Journal of Archaeological Research, Vol. 11, No. 3, September 2003 (© 2003)

Current Issues in Ceramic Ethnoarchaeology

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The last decade has seen a surge in ceramic ethnoarchaeological studies worldwide, covering such important topics as ceramic production, technological change, ceramic use and distribution, and social boundaries. Some of the most exciting new Americanist research helps archaeologists refine models of ceramic production. Increasing numbers of non-Americanist studies use a technology and culture framework to examine manufacturing variability, the dynamics of cultural transmission between generations, and the articulation between ceramic technology and social boundaries. This review summarizes these recent trends, places current ethnoarchaeological research in its theoretical contexts, and looks to the future of research in a dynamic landscape in which ceramic production systems are undergoing rapid change. Many varieties of research currently now fall under the rubric of ceramic ethnoarchaeology, and Americanist archaeologist are encouraged to look beyond their own regionalist and theoretical paradigms to consult this wider literature.

KEY WORDS: ceramic ethnoarchaeology; ceramic production; ceramic consumption; technological change; social boundaries.

INTRODUCTION

> Ethnoarchaeology's primary service mission is still the revising of the analogical consciousness of archaeologists, many of whom prefer their culture dead, sensitizing them to dimensions of variability and the richness of the relationship between humans and their artifacts . . . (David, 1992a, p. 352)

Ceramic ethnoarchaeological studies have now become an established tradition in archaeological research, and the last 15 years has seen a proliferation of research on a variety of topics germane to archaeologists. Throughout this period, reviews of the field (P. Arnold, 2000; Costin, 2000; Hegmon, 2000; Kolb, 2001) have explicitly considered contemporary pots and potters in terms of particular

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1059-0161/03/0900-0193/0 © 2003 Plenum Publishing Corporation

problems with which archaeologists frequently struggle (Kramer, 1985, p. 77). Previous scholars have summarized portions of the ceramic ethnoarchaeological literature that concentrate on particular topics in the field (Costin, 2000; David and Kramer, 2001; Kolb, 2001), focus on specific geographic regions (London, 2000b; MacEachern, 1996; Sinopoli, 1991), or survey theoretical approaches (P. Arnold, 2000; Hegmon, 2000). General reviews of trends in archaeological ceramic studies (Krishnan, 1997; Matson, 1995a; Rice, 1996a,b; Tite, 1999; Vandiver, 2001) also include ceramic ethnoarchaeological research as part of their broader literary corpus.

This review has three primary goals. The first is to summarize key trends in ceramic ethnoarchaeological research from the last 10 to 12 years by use of a broad geographic and thematic lens. A second goal lies in identifying key issues and exploring articulations between that research and its theoretical underpinnings. This review's third goal is to discuss issues that are relevant to the nature, aims, and practice of ceramic ethnoarchaeology today and in future decades.

Recent summaries of the field, while valuable, have focused largely on a processual literature that ignores most non-Americanist research. This review, in contrast, selectively surveys the world's current literature in ceramic ethnoarchaeology. By defining what constitutes ceramic ethnoarchaeology more broadly (contra P. Arnold, 2000, p. 123), this review illustrates an even wider range of contributions that ceramic ethnoarchaeology can make to archaeological interpretation.

Following current trends in the field, this review concentrates on low-fired earthenwares, made from low-refractory clays, which are fired in the range of 700–1200°C, and manufactured in nonindustrial settings. Most attention focuses on ceramic containers rather than on noncontainers (like flower pots, sculptures, figurines, cooking stoves) and structural ceramics (like bricks, roof tiles, drain pipes, concrete), although research on these items, where available, is summarized. Secondly, this review generally restricts its discussion to published materials, with a bias toward the English-language literature.

This review is organized into five sections. The first section reviews current definitions of ceramic ethnoarchaeology, discusses competing theoretical approaches that its various practitioners employ, and describes discrete regional traditions across the world. I then summarize major research themes in ceramic ethnoarchaeological research since 1992, with a focus on technology, the organization of production, ceramic production and social boundaries, assemblage formation, and ceramic change. In following sections I examine the relationship between ceramic ethnoarchaeology and archaeological research, and consider critical issues in the contemporary practice of ceramic ethnoarchaeology, both methodological and ethical. The paper concludes with a discussion of the future of ceramic ethnoarchaeological research in a globalizing world.

