallels to specific shapes in Jordan and Israel, some forms are limited to the Ammonite plateau and Jordan Valley, while still others characterize the plateau alone. Certain shapes found in 'Amman seem to have the best parallels in the Jordan Valley.

As for the repertoire as a whole, Herr notes Sauer's suggestion that the Iron II repertoire continued well after the sixth century. The work of Lugenbeal and Sauer (1972), along with more recent excavations, allows Herr (1991. 242; 1995) to concur with Sauer and provide the evidence confirming continuity of the Iron II repertoire into the Persian Period. Of equal importance is Herr's conclusion (1997· 246) concerning the different developments in Israel and Jordan in terms of pottery repertoires. Whereas a separation has been defined between Iron II and Persian period pottery in Israel, no such division characterizes Jordan, where the late Iron II repertoire continues well into the Persian period. One further inference is that the names that archaeologists devise for ceramic collections are simply labels that transcend historical developments. Continuity of the ceramic tradition is rational from the perspective of the potters who are not inclined to change something that works. Rather than being conservative in nature and unwilling to experiment, potters maintain their tradition for other reasons. Pottery manufacture involves a complex set of choices. Any change in one aspect of the work necessitates changes in each successive operation. Inclusion type and size can require modification of the surface treatment (paint will no longer adhere or a slip might be required; incising might no longer be possible). Another change would be in the firing temperature and length. Finely crushed carbonates can withstand higher temperatures than large, angular calcite crystals. With a new inclusion type or size can come a different shaping technique to build the pot as well. All of

these types of changes occurred to create the new cooking pots. A change in the clay, non-plastics, shape and manufacture of the cooking pots might also signal new developments in the organization of those who made them. While the limited distribution of calcite perhaps restricted their manufacture to a relatively small number of potters with access to the calcite, the use of powdered carbonates and/or locally available materials could signal the involvement of a larger number of potters making cooking ware than previously.

Of the Iron I and II sherds sampled mineralogically by petrographic analysis, a few preliminary statements can be made concerning the origin of the pottery excavated at 'Umayri and the organization of the ceramics industry. Petrographic samples of sherds from 'Umayri and nearby hinterland sites reveal that the same clay matrix (Petrographic Group 5 contains fine-grained carbonates, fossils fragments, and an abundance of elongated and aligned voids of burned out organics) characterizes both, Iron Age II large jars from Tall al-'Umayri, and large containers slightly later in date from Sites 23 and 34 (London, Plint, and Smith 1991. 436). This again confirms the continuity of the Iron II repertoire, both in terms of vessel form, as noted by Herr (1995), as well as clay matrix, into the succeeding era.

Petrographic Group 2, characterized by quartz non-plastics, includes Iron II vessels of diverse typology from 'Umayri and nearby Site 34. The types in this group include a large utilitarian vessel, a double ring burnished bowl of good quality, and a narrow mouthed cooking pot (London, Plint, and Smith 1991. 434 and Fig. 23.1.12, 18, and 19). This group is interesting for several reasons. In contrast to the past, cooking pots are no longer fabricated exclusively from a special clay matrix reserved for cookers. The cooking pot represents the new trend: narrow mouth and non-carbonaceous inclusions. The petrographic group contains both large utilitarian shapes as well as a nicely burnished bowl, i.e., both domestic and fine ware appear to have been produced from the same clay. The implication is that the same potters could make black burnished bowls as well as cooking pots and large containers. Finally, the same clay matrix has been identified for two neighboring sites. Although diversity of pottery types made at individual potteries is implied, this does not suggest that one workshop was responsible for all contemporaneous ceramics. A wide-bodied and wide-rimmed Iron II cooking pot from 'Umayri belongs to Petrographic Group 3, characterized by coarse calcite non-plastics (London, Plint, and Smith 1991. 434 Fig. 23.1.11). This is the old-fashioned cooker identifiable not only by its rim profile, but by its wide diameter and coarse calcite inclusions.

