Journal of Archaeological Research, Vol. 8, No. 2, 2000

Working Without a Net: Recent Trends in Ceramic Ethnoarchaeology

Philip J. Arnold III[1]

This paper reviews ceramic ethnoarchaeological research conducted subsequent to Kramer's (1985) seminal stock-taking. Among current trends are a continued interest in the relationship between ceramics and economic specialization, the degree to which manufacture constitutes a technological "style," and the link between pots and formation processes as represented in assemblage sizes, use-lives, and recycling. At the same time, some pesky theoretical issues continue to be sidestepped in the current literature. Despite its reputation as a pleasant break from the "real business" of archaeology, this paper argues that ceramic ethnoarchaeology can and should play a more substantial role in archaeological investigations.

KEY WORDS: ceramics; ethnoarchaeology; technology; analogy.

> *The ethnoarchaeologist, like any monstruous hybrid, walks a fine line. To one side are mute and non-reactive artifacts. On the other side is a vocal and decidedly reactive audience of people. This fine line is also a tight rope from which it is easy to fall. The best balancing device is the knowledge that there is no saving net below. This delicate balancing act is made only more precarious by assorted materialists and mentalists who watch from below and shout "jump!"*
>
> DeBoer (1984, p. 562)

INTRODUCTION

Warren DeBoer was right; ceramic ethnoarchaeology has all the trappings of a carnival sideshow. Some colleagues gawk at the "monstruous hybrid" from a safe distance, intrigued by the existence of this intradisciplinary oddity. Others are skeptical of the ethnoarchaeological attempt to juggle the present and the past, certain that eventually both will come crashing to the ground. And snaking through the crowd are the usual hucksters and barkers, some extolling the postmodern

[1]Department of Sociology and Anthropology, Loyola University Chicago, Chicago, Illinois 60626.

1059-0161/00/0600-0105$18.00/0

relativism of the House of Mirrors while others tempt with the materialist pragmatics of the Cotton Candy Arcade.

The above caricature provides an amusing backdrop for this essay's organization; nonetheless, I hope to show that ceramic ethnoarchaeology is more than a late-summer's eve distraction from the real business of archaeology. And while not all of the recent trends discussed below may be equally satisfying, as a whole they do move ceramic ethnoarchaeology toward a better understanding of the relationships between pottery and people. Despite its perception as "a break from excavating," ceramic ethnoarchaeology can and should play a more substantial role in our understanding of archaeological phenomena.

STEP RIGHT UP: THE DISCLAIMER

Arbitrary boundaries are fundamental to summary exercises; they focus the discussion and countermand the centrifugal spin of an ever-expanding database. "Time" and "topic" are the most relevant boundaries here. "Time" is perhaps the easier division to establish; the present discussion is restricted to studies that appeared after Carol Kramer's (1985) impressive summary of ceramic ethnoarchaeology or were not included in her references.

"Topic," on the other hand, is more problematic. Following Kramer's (1985) lead, I confine this discussion of "ceramics" to pottery, that is, ceramic containers as opposed to other fired-clay items. But what about "ethnoarchaeology"? Even card-carrying ceramic ethnoarchaeologists disagree as to what ethnoarchaeology actually means (e.g., David, 1992, p. 351; Longacre and Skibo, 1994a, p. 6; Thompson, 1991, pp. 232–234). These differences notwithstanding, it is clear that ceramic ethnoarchaeology has always been promoted as a means to aid in archaeological understanding (Kramer, 1985, pp. 77–78). Thus this discussion privileges studies that address more overtly the archaeological application of ethnographic information. Research that may simply provide "food for archaeological thought" is included in the bibliography of recent literature. This survey also emphasizes published, Anglophone accounts of ceramic production and use. Finally, experimental studies are not considered, although their contribution to ceramic ethnoarchaeology is important and has been recognized elsewhere (e.g., P. Arnold, 1999a; Longacre, 1992; Skibo, 1992a, b).

IN THE CENTER RING: MANUFACTURE AND PRODUCTION

Given its mission to facilitate archaeological understanding, ceramic ethnoarchaeology has most frequently been directed toward studies of pottery manufacture and production. Here I follow the distinction made by Rice (1996, p. 173) that manufacture refers to the actual fabrication of the vessel, while production implicates

the social, political, and ideological context of pottery making. Whether dealing with manufacture or production, however, the relevant archaeological question is essentially the same: "How do we move from patterns in the material record to meaningful statements about past behavior?"

Manufacture

Pottery manufacture has received less systematic attention than ceramic production in the ethnoarchaeological literature (Kramer, 1985, p. 79; Rice, 1987, pp. 124–144). When manufacture is discussed, it is often with respect to its potential value as an archaeological proxy of production scale and/or producer specialization (e.g., Costin, 1991). Descriptions of pottery fabrication document substantial variety in forming and finishing, including hand modeling, paddle-and-anvil shaping, mold construction, "slow wheel" manufacture, wheel throwing, or combinations thereof (e.g., Annis and Jacobs, 1986; D. Arnold, 1993, 1999; P. Arnold, 1991a; Bankes, 1985; Deal, 1998; Hagstrum, 1989; Kramer, 1997; London, 1991; Nicholson and Patterson, 1992; Sinopoli and Burton, 1986). From an archaeological perspective, these accounts belie any simple relationship between manufacturing techniques and production characteristics.

The scheduling of manufacturing activities is a potentially useful avenue of exploration. As used here scheduling means more than a simplistic distinction between "part-time"/"full-time" or "seasonal"/"year-round" potting; rather, activity scheduling should speak to the way in which manufacturing activities are embedded and orchestrated within a given production context. Such scheduling is particularly important for pottery making in residential settings and has implications for the initial adoption of ceramic containers in different parts of the world (e.g., Brown, 1989; Rice, 1999, pp. 28–29).

Given this potential, data on the amount of time required to manufacture a vessel are surprisingly rare. Some studies provide impressionistic information or single-case examples, but systematic treatments are less common. Hagstrum (1989, pp. 229–248) details the amount of time needed to manufacture cooking pots and water jars among Wanka potters in highland Peru. Despite differences in total production time (mostly a function of differences in decoration), she finds that the proportion of time devoted to vessel forming is essentially the same in both cases (48 vs 49%, respectively). These findings, in turn, are used to demonstrate the viability of a "production task index" that can be applied to the archaeological record (Hagstrum, 1989, pp. 248–258).

Other discussions challenge the conventional wisdom concerning time investment and vessel manufacture. For example, it is reasonable to suspect that using molds to fabricate pottery may reduce the time needed for vessel manufacture. Nonetheless, D. Arnold's (1999) analysis of Yucatecan potters indicates that mold making may generate additional "handling time" not always reflected in the

forming data. For example, he found that the drying time required for each fabrication step increases the length of the manufacturing episode (D. Arnold, 1999, pp. 67–68).

Different manufacturing techniques often implicate distinct forming schedules (e.g., D. Arnold, 1985, p. 202; Rice, 1987, p. 129). Under some fabrication regimes the pots are completed in one sitting, while in other circumstances (including the combination of forming techniques) the construction phase may extend over one or more days (e.g., P. Arnold, 1991a, p. 51; Kramer, 1997, p. 63; Nicholson and Patterson, 1985). Especially in these latter instances (and when ceramics are produced in a domestic context), pots are often "multiple-authored" (Kramer, 1997, pp. 50–51); that is, a variety of individuals may be involved in manufacture, aiding with everything from processing raw materials, to repositioning drying vessels, to assisting with the forming and decoration of the pottery (Chávez, 1992, p. 73; Kramer, 1985, p. 79; Nicholson and Patterson, 1985, p. 227). For craft specialists in Paradijon, Philippines, variation in surface finishing and decoration can occur when the help of nonpotters is enlisted to meet market schedules (London, 1991, pp. 200–201). Such "group effort," in turn, may undermine assessments of production context based on various standardization measures (see below).

Gender differences have been widely noted in vessel manufacture. For example, males are more likely to produce wheel-thrown ceramics than females (Kramer, 1985, p. 79; also D. Arnold, 1985, pp. 220–221). Kramer (1985, p. 79) may be correct that gender provides a poor explanation for such differences; nonetheless, there are instances in which the manufacture of certain vessel types parallels culturally perceived gender differences. Although paddle-and-anvil forming is undertaken by both sexes in the coastal Peruvian community of Morrope, larger vessels are manufactured by men while women produce the smaller pots (Bankes, 1985, p. 270). The potter's sex and vessel size also correlate in some highland Peru contexts (Chávez, 1992, p. 65). Of course, preferences or prohibitions regarding gender participation in ceramic manufacture, as well as economic factors, will contribute to cross-cultural differences (e.g., Duncan, 1998; Kramer, 1985, pp. 79–80; Mout and Arnold, 1988, p. 253; Skibo and Schiffer, 1995).

Pottery manufacture involves the selection and mixture of clays, nonplastics, and water. Archaeologists and archaeometricians use a battery of chemical and mineralogical techniques to identify these activities, isolate the locus of manufacture, and evaluate potential exchange networks (Rice, 1996). Few ethnoarchaeological studies have directly evaluated the inferences derived from archaeometric techniques; these rare studies support the position that different potters using the same clay and nonplastic sources will produce ceramics with similar elemental compositions (e.g., D. Arnold *et al*., 1991, 1999).

Archaeologically speaking, however, "source" is not a straightforward issue. As D. Arnold *et al*. (1991, p. 85) note, source can be construed as an individual mine, a production community, or a geographic region (also D. Arnold, 1992,

p. 166). Moreover, it is unclear if archaeologists can safely assume that pottery found on a site, particularly utilitarian ceramics, would have been manufactured from clay obtained within a geodesic or pheric "threshold" distance (cf. D. Arnold, 1985, pp. 38–51). Several ethnoarchaeological studies demonstrate that cooking, storage, and serving vessels can and do circulate widely. Among the Kalinga, gift giving and barter are the primary mechanisms of vessel movement (Graves, 1991; M. Stark, 1991, 1994). More than one-third of the pots bartered in Dulapa in 1988 were exchanged beyond the Pasil River Valley (M. Stark, 1994, p. 187). Nor are these numbers minimal; during a 4-year period, a single Dangtalan household exchanged 133 vessels outside the region (Graves, 1991, p. 130).

More established market systems and a reliance on animal-aided and/or water transport also can move pottery appreciable distances from its locus of manufacture (e.g., Rice, 1987, pp. 193–197). Again, utilitarian vessels constitute a considerable portion of distributed pots. Day trips of up to 20 km are common (e.g., Annis and Geertman, 1987; Kramer, 1997, pp. 114–115; Vossen, 1984, p. 376), while week-long or even month-long trips covering hundreds of kilometers may occur (Annis and Geertman, 1987; D. Arnold, 1985, p. 111; Vossen, 1984, p. 344). Greater urbanization and more sophisticated transportation networks merely extend the pattern (e.g., Kramer, 1997, pp. 135ff.). Thus, despite the fact that a redundancy in the clay and temper source can generate a consistent elemental profile, archaeometric sourcing should not always begin with the assumption that sherds found on site, even the most common ones, were of local origin.