CERAMIC ETHNOARCHAEOLOGY DEFINED AND PRACTICED GLOBALLY

Definitions

Ceramic ethnoarchaeology has Western intellectual roots and was launched in an era of Western expansionism in the late nineteenth century (David and Kramer, 2001, pp. 14–32; Longacre, 1991, pp. 1–5). With salvage ethnography as a primary goal, such research soon became associated with material culture studies and was relegated to second-class status (Stark, 1998, pp. 3–4). Few archaeologists engaged in such research until Kleindeinst and Watson (1956) called for an "action archaeology" during the 1950s, when ceramic ethnoarchaeology as we know it was born (following David and Kramer, 2001, p. 146). It became entrenched in archaeological research by the 1970s (David and Kramer, 2001, pp. 21, 26), and its popularity remains undiminished.

Myriad definitions exist for ethnoarchaeology (see summary in David and Kramer, 2001, pp. 6–13). Most, however, view ethnoarchaeology as a research strategy rather than as a "self-contained discipline" (Krause, 1999, p. 559) and as a tool for developing middle-range theory (Kosso, 1991, p. 625). Archaeological interpretation is, by its very nature, dependent on inferential reasoning (Porr, 1999, pp. 5–8; Stahl, 1993; Stark, 1993, pp. 93–94; Wylie, 1985), and ethnoarchaeological data provide material for building stronger archaeological inferences than do commonsense explanations of material culture patterning (e.g., D. Arnold, 1998, p. 355; Kramer, 1985, pp. 77–78). Few ceramic ethnoarchaeological studies have focused explicitly on constructing general interpretive models (David, 1992a, pp. 338–339). Such research, however, may ultimately revitalize the ethnological study of material culture through the development of theory relating to technology and culture (David, 1992b; Lemonnier, 1986, p. 180, 1992; Pfaffenberger, 1992; van der Leeuw, 1994; van der Leeuw and Papousek, 1992).

This review concentrates on studies that explicitly consider ceramic systems in terms that are archaeologically relevant. For the purposes of this review, a wide variety of contemporary research falls under the rubric of ceramic ethnoarchaeology, including ceramic ethnography. While ceramic ethnoarchaeology is generally structured with archaeological questions in mind and often done by archaeologists, ceramic ethnography is undertaken by anthropologists and art historians (e.g., Berns, 1993; Duncan, 1998, 2000; Frank, 1993, 1998; Lefferts and Cort, 1999; Moeran, 1997; Reith, 1997). Ceramic ethnographers rarely ask explicitly archaeological questions (David and Kramer, 2001, p. 304), but often gather quantitative data on production and formation process issues, and also expand our knowledge of how pottery works in social contexts.

Both regional and theoretical differences characterize ceramic ethnoarchaeological research done today. Not surprisingly, these differences parallel discrete

regional intellectual traditions in the broader realm of archaeological research. The next section explores the geographic distribution of current research and differences in thematic emphasis.

Regional Traditions in Ceramic Ethnoarchaeological Research

The Western roots of ethnoarchaeological research may explain why it remains a predominant concern of Euro-American researchers working across the globe. Most ethnoarchaeological explanations focus on functional variability around behavioral norms and operate within a progressive evolutionary framework. Within ceramic ethnoarchaeology specifically, the link between archaeological ceramic studies and ceramic ethnoarchaeology is closer in Americanist than in British research, where anthropology and archaeology are taught as separate disciplines (Rice, 1996a, p. 137).

Geographic emphases in recent ceramic ethnoarchaeological research are evident in some recent reviews of the field (David and Kramer, 2001, tables 1.2–1.5; London, 2000b, pp. 2–6; MacEachern, 1996; Sinopoli, 1991). Little ethnoarchaeological research has been undertaken recently in the industrialized countries of Europe and North America, where most ceramic production systems (including indigenous technologies) are now geared toward the art market. Worldwide ceramic ethnoarchaeological research has been biased toward the study of ceramic production systems in small-scale (and "tribal") societies, characterized by household industries. This paucity of research in urban industrial settings limits the utility of current ceramic ethnoarchaeological research for the study of state-level societies.

In the New World, Latin America has been a focus of ceramic ethnoarchaeological research since the mid-1950s (Druc, 2000, pp. 78–79); few ethnoarchaeologists, however, hail from these countries (David and Kramer, 2001, p. 28). The intensity of Mesoamerican research has decreased recently. Dean Arnold's longitudinal research with Yucatecan potters, begun in 1965, is a notable exception (e.g., D. Arnold, 1971, 1985, 1987, 1989). Whether changing interests of Mesoamerican archaeologists or the disappearance of traditional ceramic systems in the region explains this shift is unclear. More work from South America concentrates on Andean regions (e.g., D. Arnold, 1993, 1998; Chavez, 1992; Sillar, 1996, 1997, 2000) than on lowland areas where potters remain active (Bowser, 2000) and where exemplary ethnoarchaeological research was undertaken in the past (e.g., DeBoer, 1990; DeBoer and Lathrap, 1979).