Mineralogical tests indicate that black burnished bowls could be made by potters who used the same clay to shape other forms. However, not all black burnished bowls fall into this category. For example, two sherds designated as "Ammonite" fine ware and black burnished bowls (London, Plint, and Smith 1991. 434 Fig. 23.1.15 and 16) belong to Petrographic Group 6, an undifferentiated collection of sherds which did not fit into the other categories, but remain largely as unique examples. The two burnished bowls contain a high percentage of quartz, but lack the voids of former organic material. It is conceivable that the quartz-rich matrix used to create the fine, thin-walled bowls is similar to that used for other shapes, with one difference, namely, organics were not included. This suggests that a slightly modified clay was used for the fine ware. It should be noted that the two bowls in this category are finer and feature thinner walls than the Group 2 example. One bowl is carinated with an out-flaring rim decorated with concentric burnish strokes, and the other is a carinated bowl with a simple lip above a slightly inset upper body.

A larger sample of store jars and other shapes from 'Umayri and Hisban is presently underway (London in press). For other Iron Age II pithoi, potters' marks made prior to firing in the wet clay are similar to marks found at nearby Tall Jawa. Petrographic analysis of these jars may explain if traveling potters using different clays moved from site to site or if one clay body represents jars fabricated by one permanent workshop whose wares were widely used. To further learn about the organization of the ceramics industry requires that pottery from Tall Hisban be mineralogically sampled, compared and contrasted with that of 'Umayri and its hinterland sites. Mineralogical testing can address whether the similarities reflect a common source for the pottery, i.e., a workshop which distributed its wares to both sites, or several pottery production locations making superficially similar wares. As for small versus large vessels, decorated versus undecorated wares, some black burnished bowls appear to have been made of the same clay as undecorated larger shapes, while the finest black burnished bowls belong to a separate ware type.

Throughout the Late Bronze and Iron Age, potters confronted two situations that they successfully resolved. First, they corrected the late second millennium problem of thick-walled, poorly decorated pottery, by creating thinner walled vessels scraped and shaped in part on a turntable. The scraping solution gave rise to burnished surfaces, a significant improvement over cracking, dripping painted patterns masked by a salt layer on the surface of the pot. Burnish sheen that initially may have been an unintentional benefit of the scraping the wall thin, became a desired new surface treatment which potters learned to control and exploit. Continuous burnish and patterned burnish of numerous types were created. For the latter, no individual strokes are discernible, although this might also be a result of clay type. Some clays are more prone to creating a glossy surface, as on the so-called "Samaria ware." Similarly, for the Early Bronze Age "metallic" wares, mass spectrometry tests confirm that the glossy surface technically can be considered as a glaze, yet, since it is applied in strokes, it is not a glaze (Fischer and Toivonen-Skage 1995: 594). Although the Iron Age burnish may have originated unintentionally, it became a highly desirable surface treatment whose development arose from technological changes in production rather than as a whim or copy of earlier pottery.

The return to a slow turning tournette by the potters in the terminal Late Bronze Age reflects larger, more significant issues, than how pottery was made. A slower wheel implied slower production in contrast to a fast-wheel, mass-produced artifact to serve a society able to support professional potters and the demands of wheel-thrown pottery given the limiting nature of the raw materials.

The second major development was the shift in the seventh century, to wheel-thrown wares, long after the burnishing was fashionable. This development allowed for the rapid manufacture of pottery and accommodated the need to produce large quantities of pots (Franken 1993/4: 49). Perhaps, due to the fast wheel, a smaller number of potteries were able to replace pottery production centers. A change almost anywhere in the line of production impacts all subsequent steps, not only how the pots are made, dried, and fired, but also decorated and distributed, including who made the pots and where. This is not to suggest that there was a sudden complete change with the introduction of the wheel. Manufacture of non-wheel-thrown wares continued just as Herr (1995) notes that Iron II shapes in general persist into the Persian period. Techniques often associated with the Late Bronze Age, such as building pots with coils, slabs, and molds, continue in the Iron Age despite the fast-moving wheels (Franken and London 1995: 219). One technology does not replace another entirely since individual manufacturing techniques often coincide with vessel type, such as coil and slab manufacture for pithoi. The manufacture of cooking pots and the large, wide Mansef bowl represent the continued use of molds to shape wide bodied containers. Coil work continued for jars, large bowls and kraters, but often in combination with a mold or turntable used to facilitate rotating the vessel under construction. Pinch pots were made for toys and other small containers and slabs were used for the largest, bulkiest containers.