Production

The potential correspondence between the material record and the organization of production is a perennial concern for ceramic ethnoarchaeology. Barbara Stark (1985) provides what is still the most robust discussion of issues involving the archaeological identification of ceramic production locations. Central among these issues is the presence of production facilities, which constitutes a major source of information for archaeologists who attempt to identify and interpret ceramic specialization (e.g., Feinman, 1999; Sullivan, 1988).

A facility's relative degree of permanence can be as important as its presence or absence. Degree of permanence as used here means the ability to relocate or reposition the facility and attendant activity. Of archaeological interest is the fact that, all else being equal, more permanent facilities would be more likely preserved and recovered in an archaeological context. Also relevant is the fact that more permanent facilities serve to "anchor" specific production activities, which in turn affects how space within the production context is managed and maintained (P. Arnold, 1991a, pp. 105–107). Thus ceramic ethnoarchaeologists have not only documented the facilities that associate with production intensification, but also have considered the spatial consequences of technological decisions (e.g., Annis,

1988; D. Arnold, 1999; Gosselain and Smith, 1995; Kramer, 1997; van der Leeuw *et al*., 1992; Williams, 1995).

Although there is a tendency to associate production facilities with large-scale manufacture, the issue of facility permanence need not be restricted to such "workshop" contexts. For example, Deal (1988, 1998, pp. 74–75) notes that potting households among Tzeltal Maya have more grinding slabs than nonpotting households. Moreover, the size of these slabs restricts their portability and thus encourages temper processing to take place within a given area of the compound (Deal, 1988, p. 121). The material consequence is a build-up of calcite in these locations, a pattern that could be recovered archaeologically. P. Arnold (1991a, pp. 109–113, 1999a) shows that kiln use in the Tuxtla Mountains, Mexico, is strongly conditioned by the availability of residential space, rather than the overall intensity of pottery manufacture. The presence of these kilns, in turn, impacts other residential activities and creates specific artifact distributions throughout the houselot (P. Arnold, 1990, 1991a, pp. 120ff.).

Some facilities, such as wheels, are sufficiently diverse to exhibit different degrees of permanence. Kick-wheels, for example, are more likely to be permanent and their use restricted to a particular location (e.g., Nicholson and Patterson, 1992, p. 30). In contrast, the wheels used by some Indian potters are turned with the aid of a stick; these rotary devices can be relocated to take advantage of changing sunlight and weather conditions (Kramer, 1997, p. 62).

Other forming technologies also may affect the spatial organization of pottery making. D. Arnold (1999, pp. 70–71) explores the impact of mold-made pottery on the "spatial footprint" of production contexts. Potters in Ticul, Mexico, produce smaller vessels with molds; as a result, more vessels per unit of clay are created and thus require more space for drying. D. Arnold (1999, p. 70) found that the amount of interior space for drying was the critical factor that determined the number of vessels produced. Such studies reaffirm that spatial concerns are particularly important in domestic settings since that space must compete with other non-pottery-making activities.

Another traditional index of production scale and intensity includes the formal properties of the pottery, especially their dimensional characteristics. Increased routinization of production may encourage greater consistency in the size and shape of vessels (Costin and Hagstrum, 1995, p. 622; Longacre *et al*., 1988). Ceramic ethnoarchaeological data have informed several discussions of this issue (e.g., D. Arnold and Nieves, 1992; P. Arnold, 1991b; Benco, 1988; Rice, 1991; Sinopoli, 1988; B. Stark, 1995; M. Stark, 1995).

An important outgrowth of these studies is an increased emphasis on terminology. Rice (1991, p. 268; also D. Arnold and Nieves, 1992, p. 94) reminds us that standardization is a *relative measure*; something is either more or less standardized than something else. Thus to speak of a specific assemblage as "standardized" could be a misnomer. Toward this end, Rice (1996, p. 179) recommends that "standardization" be reserved for usage that is processual or diachronic in

scope, while "uniformity" serve to characterize a particular assemblage at a particular time. Barbara Stark (1995) notes that vessel uniformity is related to a wide array of factors. Since both specialists and nonspecialists may produce a uniform assemblage, she suggests that the archaeological issue is as much the degree of standardization as its presence or absence (B. Stark, 1995, p. 233; also Rice, 1991, p. 268).

While terminological clarification is always useful, the ethnoarchaeological issue of the relationship between production activities and formal consistency remains. Simply put, does more intensive ceramic production generate more standardized pots when compared with less intensive manufacture? Or, to pose the question in a more archaeologically useful way, "Can I assume that a uniform assemblage represents a particular production context?" Based on a number of ethnoarchaeological studies, we can now answer with an emphatic and confident, "Well, sort of."

Since 1985 few have worried this particular bone more, or with more systematic information, than William Longacre and his associates. In several publications they have used their Philippine data to link production intensity with pottery morphology (Kvamme *et al*., 1996; Longacre, 1999; Longacre *et al*., 1988). Much of their research involves comparing the ceramic output of communities that fall along a continuum from "household" production to "full-time" specialization (e.g., Kvamme *et al*., 1996, p. 118). Their data include metric variation in vessel aperture, circumference, and height.

Unfortunately, even with increasingly sensitive statistics, the Kalinga results are essentially a wash (e.g., Kvamme *et al*., 1996). Of nine comparisons (three communities by three variables), almost half (four) of their statistical tests are not significant at the 0.05 probability level (Kvamme *et al*., 1996, Table 5). This overall ambiguity concords with findings from around the globe (e.g., D. Arnold and Nieves, 1992; P. Arnold, 1991b; Sinopoli, 1988) that undermine assumptions about a necessary relationship between production intensity and vessel uniformity. A similar conclusion has been drawn by B. Stark (1995, p. 257). Her survey of ethnographic data suggests that in certain cases nonspecialists may produce more uniform vessels than specialists (B. Stark, 1995, p. 241), while in other instances vessel types manufactured in the same production contexts may exhibit considerable variation (B. Stark, 1995, pp. 253–256). At least from an archaeological standpoint, uniformity in vessel dimensions alone continues to be a poor diacritic of ceramic production intensity.

If not production intensity, then perhaps producer skill is an important factor in creating a uniform ceramic assemblage. Few might argue that, all else being equal, skilled potters will make more homogeneous vessels than unskilled potters. However, posing the question in this way may not be beneficial to archaeologists. The archaeological question must be framed the other way around: namely, to what degree does a homogeneous assemblage necessarily reflect producer skill? Again, the jury remains divided—while Longacre (1999, p. 53) and Deal (1998,

p. 166) argue that skill is related to assemblage uniformity, D. Arnold (1999, p. 76) and Rice (1991, p. 263) warn that skill may not be so easily identified in the material record of ceramic production. B. Stark (1995, pp. 233–234) suggests that, at the community level, the ratio of producers to consumers may affect the archaeologist's perception of assemblage uniformity.

These studies also raise the important issue of what constitutes specialization. For Rice (1991, p. 270) specialization, by definition, implicates a small number of producers provisioning a larger number of consumers (cf. B. Stark, 1995, p. 233). The converse of this "output" emphasis would be an "input" focus, namely, that specialization represents the amount of time, labor, and other resources invested in the manufacture and distribution of the product (e.g., Pool, 1992, pp. 278–279). An additional wrinkle involves the scale at which specialization is assessed. Thus Rice (1989, p. 110, 1991, pp. 262–263) distinguishes between specialization by an individual and specialization at the community level, as well as specialization in a particular ware or vessel form.

Other studies have stretched these distinctions. Among some ceramic ethnoarchaeologists, for example, specialization is apparently determined as much by what others do not do as what the producer does. M. Stark (1991) characterizes production within the village of Dulapa as specialized, since that community is the primary locus of ceramic production within her study area. However, this specialization is not the same as the community specialization in which different villages restrict their output to certain form/ware combinations (e.g., D. Arnold, 1993, p. 182; Chávez, 1992, p. 79; Hagstrum, 1989, p. 280; Kramer, 1997, pp. 77–79). Thus, although village production is "specialized," the Dulapa ceramicists are part-time potters who operate at the level of a household industry (M. Stark, 1991, p. 67).

A parallel example for individual specialization is seen among the Luo potters of Kenya (Dietler and Herbich, 1989; Herbich, 1987). Ceramic production is considered specialized since "less than 1% of the population" makes ceramics (Herbich, 1987, p. 195). Nonetheless, the potters are part-time producers whose efforts supplement the household economy. In the words of one Luo producer, "Potting is our second garden" (Herbich and Dietler, 1991, p. 107).

In both of the above examples reference is made to specialized production, the former at the community level and the latter at the level of the individual. Noteworthy, however, is the fact that in both cases manufacture actually falls toward the bottom half of the intensification spectrum (e.g., Costin, 1991; Costin and Hagstrum, 1995). Furthermore, for the Kalinga and Luo, specialization is apparently construed more as a function of the behavior of nonpotters than a function of the intensity of production activities. Intensity, in this case, would represent either the amount of resources (time, labor, etc.) invested per unit produced, or the number of units produced at a given level of resource investment. Thus while the above characterizations themselves may not be problematic, the specialization concept cannot help but suffer when used in so many different ways. Minimally, it is important to differentiate clearly between producer and community specialization,

as well as distinguish between specialization based on resource input and specialization based on unit output (e.g., Costin, 1991; Pool, 1992).

THE TATTOOED LADY: TECHNOLOGY, STYLE, AND IDENTITY

A more recent attempt to link manufacture with production employs manufacturing techniques as a reflection of a "technological style"; that is, Do seemingly nondecorative attributes of a production recipe provide information on producer identity? This discussion has benefitted from advances in the anthropology of technology (e.g., Dobres and Hoffman, 1994; Lemonnier, 1992; Pfaffenberger, 1992) that seek to place things, techniques, and technology within a broader, and more socially informed, production/consumption context. In ceramic ethnoarchaeology, this perspective has found its strongest application via the concept of *chaîne opératoire* (Dietler and Herbich, 1989, 1994, 1998; Gosselain, 1992, 1998; M. Stark, 1998). These studies emphasize the choices available to potters during vessel manufacture, as opposed to viewing pottery production as a process that responds simply and/or directly to functional requirements (Gosselain, 1998, pp. 79–82; Mahias, 1993; Stark, 1999; van der Leeuw, 1993).

For archaeological application, such a view implies that the sequence of manufacture (both potentially and realized) can, in fact, be reconstructed. To a certain degree this question was anticipated by Krause's (1984, 1985, 1990) study of the "grammar" of Bantu manufacturing episodes, in which he demonstrated that the manufacturing sequence leaves a retraceable trail. This perspective also assumes that archaeologists are able to recognize those production options that were not exercised but were nonetheless available to the ancient potter (e.g., van der Leeuw, 1991).

An important outcome of current investigations is the realization that different stages of the manufacturing process may be subject to different rates of change. To date, motor habits provide the most successful springboard for reconstructing a potter's social identity (e.g., D. Arnold, 1985, p. 147). Vessel shaping may provide a "reliable index of cultural diversity" (Gosselain, 1992, p. 582) and might be that part of pottery manufacture most resistant to change since it is "associated with one of the most personal and least symbolically invested operations of the *chaîne opératoire*" (Gosselain, 1998, p. 102). This characterization appears to be similar to the concept of "mechanical attributes" introduced by Costin and Hagstrum (1995, p. 622).