There were new shapes, new clays and new surface treatments with the reintroduction of thrown pottery. These co-existed with previous techniques. South of the Ammonite area, in the region associated with the territory of the ancient Edomites, pottery that C. Bennett excavated at the site of Busayra, displays the possible local transition from a slow-moving wheel for turning pottery to a fast-wheel for throwing pottery. Thin-walled bowls containing inclusions characteristic of the region could have been wheel-thrown. Painted patterns using a red and black pigment were developed locally. The dearth of burnishing in contrast to the painted designs, allows one to infer the use of a fast wheel since burnishing was a product of turning and thinning pots made on a slow-moving work surface (Homès-Fredericq and Franken 1986: 169). Wheel-thrown pottery can be made thin initially without the need to rework the lower wall or to cover the traces of the thinning with a time-consuming burnished surface.

Conclusion

To carry out the detailed analyses needed to define local contemporaneous ceramic traditions requires sherds and whole pots in addition to chemical and mineralogical testing. Also needed is a focus on pottery production rather than shape and surface treatment. Burnished surfaces, so characteristic of Iron Age pottery, represent certain shapes and manufacturing techniques rather than simply a desire to create shiny pots. Once a better, faster manufacturing technique became available such as wheel throwing, burnish surface treatment disappears, since it was part of an obsolete system of shaping pots. Given the distance from the Mediterranean economic centers and the diverse geographic regions within Jordan, one can conclude that ancient society in central Jordan maintained a local pottery industry that not only absorbed innovations from elsewhere, but also introduced new ideas, techniques and improvements of its own.

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Fig. 1.1 Map of Ammon with sites listed in text

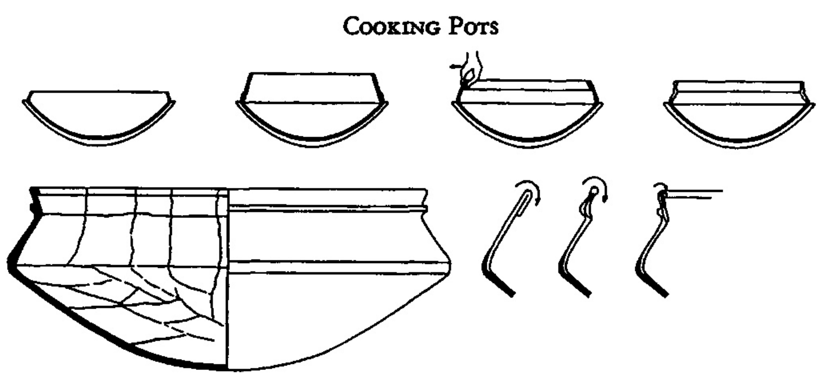

Fig. 3.2 Manufacture of Late Bronze Age cooking pots initally involved lining an external mould with clay. To increase the height, coils were added to shape the rim. Afterwards, when the clay was sufficiently dry, the exterior base was smoothed. Drawing reproduced with permission of the author, from H.J. Franken and J. Kalsbeek, 1969, *Excavations at Tell Deir 'Alla*, Fig. 26.

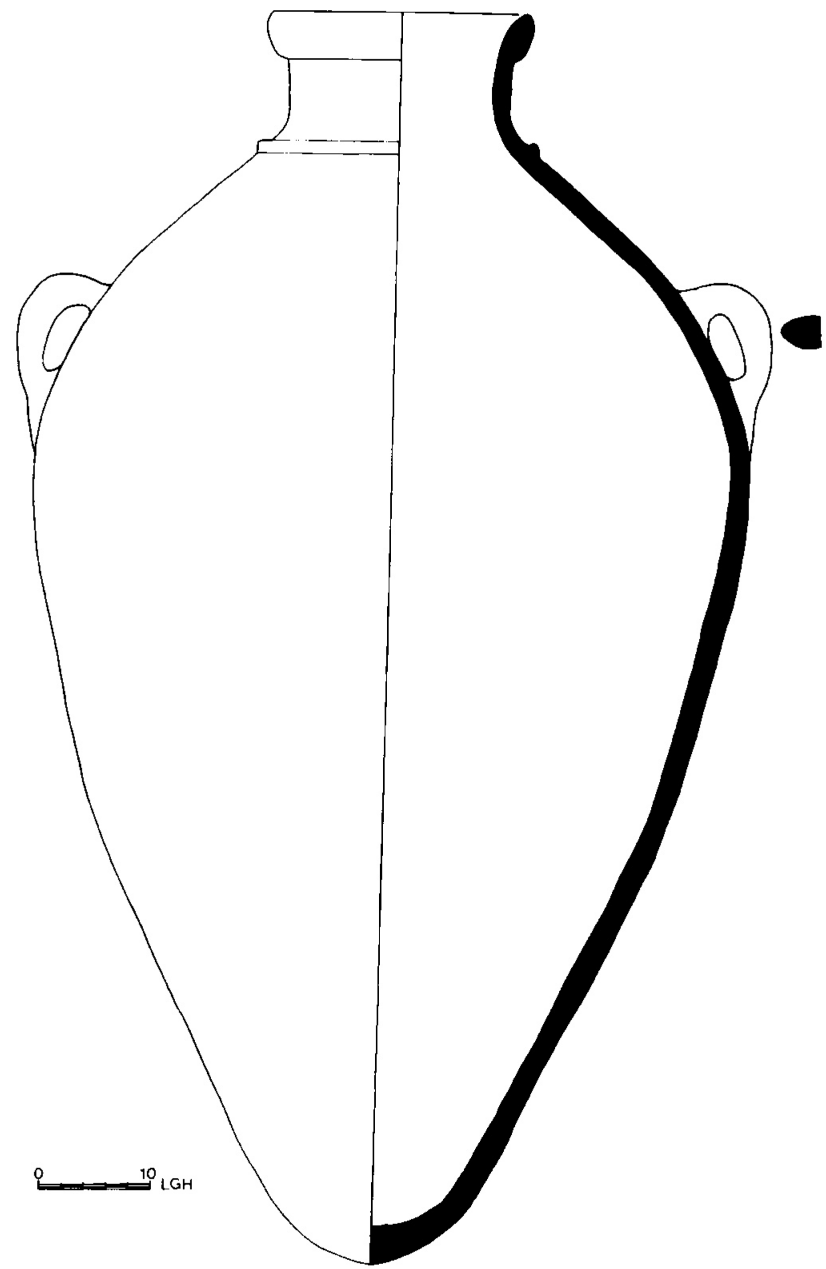

Fig. 3.3 collared rim jar ('Umayri)