The relationship among vessel shape, modes of carrying, and ethnic affiliation has been discussed in a variety of contexts. Sterner (1989, p. 454) cites vessel morphology and the way in which pots are carried as useful ethnic signifiers. D. Arnold (1985, pp. 147–149) notes that vessels for carrying water are designed differently than other pots, based on whether they are to be carried on the hip, the head, or are transported with a tumpline. Formal differences include the number

and location of handles, the length of the neck, and the shape of the vessel base (also D. Arnold, 1993, pp. 121–124).

Of course, considerable attention continues to be paid to pottery decoration, both as a relatively passive icon of group affiliation and as a means to actively negotiate identity and/or empower the producer/consumer. Several studies discuss the learning frameworks through which fabrication knowledge is passed from teacher to pupil (e.g., D. Arnold, 1989; Deal, 1998, pp. 26–37; Hardin, 1991, Kramer, 1997, pp. 16–31). Other work takes exception to the "style as information" school and continues to chip away at the tenets of "ceramic sociology" (e.g., David *et al*., 1988; DeBoer, 1990; Dietler and Herbich, 1994; Graves, 1985, 1991; Herbich, 1987; Skibo *et al*., 1989).

Sterner (1989) challenges the conventional wisdom regarding vessel elaboration and use context. She notes that for the Sirak Bulahay of northern Cameroon, the least socially visible ceramics (used in private rituals) are the most elaborately decorated. Among the Kalinga, stylistic variation correlates with political organization; decoration in these contexts represents *potential* interaction rather than overt expressions of identity and/or regional boundaries (Graves, 1991, p. 143, original emphasis). Potters who are brought into a new social context (especially through abduction or marriage) often conform to the stylistic cannons of their new settings. This pattern may occur because abducted potters have little social power (e.g., DeBoer, 1986, pp. 242–243) or because potters learn to manufacture vessels from in-laws after they have married (Dietler and Herbich, 1994; Herbich, 1987). The ultimate slap to the status quo, of course, is the potential incongruity between the extant and archaeological. This possibility causes Hegmon (1998, p. 278) to wonder if concepts such as boundaries and ethnicity "really represent things or entities that we can discover in the past" (also MacEachern, 1998).

JUGGLING BALLS AND SPINNING PLATES: HOUSEHOLD CERAMIC ASSEMBLAGES

The frequency and use-life of ceramics within a household continue to receive considerable ethnoarchaeological attention. A common justification has been to use household assemblage information as a way to access prehistoric population figures and correct for frequency-based seriation chronologies (e.g., Rice, 1987, pp. 293–305; Shott, 1996, p. 464). Useful summaries are given by Rice (1987), Mills (1989), Nelson (1991), and Shott (1996). Other ceramic census information is provided by P. Arnold (1988, 1991a), Deal (1998), Hagstrum (1989), Longacre (1985), Tani (1994), and Trostel (1994).

Not unexpectedly, these data display a wide variation in the number of pots within ethnographic households. Despite the seemingly common-sense expectation that potters would have larger household assemblages than nonpotters, the ethnoarchaeological data demonstrate that the relationship is considerably more

complicated. Among the Kalinga, for example, households in two of the three non-pottery-making communities averaged as many or more pots than households in the two pottery-making villages (Longacre and Stark, 1992, p. 128). At the same time, nonpotting households within the pottery-producing community of Dangtalan have fewer ceramics than the assemblages of potters' residences (Tani, 1994, p. 56). Deal (1998, p. 148) suggests that the number of different vessel types within an assemblage [the "richness" contribution to diversity (e.g., Rice, 1989, p. 112)] may offer an alternative to analysis based solely on the number of vessels. Nonetheless, his own findings indicate that the number of types is not sufficient for inferring the presence of potters within a household (Deal, 1998, p. 158).

One possible reason for this lack of direct correlation may involve the household's access to pottery. As access (real or perceived) is restricted, greater investment in ceramic backups may take place. Thus among households that do not manufacture their own ceramics, stockpiling vessels can mitigate the impact of unexpected breakage or can occur in anticipation of upcoming celebrations (P. Arnold, 1988; Longacre, 1985, p. 334; Nelson, 1991, p. 171).

Stockpiling, along with diverse eating habits and food preparation strategies (Nelson, 1991, p. 168; Rice, 1987, p. 294; Tani, 1994, pp. 54–56) also would conspire against any direct relationship between household population and household ceramic assemblage. Among the several ethnographic groups discussed by Nelson (1991, pp. 169–170), household population is not correlated with the ceramic census. Longacre (1991, p. 109) and Tani (1994, p. 57) derive the same conclusion for the Kalinga data.

Nonetheless, some relationships may still obtain between household demographics and the container assemblage. Contrary to earlier studies (e.g., Longacre, 1991, p. 109), Tani (1994, p. 52) notes a significant correlation between the volume of cooking vessels and household population among the Kalinga. The volume of cooking vessels (ceramic and metal) among the Kalinga also correlates with the wealth of a given household (Trostel, 1994). Perhaps not too surprisingly, the strongest identified relationship is between household wealth and metal pots, or those containers that are the most expensive to acquire (Trostel, 1994, p. 222). A similar association was identified for Wanka households (Hagstrum, 1989, p. 286). In highland Chiapas the socioeconomic status of the household is also positively correlated with the number of ceramic and nonceramic container types (Deal, 1998, p. 160).

Use-lives are one of the most common performance characteristics documented by ceramic ethnoarchaeologists (Kramer, 1985, pp. 89–90; Rice, 1987, pp. 296–299). As has been noted (P. Arnold, 1988; Longacre, 1985; Mills, 1989; Nelson, 1991), vessel use-lives not only reflect cultural behavior, but also have direct archaeological implications for seriation and other site formation issues (see below). Generally speaking, the various studies reveal two basic relationships (*ceteris paribus*): (a) ceramics used in cooking have shorter use lives than those that are not subject to heating, and (b) larger vessels last longer than smaller vessels.

Shott (1996; also 1989) presents one of the more thorough discussions of the forces that affect vessel use-lives. His analysis documents that vessel height and volume are the best predictors of use-life, followed by vessel weight and diameter attributes (Shott, 1996, p. 478; cf. DeBoer, 1985). Unfortunately, the latter data are more easily extrapolated than the former from archaeological sherds. Nonetheless, estimates of vessel volume and other metric attributes are possible based on pieces of pottery (e.g., Hagstrum and Hildebrand, 1990; Orton *et al*., 1993).

A recent correction to the use-life literature involves the previous estimates of Kalinga pottery longevity (Tani and Longacre, 1999). The original estimates, based on ceramic inventories, apparently underrepresented short-lived vessels. Recalculations place the Kalinga pottery in line with other ceramic use-life data (Tani and Longacre, 1999). These new figures also warrant a reassessment of previous comments concerning informant-based estimates of ceramic use-lives. Given the inventory-based calculations, researchers (Longacre, 1985, p. 340; Neupert and Longacre, 1994, p. 74) were forced to argue that informants were poor estimators of the longevity of their own pottery, particularly the cooking vessels. The new Kalinga data bring the use-lives of cooking pots comfortably within the informant-based estimates (e.g., Kalinga informant estimates at 2–3 years [Longacre, 1985, p. 339], recalculated use-life at 2.2 years [Tani and Longacre, 1999, p. 307]). Thus the newest Kalinga analysis indicates that ceramic consumers can be accurate predictors of their pottery's life span. The next logical step is to begin examining why consumer predictions are accurate for certain cases but miss the mark for others.

STRIKING THE BIG TOP: SITE FORMATION PROCESSES

Recent studies that specifically relate ceramic production and use to the archaeological record are conspicuous in their infrequency. The majority of investigations that fit this bill reflect a strong "behavioral archaeology" (e.g., Schiffer, 1987) emphasis, focusing particularly on ceramic recycling and resolving site abandonment issues. Other treatments expand earlier interests in the effects of ceramic production and consumption on the formation of archaeological assemblages (e.g., Kramer, 1985, pp. 89–92). A few brave souls have even wrestled with the potential incongruity between the data that ceramic ethnoarchaeologists collect and those data most commonly obtained from the archaeological record (e.g., Mills, 1989; Skibo, 1992a).

Michael Deal (1985, 1988, 1998) provides some of the most specific discussions of the archaeological record with reference to ethnoarchaeological ceramic data. Particularly useful is his consideration of "provisional discard," a process by which worn ceramics are stored for potential reuse within specific portions of the houselot (Deal, 1985, 1998, p. 118). The ability to differentiate among disposal strategies can be extremely useful in attempts to distinguish between primary and secondary contexts in the archaeological record (e.g., Skibo *et al*., 1989).

Deal and Hagstrum (1995) provide a comparative assessment of ceramic reuse within Tzeltal and Wanka households. They document a range of reuse activities including food preparation, gardening, and construction. Of particular archaeological relevance is their position that "As a rule of thumb, we should assume that most, if not all, ceramic vessels recovered at an archaeological house site were last in a state of reuse or discard" (Deal and Hagstrum, 1995, p. 124).

P. Arnold (1990, 1991a) also discusses the archaeological implications of ceramic ethnoarchaeological deposits, with an emphasis on the spatial distribution of activities and artifacts. Houselots in the Tuxtla Mountains are characterized by significant variation in the amount of activity space available for pottery making and other domestic tasks. These differences are reflected in the frequency and weight of refuse distributed throughout the residential compound (P. Arnold, 1990, 1991a, pp. 120ff.). The available work area also dictates whether activities will be conducted according to a spatially flexible or a spatially restrictive format (P. Arnold, 1991a, pp. 100–101). These conditions directly impact the organization of ceramic manufacture and the resulting archaeological record.

Several scholars consider the combined effects of household assemblages and vessel use-lives on the creation of the archaeological record. Mills (1989) provides one of the more sophisticated treatments, noting that the length of site occupation may be as important as site function in the formation of the particular ceramic assemblage. A second issue raised in Mills' (1989) discussion is the potential incongruity between ethnoarchaeological and archaeological data (also Skibo, 1992a). The most frequent distinction made in such discussions is between the whole vessels observed in the ethnographic setting or reconstructed archaeologically and the sherds that comprise a majority of archaeological assemblages. Mills (1989, p. 133) notes that whole vessels are commonly used by archaeologists to address subsistence questions, while sherds inform the majority of settlement pattern studies. Only by considering more carefully the formation of the archaeological record will the two approaches become complementary, rather than dichotomous (Mills, 1989, pp. 144–145). Skibo *et al*. (1989, p. 403) make a similar point when they encourage the ethnoarchaeologist to simulate sherd assemblages based on an understanding of formation processes.

Other presentations, however, do not seem to share this sense of synthesis. Longacre and Skibo (1994b, p. xiv) suggest that archaeologists should think in terms of whole pots rather than sherds, thus aligning the archaeological unit of analysis to that of the ceramic ethnoarchaeologist. Deal (1998, pp. 141–142) notes that it would be more reasonable for archaeologists to translate their sherds into whole vessels, "rather than for the ethnoarchaeologist to destroy the pottery of his unsuspecting informants for the purpose of making sherd counts."

While the image of ceramic ethnoarchaeologists smashing their informants' assemblages might raise a chuckle, the issue is serious and goes to the very heart of what ceramic ethnoarchaeology is designed to accomplish. If ceramic studies undertaken in the present are genuinely targeted at improving archaeological

understanding, then it would seem disingenuous to demand that archaeologists convert their data into units that make the ethnoarchaeologist comfortable. Although most contemporary archaeologists are interested in understanding human behavior, "archaeologists cannot simply do ethnography in the past" (Hegmon, 1998, p. 272). In other words, the archaeological record, not the ethnographic record, constitutes the domain of archaeological research. If ceramic ethnoarchaeologists are unable to translate their data into some reasonable approximation of archaeological patterns, then it becomes difficult to construe their efforts as conforming to the commonly held precepts of ethnoarchaeology.

THE FORTUNE TELLER: FUTURE ISSUES

Two areas would seem to be particulary important for ceramic ethnoarchaeology in the future. The more immediate involves the overall decrease in the number of ceramic-using groups throughout the world. Framed in a less reactionary tone, this issue considers the replacement of ceramics by other types of containers. A second, related concern is somewhat more theoretical in scope; it is the potential lack of ethnographic examples for prehistoric pottery production and consumption activities.

Alternative Containers

It is clear that pottery-using societies are rapidly disappearing, and fieldwork is needed to collect relevant information. At the same time, ceramic ethnoarchaeologists should not lose sight of the fact that change, be it technological, social, and/or ideological, characterized the past as well as the present. Understanding how change operates is fundamental to contemporary archaeology. Thus the appearance of new or alternative container technologies provides an excellent opportunity to monitor the factors that condition assemblage change and transformation. Several studies provide specific information relative to this phenomenon (e.g., Hagstrum, 1989; Hodder, 1991; Sargent and Friedel, 1986; Skibo, 1994; Trostel, 1994).

Deal (1998, p. 168) makes the important observation that the presence of nonceramic containers is not always a case of simple assemblage replacement. Within the potting community of Chanal, nonceramic containers are more likely to augment the household assemblage, while in the potting community of Aguacatenango, nonceramic containers appear to be replacing particular vessel forms. Farming households in highland Peru use both ceramic and metal cooking pots; it is not an instance of metal always displacing pottery (Hagstrum, 1989, p. 287).

The decision to replace rather than not replace does not appear to be related to the presence/absence of pottery-making households. Rather, wealth apparently plays a major role in such decisions (e.g., Deal, 1998, p. 160; Trostel, 1994, p. 222).

For example, even given their superior performance, more costly metal cooking pots may fall out of favor if the economic opportunities of the Kalinga continue to decline (Skibo, 1994, p. 123).

Finally, ceramic replacement is not an all-or-nothing proposition. In fact, several studies indicate that nonceramic replacements often target a particular vessel type or activity. Among the Kalinga, metal vessels have replaced rice-cooking pots in some households (Skibo, 1994). This situation differs from other contexts, in which cooking vessels are often the last to be converted to nonceramic options (e.g., D. Arnold, 1985, pp. 142–143). In highland Peru, tea kettles have replaced ceramic pots for boiling water, a situation in which "taste is not an issue" (Hagstrum, 1989, p. 286).

Vessels used in ritual activities or for medicinal preparation also are less likely to be given over to nonceramic alternatives (Deal, 1998, pp. 90–91; Sargent and Friedel, 1986, p. 192; for an archaeological twist see Vitelli, 1999, pp. 191–192). Nonceramic containers are often used for food presentation as opposed to food preparation. This fact suggests to Deal (1998, p. 168) that some nonceramic containers in the present may be operating in a manner analogous to prestige ceramics in the past.

Of course, the issue of supplanting versus supplementing implies an ability to identify and control for vessel function. Some of the most promising trends in this regard come from studies of ceramic use alterations (Skibo, 1992b). Ethnoarchaeological studies suggest that such patterns as interior fabric attrition and the characteristics of carbon deposits provide reliable signatures of pottery function (Kobayashi, 1994; Skibo, 1992b).

Ethnographic Tyranny Revisited

The increased use of nonceramic containers fosters a related issue: namely, How might researchers begin to address conditions in the past that have few or no contemporary analogues? Given that ceramic ethnoarchaeology has emphasized data acquisition over data application (see below), perhaps the answer is to leave the problem to the archaeologists (e.g., David, 1992, p. 338). Nonetheless, the original purpose of ceramic ethnoarchaeology was ostensibly to aid archaeology through an improved understanding of the material record (Kramer, 1985).

The issue would seem overly hypothetical, were it not for recent discussions of ancient ceramic production and consumption activities that are not well represented in the ethnohistoric or ethnographic literature. For example, archaeological research in Oaxaca, Mexico, has encountered a production configuration that appears to defy ethnographically derived production modes (Feinman, 1999). In the Oaxaca case, residentially focused production is intensive and apparently includes a wide array of crafts, including pottery, ceramic figurines, and shell ornaments. This kind of intensive, household "multicrafting" (Feinman, 1999, p. 94) is not

represented in the ethnohistoric record, nor is it apparent in studies of contemporary groups.

Issues surrounding the origins of pottery provide another instance in which the ethnographic record has been of little aid. Despite the fact that few contemporary hunting-gathering groups make and use pottery, the archaeological record shows that mobile settings were often the focus of ceramic origins (Hoopes and Barnett, 1995; Rice, 1999). Thus an important question involving ceramics (i.e., Why is it adopted?) may not be readily accessible through ethnographic data. Can ceramic ethnoarchaeology still contribute to such research questions?

Although ethnographic analogies cut whole cloth from the present may fail in these and other archaeological contexts, there may still be ways to link contemporary behavior with the past. One solution would break down ethnographic analogies into their constituent parts and reassemble those parts to create "cultural composites" (e.g., P. Arnold, 1999a, pp. 116–117). The emphasis in such an approach is to understand the causal relationships that link behavior to material patterning, rather than simply overlying an ethnographic situation atop an archaeological one. These relationships can then be rearranged into composites that represent potentially novel models of behavior, in much the same way that experimental archaeology uses causal relationships to extend its findings beyond the confines of any particular experiment (e.g., P. Arnold, 1998, pp. 28–29; Skibo, 1992b).

CIRCUS MAXIMUS: GENERAL ISSUES

It should be clear from the above discussion that researchers differ markedly with respect to what they think ceramic ethnoarchaeology is and what it seeks to achieve. It may be unreasonable to insist that all ceramic ethnoarchaeology follows a particular set of standards; nonetheless, the current lack of consensus highlights a potentially serious identity crisis. As part of ceramic ethnoarchaeology's "coming of age" (e.g., Longacre and Skibo, 1994b, p. xiii; Stahl, 1995), it is time to call attention to the uncomfortable hodgepodge of protocol and purpose subsumed within the increasingly ambiguous arena of ceramic ethnoarchaeology.

First, should ceramic ethnoarchaeology become the domain of a particular anthropological background? Some researchers have argued that ceramic ethnoarchaeology should be restricted to archaeologists since archaeologists have training in material culture studies (e.g., Longacre, 1991, pp. 1–2; Longacre and Skibo, 1994a, p. 6). Although well intended, this position misses the mark—rather than privilege the investigator's pedigree, we are better off focusing attention on the results of her or his investigation. Thompson (1991, p. 234) makes this point clearly: "In fact, there is no reason why ethnoarchaeology has to be done by archaeologists. It is not who does the work that counts, but the purpose for which it is done." Purpose, in this case, refers to the archaeological application of ethnographic

information:

> Unfortunately, some archaeologists who begin to do ethnography without an archaeological purpose find it difficult to abandon archaeology completely and, as some of the post-processualists have ably demonstrated, start writing fictional accounts of ancient cultures that are little more than archaeological fairy tales. (Thompson, 1991, p. 234)

It would seem that archaeologists of a more processual persuasion also could be included in the above characterization.

Of course, some might argue that fairy tales are no worse than cautionary tales. Several researchers have commented on the growth industry of cautionary tales and wondered if ceramic ethnoarchaeology is condemned to providing little more than spoiler arguments. P. Arnold (1991a, pp. 2–3) notes that cautionary tales simply combine an awareness of behavioral variation with an ignorance of behavioral causality. D. Arnold (1991) suggests that cautionary tales occur because the ethnographic record can be somewhat overwhelming, especially if one is accustomed to etic categories and is looking for cross-cultural regularities. In contrast to the more archaeocentric position, D. Arnold (1991, p. 328) emphasizes the importance of ethnographic training:

> Ceramic ethnoarchaeology is ethnography, and if archaeologists think that they can study material culture without benefit of ethnographic method and theory, they are naive and archaeology is the poorer for it.

To remedy this situation, D. Arnold (1991) calls for the development of improved theory, particularly along the lines of ceramic ecology (e.g., D. Arnold, 1985, 1993; P. Arnold, 1991a, pp. 4–5; Kolb, 1989; Rice, 1987, pp. 314–317).

Nonetheless, some ceramic ethnoarchaeologists have been particularly critical of ceramic ecology. Gosselain (1998, p. 80), for example, strongly chides ceramic ecology for "endlessly hark[ing] back to the same basic assumptions." Foremost among these assumptions is a view of the environment as constraining production and a belief that potters must manufacture vessels according to functional parameters (Gosselain, 1998, p. 80). Others have disparaged such assumptions as "extreme" (Neff, 1993, p. 32) and of "limited theoretical power" (M. Stark, 1993, p. 188). Nonetheless, a closer reading of the literature shows that discussions of ceramic ecology and pottery technology never intended to promote environmental determinism or functional reductionism (e.g., D. Arnold, 1985; P. Arnold, 1999a; Kolb, 1989; Schiffer and Skibo, 1987, 1997). His own polemic notwithstanding, Gosselain (1998) is forced to remain skeptical regarding the viability of the *chaîne opératoire* agenda, ultimately admitting that his "somewhat mitigated conclusion will probably appear as a failed attempt" (Gosselain, 1998, p. 104).

This admission raises another interesting question, namely, How does one evaluate the success or failure of ceramic ethnoarchaeological studies? Within the current literature ceramic ethnoarchaeology appears to pass as just about anything that links contemporary people with pottery. Given such topical latitude, assessments of quality and utility can be particularly difficult (P. Arnold, 1998; Sillar,

1993; Stahl, 1995). In fact, the one criterion for ceramic ethnoarchaeology that seems to resound with most researchers is that "length matters."

This emphasis on longitudinal studies apparently stems from some misplaced but well-meaning ideas regarding sampling. Long-term studies are necessary, so goes the logic, because only then can we be satisfied that the observed relationships between behavior and material culture are representative. But what does it really mean to be representative in ethnographic cases (e.g., David, 1992, p. 334)? Ceramic ethnoarchaeological studies that meet the sampling requirement of uniform access to all production loci are extremely rare; considerably more common are investigations in which *entree* to potting households or other production contexts is restricted or uneven (e.g., D. Arnold, 1993; P. Arnold, 1991a; Deal, 1998; Hagstrum, 1989; Kramer, 1997). It is doubtful if the majority of ceramic ethnoarchaeological studies will ever be able to meet the basic requirements of a "representative sample."