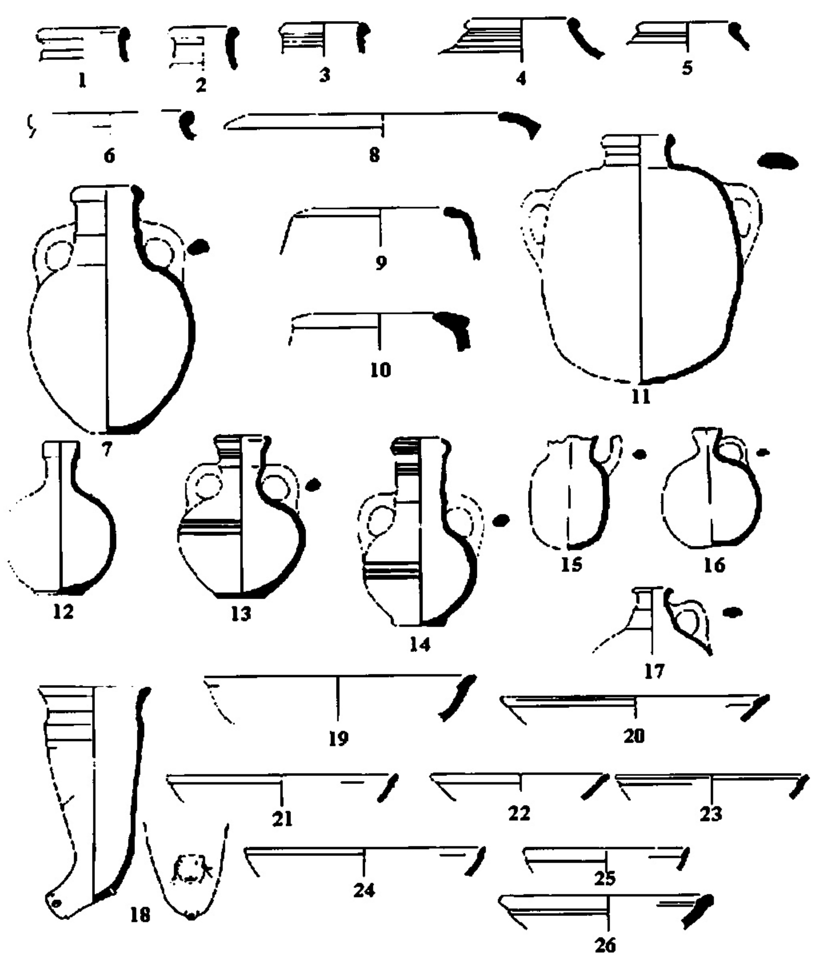

Fig. 3.4 Pots from ʿUmayri

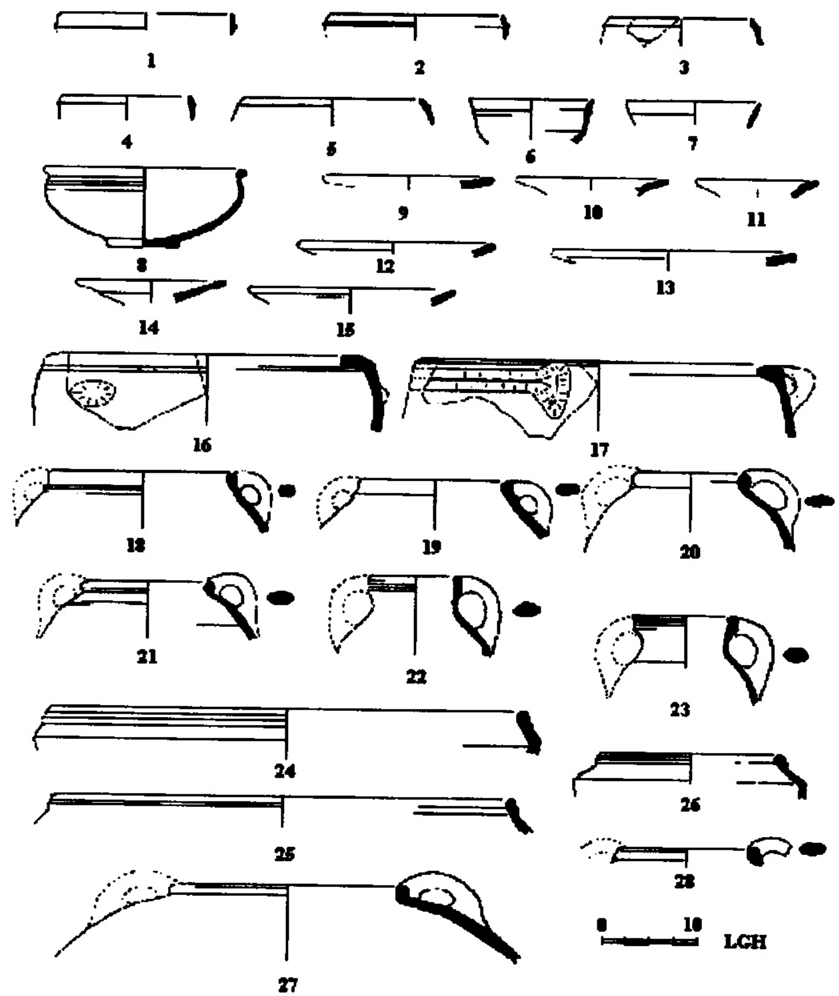

Fig. 3.5 Pots from ʿUmayri

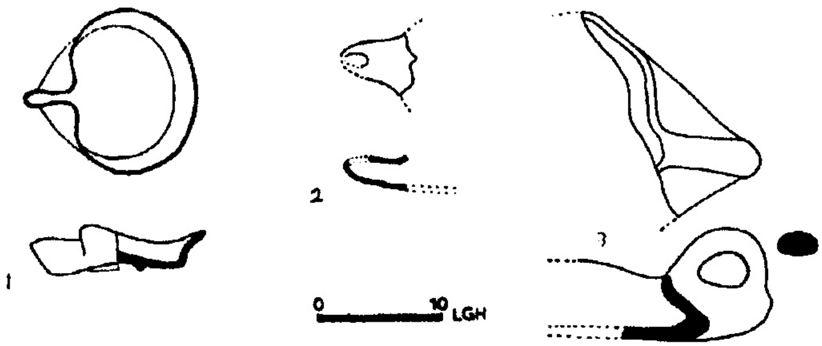

Fig. 3.6 Lamps from ‘Umayri