A second reason for seeking a representative sample could be a more robust tool for generating archaeological inferences. But, as mentioned above, how many self-described ceramic ethnoarchaeologists have actually followed through and applied their findings to the archaeological record in more than a cursory fashion? Archaeologists have a choice—they can support a hypothesis based on causal links between behavior and the material record (even if derived from a single potter) or they can support a hypothesis by argument through enumeration. The former moves archaeology toward explanation, the latter requires nothing more than simple description.

Finally, as previously noted, what of those instances in which potential contemporary analogs for potting activities are few or nonexistent? Requiring ceramic ethnoarchaeology to generate a "representative sample" for archaeological use would be ludicrous. As we learn more about the archaeological record, we are likely to find this condition more often the rule than the exception (e.g., P. Arnold, 1999b; Rice, 1999; Skibo and Blinman, 1999). In sum, it is unlikely that the archaeological utility of ceramic ethnoarchaeological data will be fortified by insisting that those data be "statistically representative" of some presumed normative behavior.

BRING IN THE CLOWNS: CONCLUSION

Some 15 years after Kramer's (1985) summary, ceramic ethnoarchaeology continues to reflect a diversity of research interests and agendas. New data have been collected regarding the archaeological appearance of ceramic manufacture and production, the composition of household assemblages, and issues involving vessel use, reuse, and disposal. Some findings further develop existing patterns, others call into question assumed relationships between human behavior and the material record. And some studies have begun to move beyond ceramics *per se* and are now considering the general role of containers in household inventories.

Nonetheless, potential difficulties loom on the horizon. One of the more important, but least discussed, issues is the degree to which ceramic ethnoarchaeology should be directly relevant to the archaeological record. Despite lip service to the affirmative, the evidence actually shows that such applications are rarely made and, even then, are undertaken mostly by researchers outside of ceramic ethnoarchaeology. In fact, some ceramic ethnoarchaeologists are apparently satisfied that "ethnoarchaeology is becoming less restricted to topics of specific and immediate archaeological concern" (David, 1992, p. 351). Given such positions, it is certainly time for some serious stocktaking in ceramic ethnoarchaeology.

One of the outcomes of such reflection might be the development of protocols for obtaining and applying ceramic ethnoarchaeological data. Although some might view such parameters as overly restrictive, they provide the benefit of a common point of reference for conducting and evaluating ceramic ethnoarchaeology. When ceramic ethnoarchaeology becomes almost anything that includes modern people and pottery, it risks losing credibility as a legitimate tool in archaeological inquiry.

Ceramic ethnoarchaeology is no easy task. It is not what one does on their "day off" nor is it effectively conducted on a whim. As with so many other things, those researchers who make it look easy succeed because of their hard work and long-term investment in the process. So if you ever long to run away from archaeology, join the circus, and live the life of a ceramic ethnoarchaeologist, keep one thing in mind: even Ringling Brothers makes their performers attend clown school.

ACKNOWLEDGMENTS

I would like to thank Gary M. Feinman and T. Douglas Price for the invitation to discuss recent trends in ceramic ethnoarchaeology. I would also like to express my thanks to those authors who have sent reprints and copies of their work to me over the years (yes, I promise to reciprocate!). Support for my own ceramic ethnoarchaeology has been provided by the National Science Foundation, Sigma Xi, the Tinker Foundation, and the University of New Mexico. The final manuscript benefited from close readings by Dean Arnold, Gary Feinman, Shannon Fie, Chris Pool, Jim Skibo, and an anonymous reviewer. Their time and assistance are gratefully acknowledged.

REFERENCES CITED

Annis, M. B. (1988). Modes of production and the use of space in potters' workshops in Sardinia: A changing picture. *Newsletter of the Department of Pottery Technology* **6**: 47–78 (University of Leiden, Leiden, The Netherlands).

Annis, M. B., and Geertman, H. (1987). Production and distribution of cooking wares in Sardinia. *Newsletter of the Department of Pottery Technology* **5**: 154–196 (University of Leiden, Leiden, The Netherlands).

Annis, M. B., and Jacobs, L. (1986). Ethnoarchaeological research—Pottery production in Oristano (Sardinia): Relations between raw materials, manufacturing techniques, and artifacts. *Newsletter of the Department of Pottery Technology* **4**: 56–85 (University of Leiden, Leiden, The Netherlands).

Arnold, D. E. (1985). *Ceramic Theory and Cultural Process*, Cambridge University Press, Cambridge.

Arnold, D. E. (1989). Patterns of learning, residence, and descent among potters in Ticul, Yucatán, Mexico. In Shennan, S. J. (ed.), *Archaeological Approaches to Cultural Identity*, George Allen and Unwin, London, pp. 174–184.

Arnold, D. E. (1991). Ethnoarchaeology and investigations of ceramic production and exchange: Can we go beyond cautionary tales? In Bishop, R. L., and Lange, F. W. (eds.), *The Ceramic Legacy of Anna O. Shepard*, University Press of Colorado, Niwot, CO, pp. 321–345.

Arnold, D. E. (1992). Comments on Section II. In, Neff, H. (ed.), *Chemical Characterization of Ceramic Pastes in Archaeology*, Monographs in World Archaeology No. 7, Prehistory Press, Madison, WI, pp. 159–170.

Arnold, D. E. (1993). *Ecology and Ceramic Production in an Andean Community*, Cambridge University Press, Cambridge.

Arnold, D. E. (1999). Advantages and disadvantages of vertical-half molding technology: Implications for production organization. In Skibo, J. M., and Feinman, G. M. (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 59–80.

Arnold, D. E., and Nieves, A. (1992). Factors affecting ceramic standardization. In Bey, G., and Pool, C. (eds.), *Ceramic Production and Distribution: An Integrated Approach*, Westview, Boulder, CO, pp. 93–113.

Arnold, D. E., Neff, H. A., and Bishop, R. L. (1991). Compositional analysis and "sources" of pottery: An ethnoarchaeological approach. *American Anthropologist* **93**: 71–90.

Arnold, D. E., Neff, H. A., Bishop, R. L, and Glascock, M. D. (1999). Testing interpetative assumptions of nuetron activation analysis: Contemporary pottery in Yucatán, 1964–1994. In Chilton, E. S. (ed.), *Material Meanings: Critical Approaches to the Interpretation of Material Culture*, University of Utah Press, Salt Lake City, pp. 61–84.

Arnold, P. J., III (1988). Household ceramic assemblage attributes in the Sierra de los Tuxtlas, Veracruz, Mexico. *Journal of Anthropological Research* **44**: 357–383.

Arnold, P. J., III (1990). The organization of refuse disposal and ceramic production within contemporary Mexican houselots. *American Anthropologist* **92**: 915–932.

Arnold, P. J., III (1991a). *Domestic Ceramic Production and Spatial Organization: A Mexican Case Study in Ethnoarchaeology*, Cambridge University Press, Cambridge.

Arnold, P. J., III (1991b). Dimensional standardization and production scale in Mesoamerican ceramics. *Latin American Antiquity* **2**: 363–370.

Arnold, P. J., III (1998). Ceramic ethnoarchaeology: Caught between "coming of age" and "showing its age." *Reviews in Anthropology* **27**: 17–32.

Arnold, P. J., III (1999a). On typologies, selection, and ethnoarchaeology in ceramic production studies. In Chilton, E. S. (ed.). *Material Meaning: Critical Approaches to the Interpretation of Material Culture*, University of Utah Press, Salt Lake City, pp. 103–117.

Arnold, P. J., III (1999b). *Tecomates*, residential mobility, and Early Formative occupation in coastal lowland Mesoamerica. In Skibo, J. M., and Feinman, G. M. (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 157–170.

Bankes, G. (1985). The manufacture and circulation of paddle and anvil pottery on the North Coast of Peru. *World Archaeology* **17**: 269–277.

Benco, N. (1988). Morphological standardization: An approach to the study of craft specialization. In Kolb, C. C., and Lackey, L. M. (eds.), *A Pot for all Reasons: Ceramic Ecology Revisited*, Temple University, Philadelphia, pp. 57–72.

Brown, J. A. (1989). The beginnings of pottery as an economic process. In van der Leeuw, S. E., and Torrence, R. (eds.), *What's New? A Closer Look at the Process of Innovation*, Unwin Hyman, London, pp. 203–224.

Chávez, K. L. M. (1992). The organization of production and distribution of traditional pottery in south highland Peru. In Bey, G., and Pool, C. (eds.), *Ceramic Production and Distribution: An Integrated Approach*, Westview, Boulder, CO, pp. 49–92.

Costin, C. L. (1991). Craft specialization: Issues in defining, documenting, and explaining the organization of production. In Schiffer, M. B. (ed.), *Advances in Archaeological Method and Theory, Vol. 3*, University of Arizona Press, Tucson, pp. 1–56.

Costin, C. L., and Hagstrum, M. B. (1995). Standardization, labor investment, skill, and the organization of ceramic production in late prehistoric Highland Peru. *American Antiquity* **60**: 619–639.
David, N. (1992). Integrating ethnoarchaeology: A subtle realist perspective. *Journal of Anthropological Archaeology* **11**: 330–359.
David, N., Stern, J., and Gavua, K. (1988). Why pots are decorated. *Current Anthropology* **29**: 365–389.
Deal, M. (1985). Household pottery disposal in the Maya Highlands: An ethnoarchaeological interpretation. *Journal of Anthropological Archaeology* **4**: 243–291.
Deal, M. (1988). An ethnoarchaeological approach to the identification of Maya domestic pottery production. In Kolb, C. (ed.), *Ceramic Ecology Revisited, 1987: The Technology, and Socioeconomics of Pottery*, BAR International Series 436 (i), Oxford, pp. 111–142.
Deal, M. (1998). *Pottery Ethnoarchaeology in the Central Maya Highlands*, University of Utah Press, Salt Lake City.
Deal, M., and Hagstrum, M. B. (1995). Ceramic reuse behavior among the Maya and Wanka: Implications for archaeology. In Skibo, J. M., Walker, W. H., and Nielsen, A. E. (eds.), *Expanding Archaeology*, University of Utah Press, Salt Lake City, pp. 111–125.
DeBoer, W. R. (1984). The last pottery show: System and sense in ceramic studies. In van der Leeuw, S., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 527–568.
DeBoer, W. R. (1985). Pots and pans do not speak, nor do they lie: The case for occasional reductionism. In Nelson, B. A. (ed.), *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale, pp. 347–357.
DeBoer, W. R. (1986). Pillage and production in the Amazon: A view through the Conibo of the Ucayali Basin, eastern Peru. *World Archaeology* **18**: 231–246.
DeBoer, W. R. (1990). Interaction, imitation, and communication as expressed in style: The Ucayali experience. In Conkey, M. W., and Hastorf, C. A. (eds.), *The Uses of Style in Archaeology*, Cambridge University Press, Cambridge, pp. 82–104.
Dietler, M., and Herbich, I. (1989). *Tich Matek*: The technology of Luo pottery production and the definition of ceramic style. *World Archaeology* **21**: 148–164.
Dietler, M., and Herbich, I. (1994). Ceramics and ethnic identity: Ethnoarchaeological observations on the distribution of pottery styles and the relationship between the social context of production and consumption. In *Terre Cuite et Société: La Céramique, Document Technique, Economique, Culturel*, XIVe Rencontres Internationales d'Archéologie et d'Histoire d'Antibes, Editions APDCA, Juan-les-Pins, France, pp. 459–472.
Dietler, M., and. Herbich, I. (1998). *Habitus*, techniques, style: An integrated approach to the social understanding of material culture and boundaries. In Stark, M. T. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, pp. 232–263.
Dobres, M.-A., and Hoffman, C. R. (1994). Social agency and the dynamics of prehistoric technology. *Journal of Archaeological Method and Theory* **1**: 211–249.
Duncan, R. J. (1998). *The Ceramics of Ráquira, Columbia: Gender, Work, and Economic Change*, University of Florida Press, Gainesville.
Feinman, G. M. (1999). Rethinking our assumptions: Economic specialization at the household scale in ancient Ejutla, Oaxaca, Mexico. In Skibo, J. M., and Feinman, G. M. (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 81–98.
Gosselain, O. P. (1992). Technology and style: Potters and pottery among Bafia of Cameroon. *Man* **27**: 559–586.
Gosselain, O. P. (1998). Social and technical identity in a clay crystal ball. In Stark, M. T. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, pp. 78–106.
Gosselain, O. P., and Smith, A. L. (1995). The Ceramics and Society Project: An ethnographic and experimental approach to technological choices. In Lindhal, A., and Stilborg, O. (eds.), *The Aim of Laboratory Analyses of Ceramics in Archaeology*, KVHAA Konferenser 34, Stockholm, pp. 147–160.
Graves, M. W. (1985). Ceramic design variation within a Kalinga village: Temporal and spatial process. In Nelson, B. A. (ed.), *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale, IL, pp. 9–34.
Graves, M. W. (1991). Pottery production and distribution among the Kalinga: A study of household and

regional organization and differentiation. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 112–143.

Hagstrum, M. B. (1989). *Technological Continuity and Change: Ceramic Ethnoarchaeology in the Peruvian Andes*, Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles.

Hagstrum, M. B., and Hildebrand, J. A. (1990). A two-curvature method for reconstructing ceramic morphology. *American Antiquity* **55**: 388–403.

Hardin, M. A. (1991). Sources of ceramic variability at Zuni Pueblo. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 40–70.

Hegmon, M. (1998). Technology, style, and social practice: Archaeological approaches. In Stark, M. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, pp. 264–279.

Herbich, I. (1987). Learning patterns, potter interaction, and ceramic style among the Luo of Kenya. *African Archaeological Review* **5**: 193–204.

Herbich, I., and Dietler, M. (1991). Aspects of the ceramic system of the Luo of Kenya. In Ludtke, H., and Vossen, R., (eds.), *Topferei-und Keramikforschung*, Band 2, Habelt, Bonn, pp. 105–135.

Hodder, I. (1991). The decoration of containers: An ethnographic and historical study. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 71–94.

Hoopes, J. W., and Barnett, W. K. (eds.) (1995). *The Emergence of Pottery: Technology and Innovation in Ancient Societies*, Smithsonian Institution Press, Washington, DC.

Kobayashi, M. (1994). Use-alteration analysis of Kalinga pottery: Interior carbon deposits of cooking pots. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 127–168.

Kolb, C. C. (1989). Ceramic ecology in retrospect: A critical review of methodology and results. In Kolb, C. C. (ed.), *Ceramic Ecology, 1988: Current Research on Ceramic Materials*, BAR International Series 513, Oxford, pp. 261–375.

Kramer, C. (1985). Ceramic ethnoarchaeology. *Annual Review in Anthropology* **14**: 77–102.

Kramer, C. (1997). *Pottery In Rajasthan: Ethnoarchaeology in Two Indian Cities*, Smithsonian Institution Press, Washington, DC.

Krause, R. A. (1984). Modeling the making of pots: An ethnoarchaeological approach. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 615–698.

Krause, R. A. (1985). *The Clay Sleeps: An Ethnoarchaeological Study of Three African Potters*, University of Alabama Press, Tuscaloosa.

Krause, R. A. (1990). Ceramic practice and semantic space: An ethnoarchaeological inquiry into the logic of Bantu potting. *Antiquity* **64**: 711–726.

Kvamme, K. L., Stark, M. T., and Longacre, W. A. (1996). Alternative procedures for assessing standardization in ceramic assemblages. *American Antiquity* **61**: 116–126.

Lemonnier, P. (1992). *Elements for an Anthropology of Technology*, Anthropological Papers, No. 88, Museum of Anthropology, University of Michigan, Ann Arbor.

London, G. A. (1991). Standardization and variation in the work of craft specialists. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 182–204.

Longacre, W. A. (1985). Pottery use-life among the Kalinga, northern Luzon, the Philippines. In Nelson, B. A. (ed.), *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale, pp. 334–346.

Longacre, W. A. (1991). Ceramic ethnoarchaeology: An introduction. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 1–10.

Longacre, W. A. (1992). The perfect marriage: The essential joining of ethnoarchaeology and experimental archaeology. In Audouze, F. (ed.), *Ethnoarchéologie: justification, problemes, limites, XIIe Rencontres Internationales d'Archéologie et d'Histoire d'Antibes*, Editions APDCA, Juan-les-Pins, France, pp. 15–24.

Longacre, W. A. (1999). Standardization and specialization: What's the link? In Skibo, J. M., and Feinman, G. M., (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 44–58.

Longacre, W. A., and Skibo, J. M. (1994a). An introduction to Kalinga ethnoarchaeology. In Longacre,

W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 1–11.
Longacre, W. A., and Skibo, J. M. (1994b). Preface. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. xiii–xvi.
Longacre, W. A., and Stark, M. T. (1992). Ceramics, kinship and space: A Kalinga example. *Journal of Anthropological Archaeology* **11**: 125–136.
Longacre, W. A., Kvamme, K. L., and Kobayashi, M. (1988). Southwestern pottery standardization: An ethnoarchaeological view from the Philippines. *Kiva* **53**: 101–112.
MacEachern, S. (1998). Scale, style, and cultural variation: Technological traditions in the northern Mandara Mountains. In Stark, M. T. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, pp. 107–131.
Mahias, M.-C. (1993). Pottery techniques in India. In Lemonnier, P. (ed.), *Technological Choices: Transformations in Material Cultures Since the Neolithic*, Routledge, London, pp. 157–180.
Mills, B. J. (1989). Integrating functional analyses of vessel and sherds through models of ceramic assemblage formation. *World Archaeology* **21**: 133–147.
Mouat, L., and Arnold, D. (1988). Ceramic ecology and pottery production in El Porvenir, Honduras. In Kolb, C. C., and Lackey, L. M. (eds.), *A Pot for all Reasons: Ceramic Ecology Revisited*, Laboratory of Anthropology, Temple University, Philadelphia, pp. 239–261.
Neff, H. (1993). Theory, sampling, and analytical techniques in the archaeological study of prehistoric ceramics. *American Antiquity* **58**: 23–44.
Nelson, B. A. (1991). Ceramic frequency and use-life: A highland Maya case in cross-cultural perspective. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 162–181.
Neupert, M. A., and Longacre, W. A. (1994). Informant accuracy in pottery use-life studies. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 71–82.
Nicholson, P. T., and Patterson, H. L. (1985). Pottery making in Upper Egypt: An ethnoarchaeological approach. *World Archaeology* **17**: 222–239.
Nicholson, P. T., and Patterson, H. L. (1992). The Ballas pottery project: Ethnoarchaeology in Upper Egypt. In Bey, G., and Pool, C. (eds.), *Ceramic Production and Distribution: An Integrated Approach*, Westview, Boulder, CO, pp. 25–47.
Orton, C., Tyers, P., and Vince, A. (1993). *Pottery in Archaeology*, Cambridge University Press, Cambridge.
Pfaffenberger, B. (1992). Social anthropology of technology. *Annual Review of Anthropology* **21**: 491–516.
Pool, C. A. (1992). Integrating ceramic production and distribution. In Bey, G. J, III, and Pool, C. A. (eds.), *Ceramic Production and Distribution: An Integrated Approach*, Westview Press, Boulder, CO, pp. 275–313.
Rice, P. M. (1987). *Pottery Analysis: A Sourcebook*, University of Chicago Press, Chicago.
Rice, P. M. (1989). Ceramic diversity, production, and use. In Leonard, R. D., and Jones, G. T. (eds.), *Quantifying Diversity in Archaeology*, Cambridge University Press, Cambridge, pp. 109–117.
Rice, P. M. (1991). Specialization, standardization, and diversity: A retrospective. In Bishop, R. L., and Lange, F. W. (eds.), *The Ceramic Legacy of Anna O. Shepard*, University Press of Colorado, Niwot, CO, pp. 257–279.
Rice, P. M. (1996). Recent ceramic analysis: 2. Composition, production, and theory. *Journal of Archaeological Research* **4**: 165–202.
Rice, P. M. (1999). On the origins of pottery. *Journal of Archaeological Method and Theory* **6**: 1–54.
Sargent, C. F., and Friedel, D. A. (1986). From clay to metal: Culture change and container usage among the Bariba of northern Benin, West Africa. *African Archaeological Review* **4**: 177–195.
Schiffer, M. B. (1987). *Formation Processes of the Archaeological Record*, University of New Mexico Press, Albuquerque.
Schiffer, M. B., and Skibo, J. M. (1987). Theory and experiment in the study of technological change. *Current Anthropology* **28**: 595–622.
Schiffer, M. B., and Skibo, J. M. (1997). The explanation of artifact variability. *American Antiquity* **62**: 27–50.

Shott, M. J. (1989). On tool-class use lives and the formation of archaeological assemblages. *American Antiquity* **54**: 9–30.
Shott, M. J. (1996). Mortal pots: On use life and vessel size in the formation of ceramic assemblages. *American Antiquity* **61**: 463–482.
Sillar, B. (1993). Review of P. Arnold's *Domestic Ceramic Production and Spatial Organization* and W. Longacre's (ed.), *Ceramic Ethnoarchaeology*. *Antiquity* **67**: 681–682.
Sinopoli, C. M. (1988). The organization of ceramic production at Vijayanagara, South India. *American Anthropologist* **90**: 580–587.
Sinopoli, C. M., and Burton, T. R. (1986). Modern pottery production in rural Karnataka. In Chandra, L., and Jain, J. (eds.), *Dimensions of Indian Art: Pupul Jayakar Seventry*, Agam Kala Prakashan, Delhi, pp. 439–456.
Skibo, J. M. (1992a). Ethnoarchaeology, experimental archaeology, and inference building in ceramic research. *Archaeologia Polona* **30**: 27–38.
Skibo, J. M. (1992b). *Pottery Function: A Use Alteration Perspective*, Plenum Press, New York.
Skibo, J. M. (1994). The Kalinga cooking pot: An ethnoarchaeological and experimental study of technological change. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 113–126.
Skibo, J. M., and Blinman, E. (1999). Exploring the origins of pottery on the Colorado Plateau. In Skibo, J. M., and Feinman, G. M. (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 171–183.
Skibo, J. M., and Schiffer, M. B. (1995). The clay cooking pot: An exploration of women's technology. In Skibo, J. M., Walker, W. H., and Nielsen, A. E. (eds.), *Expanding Archaeology*, University of Utah Press, Salt Lake City, pp. 80–91.
Skibo, J. M., Schiffer, M. B., and Kowalski, N. (1989). Ceramic style analysis in archaeology and ethnoarchaeology: Bridging the analytical gap. *Journal of Anthropological Archaeology* **8**: 388–409.
Stahl, A. (1995). Has ethnoarchaeology come of age? *Antiquity* **69**: 404–407.
Stark, B. L. (1985). Archaeological identification of pottery-production locations: Ethnoarchaeological and archaeological data in Mesoamerica. In Nelson, B. A. (ed.), *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale, pp. 158–194.
Stark, B. L. (1995). Problems in analysis of standardization and specialization in pottery. In Mills, B. J., and Crown, P. L. (eds.), *Ceramic Production in the American Southwest*, University of Arizonza Press, Tucson, pp. 231–267.
Stark, M. T. (1991). Ceramic production and community specialization: A Kalinga ethnoarchaeological study. *World Archaeology* **23**: 64–78.
Stark, M. T. (1993). Review of *Ceramic Production and Distribution: An Integrated Approach*, Bey, G. J., and Pool, C. A. (eds.), *Antiquity* **67**: 184–188.
Stark, M. T. (1994). Pottery exchange and the regional system: A Dulapa case study. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Instiution Press, Washington, DC, pp. 169–197.
Stark, M. T. (1995). Economic intensification and ceramic specialization in the Philippines: A view from Kalinga. *Research in Economic Anthropology* **16**: 179–226.
Stark, M. T. (1998). Technical choices and social boundaries in material culture patterning: An introduction. In Stark, M. T. (ed.), *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC, pp. 1–11.
Stark, M. T. (1999). Social dimensions of technical choice in Kalinga ceramic traditions. In Chilton, E. S. (ed.), *Material Meanings: Critical Approaches to the Interpretation of Material Culture*, University of Utah Press, Salt Lake City, pp. 24–43.
Sterner, J. A. (1989). Who is signalling whom? Ceramic style, ethnicity, and taphonomy among the Sirak Bulahay. *Antiquity* **63**: 451–459.
Sullivan, A. P., III (1988). Prehistoric southestern ceramic manufacture: The limitations of the current evidence. *American Antiquity* **53**: 23–35.
Tani, M. (1994). Why should more pots break in larger households? Mechanisms underlying population estimates from ceramics. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 51–70.

Tani, M., and Longacre, W. A. (1999). On methods of measuring ceramic uselife: A revision of the uselife estimates of cooking vessels among the Kalinga, Philippines. *American Antiquity* **64**: 299–308.

Thompson, R. H. (1991). The archaeological purpose of ethnoarchaeology. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 231–245.

Trostel, B. (1994). Household pots and possessions: An ethnoarchaeological study of material goods and wealth. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 209–224.

van der Leeuw, S. E. (1991). Variation, variability, and explanation in pottery studies. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 11–39.

van der Leeuw, S. E. (1993). Giving the potter a choice: Conceptual aspects of pottery techniques. In Lemonnier, P. (ed.), *Technological Choices: Transformation in Material Cultures Since the Neolithic*, Routledge, London, pp. 238–288.

van der Leeuw, S. E., Papousek, R. A., and Coudart, A. (1992). Technological traditions and unquestioned assumptions: The case of pottery in Michoacan. *Techniques et Culture* **16–17**: 145–173.

Vitelli, K. D. (1999). "Looking up" at early ceramics in Greece. In Skibo, J. M., and Feinman, G. M. (eds.), *Pottery and People: A Dynamic Interaction*, University of Utah Press, Salt Lake City, pp. 184–198.

Vossen, R. (1984). Towards building models of traditional trade in ceramics: Case studies from Spain and Morocco. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 339–397.

Williams, E. (1995). The spatial organisation of pottery production in Huáncito, Michoacan, Mexico. *Papers from the Institute of Archaeology* **6**: 47–56.

BIBLIOGRAPHY OF RECENT LITERATURE

Annis, M. B. (1985). Ethnoarchaeological research—Water vessels in Sardinia. *Newsletter of the Department of Pottery Technology* **3**: 43–93 (University of Leiden, Leiden, The Netherlands).

Annis, M. B. (1985). Resistance and change: Pottery manufacture in Sardinia. *World Archaeology* **17**: 240–255.

Annis, M. B., and Jacobs, L. (1989–1990). Cooking wares from Pabillonis (Sardinia): Relationships between raw materials, manufacturing techniques and the function of vessels. *Newsletter of the Department of Pottery Technology* **7/8**: 75–132 (University of Leiden, Leiden, The Netherlands).

Arnold, D. E. (1987). Maya pottery after 20 years: Archaeological implications. In Rice, P. M., and Sharer, R. J. (eds.), *Maya Ceramics: Papers from the 1985 Maya Ceramics Conference*, BAR International Series 345, Oxford, pp. 545–561.

Arnold, D. E. (1989). Technological diversity and evolutionary viability: A comparison of contemporary pottery-making technologies in Guatemala, Peru, and Mexico. In Kolb, C. C. (ed.), *Ceramic Ecology, 1988: Current Research on Ceramic Materials*, BAR International Series 513, Oxford, pp. 29–53.

Arnold, D. E. (1998). Andean ceramic technology: An ethnoarchaeological perspective. *MASCA Research Papers in Science and Archaeology*, Supplement to Vol. 15, Philadelphia, pp. 353–367.

Arnold, P. J., III (1988). *The Production and Consumption of Ceramics in the Sierra de los Tuxtlas, Veracruz, Mexico*, Research Paper Series, No. 21, Latin American Institute, University of New Mexico, Albuquerque.

Aronson, M. A., and Fournier, P. (1993). Models for technological innovation: An ethnoarchaeological project in Pino Suárez, Mexico. In Kingery, W. D. (ed.), *The Social and Cultural Contexts of New Ceramic Technologies*, American Ceramic Society, Westerville, OH, pp. 33–74.

Aronson, M. A., Skibo, J. M., and Stark, M. T. (1991). Use technologies: An ethnoarchaeological study of Kalinga pottery. In Vandiver, P. B., Druzik, J., and Wheeler, G. S. (eds.), *Materials Issues in Art and Archaeology II*, Materials Research Society Symposium Proceedings, Vol. 185, Materials Research Society, Pittsburgh, pp. 415–428.

Aronson, M. A., Skibo, J. M., and Stark, M. T. (1994). Production and use technologies in Kalinga pottery. In Longacre, W. A., and Skibo, J. M. (1994), *Kalinga Ethnoarchaeology: Expanding*

Archaeological Method and Theory, Smithsonian Instiution Press, Washington, DC, pp. 83–111.

Balfet, H. (1984). Methods of formation and the shape of pottery. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 171–197.

Barley, N. (1994). *Smashing Pots: Works of Clay from Africa*, Smithsonian Institution Press, Washington, DC.

Barley, N. (1997). Traditional rural potting in West Africa. In Freestone, I., and Gainster, D. (eds.), *Pottery in the Making: Ceramic Traditions*, Smithsonian Institution Press, Washington, DC, pp. 140–145.

Bedaux, R. M. A., and van der Waals, J. D. (1987). Aspects of life-span of Dogon pottery. *Newsletter of the Department of Pottery Technology* **5**: 137–153 (University of Leiden, Leiden, The Netherlands).

Bey, G. J., III, and Pool, C. A. (eds.) (1992). *Ceramic Production and Distribution: An Integrated Approach*, Westview Press, Boulder, CO.

Bourges, C. T. (1993). Ethnoarchaeological approach to understanding archaeological ceramic assemblages from Grea, northern Cameroon. *Nyame Akuma* **41**: 8–11.

Bryant, D. D., and Brody, M. J. (1986). Modern and prehistoric Maya pottery manufacture. *Cerámica de Cultura Maya* **14**: 73–86.

Chávez, K. L. M. (1987). Traditional pottery of Raqch'i, Cuzco, Peru: A preliminary study of its production, distribution, and consumption. *Nawpa Pacha* **22–23**: 161–210.

David, N. (1990). *Vessels of the Spirits: Pots and People in North Cameroon*, Video (50 min), Department of Communications Media, University of Calgary, Calgary.

David, N., Gavua, K., MacEachern, A. S., and Sterner, J. (1991). Ethnicity and material culture in North Cameroon. *Canadian Journal of Archaeology* **15**: 171–177.

David, N. (1998). *Keyword Bibliography of Ethnoarchaeology and Related Topics*, Version 3.1, http://www.ucalgary.ca/UofC/faculties/SS/ARKY/ethnarky.html.

Davis, J. L., and Lewis, H. (1985). Mechanization of pottery production: A case study from the Cycladic Islands. In Knapp, A. B., and Stech, T. (eds.), *Prehistoric Production and Exchange: The Aegean and Eastern Mediterranean*, Institute of Archaeology Monograph XXV, University of California, Los Angeles, pp. 79–92.

Deal, M., Serwint, N., and Sohn C. (1993). *Traditional Potters of Cyprus*, Video (30 min), Cyprus American Archaeological Research Institute, Nicosia.

DeBoer, W. R. (1991). The decorative burden: Design, medium and change. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 144–161.

Efstratiou, N. (1992). Production and distribution of a ceramic type in highland Rhodope: An ethnoarchaeological study. *Origini: Preistoria E Protostoria Delle Civilta Antiche* **16**: 311–328.

Frank, B. E. (1998). *Mande Potters and Leather-Workers: Art and Heritage in West Africa*, Smithsonian Institution Press, Washington, DC.

Gosselain, O. P. (1992). Bonfire of the enquiries. Pottery firing temperatures in archaeology: What for? *Journal of Archaeological Science* **19**: 243–259.

Gosselain, O. P. (1993). From clay to pottery, with style: 1990–1992 fieldwork in Cameroon. *Nyame Akuma* **39**: 2–7.

Gosselain, O. P. (1994). Skimming through potters' agendas: An ethnoarchaeological study of clay selection strategies in Cameroon. In Childs, S. T. (ed.), *Society, Culture, and Technology in Africa*, MASCA Research Papers in Science and Archaeology, Supplement to Volume 11, Philadelphia, pp. 99–107.

Graves, M. W. (1994). Kalinga social and material culture boundaries: A case of spatial convergence. In Longacre, W. A., and Skibo, J. M. (eds.), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC, pp. 13–49.

Hagstrum, M. B. (1986). The technology of ceramic production of Wanka and Inka wares from the Uanamarca Valley, Peru. In Rice, P. M. (ed.), *Occasional Publications of the Ceramic Technology Laboratory, Vol. 3*, Florida State Museum, Gainesville, pp. 1–29.

Hagstrum, M. B. (1988). Ceramic production in the central Andes, Peru: An archaeological and ethnographic comparison. In Kolb, C. C., and Lackey, L. M. (eds.), *A Pot for all Reasons: Ceramic*

Ecology Revisited, Laboratory of Anthropology, Temple University, Philadelphia, pp. 127–145.
Hardin, M. A. (1984). Models of decoration. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 573–607.
Herbich, I., and Dietler, M. (1989). River lake Nilotic: Luo. In Barbour, J., and Wandibba, S., (eds.), *Kenya Pots and Potters*, Oxford University Press, Nairobi, pp. 27–40.
Hudson, J. (1997). Urban pottery workshops in North Africa. In Freestone, I., and Gainster, D. (eds.), *Pottery in the Making: Ceramic Traditions*, Smithsonian Institution Press, Washington, DC, pp. 134–139.
Huyler, S. P. (1994). Tulasi: A survey and case study of ritual terracotta planters for Tulasi, the goddess incarnate as a basil bush, in coastal Orissa. In Allchin, B. (ed.), *Living Traditions: Studies in the Ethnoarchaeology of South Asia*, Oxford and IBH Publishing, New Delhi, pp. 323–349.
Kaplan, F. S. (1985). Measuring, mapping, and meaning of pots. *American Anthropologist* **87**: 357–364.
Kaplan, F. S. (1990). Pottery for the dead: Role and function of blackware in Puebla, Mexico. In Kingergy, W. D. (ed.), *The Changing Roles of Ceramics in Society: 26,000 B.P. to the Present*, American Ceramic Society, Westerville, OH, pp. 211–229.
Kolb, C. C. (ed.) (1988). *Ceramic Ecology Revisited, 1987: The Technology and Socioeconomics of Pottery* (2 vols.), BAR International Series 436, Oxford.
Kolb, C. C. (1989). The current status of ceramic studies. In Kolb, C. C. (ed.), *Ceramic Ecology, 1988: Current Research on Ceramic Materials*, BAR International Series 513, Oxford, pp. 377–421.
Kolb, C. C. (ed.) (1989). *Ceramic Ecology, 1988: Current Research on Ceramic Materials*, BAR International Series 513, Oxford.
Kolb, C. C., and Lackey, L. M. (eds.) (1988). *A Pot for all Reasons: Ceramic Ecology Revisited*, Temple University, Laboratory of Anthropology, Philadelphia.
Kramer, C. (1991). Ceramics in two Indian cities. In Longacre, W. A. (ed.), *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson, pp. 205–230.
Kramer, C. (1992). Ceramics in Rajashtan: Distributional and scalar variation. In Audouze, F. (ed.), *Ethnoarchéologie: justification, problemes, limites*, XIIe Rencontres Internationales d'Archéologie et d'Histoire d'Antibes, Editions APDCA, Juan-les-Pins, France, pp. 127–134.
Kramer, C. (1994). A tale of two cities: Ceramic ethnoarchaeology in Rajasthan. In Allchin, B. (ed.), *Living Traditions: Studies in the Ethnoarchaeology of South Asia*, Oxford and IBH, New Delhi, pp. 307–322.
Kramer, C., and Douglas, J. E. (1992). Ceramics, caste, and kin: Spatial relations in Rajasthan, Indian. *Journal of Anthropological Archaeology* **11**: 187–201.
Lacovara, P. (1985). The ethnoarchaeology of pottery production in an Upper Egyptian Village. In Kingery, W. D. (ed.), *Ancient Technology to Modern Science*, American Ceramic Society, Columbus, OH, pp. 51–60.
Lindahl, A., and Matenga, E. (1995). *Present and Past: Ceramics and Homesteads. An Ethnoarchaeological Project in the Buhera District, Zimbabwe*, Studies in African Archaeology 11, Department of Archaeology, Uppsala University.
London, G. A. (1987). Regionalism in traditional Cypriote ceramics. *Newsletter of the Department of Technology* **5**: 125–136 (University of Leiden, Leiden, The Netherlands).
London, G. A. (1989). On fig leaves, itinerant potters, and pottery production locations in Cyprus. In McGovern, P. E. (ed.), *Cross-craft and Cross-cultural Interactions in Ceramics*, American Ceramic Society, Westerville, OH, pp. 65–80.
London, G. A. (1989). Past present: The village potters of Cyprus. *Biblical Archaeologist* **52**: 219–229.
London, G. A., Egoumenidou, F., and Karageorghis, V. (1990). *Traditional Pottery in Cyprus* (trans., Krull, K.), Philipp von Zabern, Mainz.
Longacre, W. A. (ed.) (1991). *Ceramic Ethnoarchaeology*, University of Arizona Press, Tucson.
Longacre, W. A., and Skibo, J. M. (eds.) (1994b). *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*, Smithsonian Institution Press, Washington, DC.
Longacre, W. A., Skibo, J. M., and Stark, M. T. (1991). Ethnoarchaeology at the top of the world. *Expedition* **33**(1): 4–15.
MacEachern, S. (1992). Ethnicity and ceramic variation around Mayo Plata, northern Cameroon. In

Sterner, J., and David, N. (eds.), *An African Commitment: Papers in Honour of Peter Lewis Shinnie*, University of Calgary Press, Calgary, pp. 211–230.
Miller, D. (1985). *Artifacts as Categories: A Study of Ceramic Variability in Central India*, Cambridge University Press, Cambridge.
Mossman, B. M., and Selsor, M. (1988). A utilitarian pottery tradition and the modern Spanish kitchen. In Kolb, C. C., and Lackey, L. M. (eds.), *A Pot for All Reasons: Ceramic Ecology Revisited*, Laboratory of Anthropology, Temple University, Philadelphia, pp. 213–237.
Nelson, B. A. (1985). Reconstructing ceramic vessels in their systemic contexts. In Nelson, B. A. (ed.), *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale, pp. 310–329.
Nelson, B. A. (ed.) (1985). *Decoding Prehistoric Ceramics*, Southern Illinois University Press, Carbondale.
Nicholson, P. T., and Patterson, H. L. (1985). Ethnoarchaeology in Egypt: The Ballas Pottery Project. *Archaeology* **38**(3): 52–59.
Nicholson, P. T., and Patterson, H. L. (1989). Ceramic technology in Upper Egypt: A study of pottery firing. *World Archaeology* **21**: 71–86.
Okpoko, A. I. (1987). Pottery-making in Igboland, eastern Nigeria: An ethnoarchaeological study. *Proceedings of the Prehistoric Society* **53**: 445–455.
Papousek, D. A. (1984). Pots and people in Los Pueblos: The social and economic organization of pottery. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 475–520.
Phillipson, D. W. (1990). Traditional pottery manufacture in the southern Sudan. *Origini: Preistoria E Protostoria Delle Civilta Antiche* **13**: 425–450.
Ralph, D. M., and Arnold, D. E. (1988). Socioeconomic status, kinship, and innovation: The adoption of the tornete in Ticul, Yucatán. In Kolb, C. C. (ed.), *Ceramic Ecology Revisited, 1987: The Technology and Socioeconomics of Pottery*, BAR International Series 436 (i), Oxford, pp. 145–164.
Rice, P. M. (1996). Recent ceramic analysis: 1. Function, style, and origins. *Journal of Archaeological Research* **4**: 133–163.
Roux, V. (1989). *The Potter's Wheel: Craft Specialization and Technical Competence*, Oxford and IBH, New Delhi.
Sayers, R., and Rinzler, R. (1987). *The Korean Onggi Potter*, Smithsonian Institution Press, Washington, DC.
Sheehy, J. J. (1988). Ceramic ecology and the clay/fuel ratio: Modeling fuel consumption in Tlajinga 33, Teotihuacan, Mexico. In Kolb, C. C. (ed.), *Ceramic Ecology Revisited, 1987: The Technology and Socioeconomics of Pottery*, BAR International Series 436(i), Oxford, pp. 199–226.
Sheehy, J. J. (1992). *Ceramic Production in Ancient Teotihuacan, Mexico: A Case Study of Tlajinga 33*, Unpublished Ph.D. dissertation, Department of Anthropology, Pennsylvania State University, University Park.
Sillar, B. (1996). The dead and the drying: Techniques for transforming people and things in the Andes. *Journal of Material Culture* **1**: 259–290.
Sinopoli, C. M. (1991). *Approaches to Archaeological Ceramics*, Plenum, New York.
Sinopoli, C. M. (1991). Seeking the past through the present: Recent ethnoarchaeological research in South Asia. *Asian Perspectives* **30**: 177–192.
Soper, R. (1985). Roulette decoration on African pottery: Technical considerations, dating, and distributions. *African Archaeological Review* **3**: 29–51.
Stark, M. T. (1991). Ceramic change in ethnoarchaeological perspective: A Kalinga case study. *Asian Perspectives* **30**: 193–216.
Stark, M. T. (1991). Transforming the Kalinga immosso: An ethnoarchaeological perspective on causes behind ceramic change. *Dyn* **10**: 80–91.
Stark, M. T. (1992). From sibling to suki: Social relations and spatial proximity in Kalinga pottery exchange. *Journal of Anthropological Archaeology* **11**: 137–151.
Stark, M. T. (1993). Re-fitting the "cracked and broken façade": The case for empiricism in post-processual ethnoarchaeology. In Yoffee, N., and Sherratt, A. (eds.), *Archaeological Theory: Who Sets the Agenda*? Cambridge University Press, Cambridge, pp. 93–104.
Stark, M. T. (ed.) (1998). *The Archaeology of Social Boundaries*, Smithsonian Institution Press, Washington, DC.

Stark, M. T., and Longacre, W. A. (1993). Kalinga ceramics and new technologies: Social and cultural contexts of ceramic change. In Kingery, W. D. (ed.), *The Social and Cultural Contexts of New Ceramic Technologies*, American Ceramic Society, Westerville, OH, pp. 1–32.

Sterner, J. A. (1992). Sacred pots and 'symbolic reserviors' in the Mandara Highlands of northern Cameroon. In Sterner, J. A., and David, N. (eds.), *An African Commitment: Papers in Honour of Peter Lewis Shinnie*, University of Calgary Press, Calgary, pp. 171–180.

van den Bel, M., Hamburg, G., and Jacobs, L. (1995). The use of kwep as temper for clay among the Palikur in French Guyana. *Newsletter of the Department of Technology* **13**: 42–52 (University of Leiden, Leiden, The Netherlands).

van der Leeuw, S. E. (1984). Dust to dust: A transformational view of the ceramic cycle. In van der Leeuw, S. E., and Pritchard, A. C. (eds.), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, Albert Egges Van Giffen Instituut voor Prae- en Protohistorie, Cingvla VII, Universiteit van Amsterdam, Amsterdam, pp. 707–773.

van der Leeuw, S. E. (1989). Risk, innovation, perception. In van der Leeuw, S. E., and Torrence, R. (eds.), *What's New? A New Look at the Process of Innovation*, Methuen, London, pp. 300–329.

van der Leeuw, S. E., and Papousek, R. A. (1992). Tradition and innovation. In Audouze, F. (ed.), *Ethnoarchéologie: justification, problemes, limites*, XIIe Rencontres Internationales d'Archéologie et d'Histoire d'Antibes, Editions APDCA, Juan-les-Pins, France, pp. 135–158.

Yang, Y. (1986). The ceramic technology of Honggao Village, Yuanmou, Yunnan. *Kaogu* **12**: 1133–1138.