Ceramic ethnoarchaeological research has been conducted throughout many parts of the Old World for decades. However, political conflicts in the Near East, where valuable ethnoarchaeological research was undertaken previously (e.g., Kramer, 1982; Watson, 1979), have prevented the development of new projects in this region. This review consequently includes few studies from the Near East.

Africa has become a prominent research location for ceramic ethnoarchaeological research. Its vast size, cultural diversity, active ceramic production systems, and accessibility make it a major research locus, and the pace of work by African scholars has accelerated since the early 1990s (David and Kramer, 2001, p. 28). Sub-Saharan Africa is a particularly rich area for ethnoarchaeological research (Agorsah, 1990; MacEachern, 1996). Local scholars are better represented in the African literature than perhaps in any other region in the world, in part because ethnoarchaeology provides a low-cost alternative to archaeological survey and excavation (McIntosh, 1994, p. 182), because continuities in the region encourage the use of ethnoarchaeology as a direct historical approach (McIntosh, 1994, p. 182), and because African archaeologists employ Western theoretical frameworks that privilege ethnoarchaeology as a research strategy (Lane, 1996, pp. 727–731).

Current literature reflects a growing research emphasis on West Africa, where ethnoarchaeological research increased substantially in the last decade (McIntosh, 1994, p. 182). Francophone scholars have undertaken a disproportionate amount of this research (MacEachern, 1996, pp. 250–262). Researchers from three large-scale projects dominate the current literature, and their names feature prominently in the literature review that follows. The Mandara Archaeological Project, begun in 1984 by Nicholas David, has produced a wealth of research on style and social identity (among other topics). Research by the Swiss Archaeological and Ethnoarchaeological Mission in West Africa (MAESAO), begun in 1988 by Alain Gallay and Eric Huysecom, concentrates on manufacturing techniques (classification and typology, and life span of pottery). Researchers from the Ceramics and Society Project, begun in 1990 by Pierre de Maret, have studied ceramic traditions in 13 countries across Sub-Saharan Africa and blend ethnoarchaeological, experimental, and archaeometric approaches.

Little ceramic ethnoarchaeological research has been undertaken across Asia relative to its geographic and demographic size, in part because proportionately few archaeologists trained in the Americanist tradition work in these regions. Civil war and political instability have precluded researchers from studying pottery traditions in the Caucasus and Central Asia, although potters were at least active in areas such as Afghanistan in the late 1960s (e.g., Matson, 1995b, pp. 14–17). Discrete trends in ceramic ethnoarchaeological studies characterize South, East, and Southeast Asia, but each region contains a mixture of Americanist research and local research.

Disappointingly little work has been published from East Asia (i.e., China, Japan, Korea), given the scope of the region and the diversity of its traditional cultures. Until recently, Western scholars were prohibited from undertaking projects in countries like China and Tibet. Countries like Korea and Japan both have high-fired folk pottery ceramic traditions. Western-language research on these industries, however, has been the work primarily of art historians and anthropologists (e.g., Moeran, 1997) rather than anthropological archaeologists (whose

primary interests lie in the prehistoric period and in low-fired earthenware pottery). Some provinces of China still contain substantial populations of cultural minorities, particularly in the southwestern provinces, who manufacture and use earthenware ceramics (see Underhill, 2002). China now welcomes archaeologists to work in their country, and many areas of China provide ideal settings for future research.

Americanist archaeologists have paid distressingly little attention to the wealth of ethnoarchaeological research produced in South Asia and by South Asian scholars, despite the region's rich cultural diversity and its dynamic ceramic traditions (for reviews, see Allchin, 1994; Sinopoli, 1991). The existence of so-called "tribals" (traditional indigenous groups) across an otherwise stratified and casted India has prompted some ceramic research (e.g., Ghosh and Bhattacharya, 1997), as has the continued operation of urban, industrial-level ceramic production systems (e.g., Kramer, 1991, 1992, 1994, 1997).

Southeast Asia's rich cultural diversity and its uneven economic development make the region an ideal locus for ceramic ethnoarchaeological study; potters are active today in most areas in the region. Research from the Kalinga Ethnoarchaeological Project (begun in 1973 by William Longacre) and its offshoots elsewhere in the Philippines currently dominate this region's literature, including publications on assemblage formation, formation processes, and organizational models of ceramic production and distribution (e.g., Kobayashi, 1994; Longacre, 1991; Skibo, 1992, 1994; Stark, 1992, 1994, 1999; Stark and Longacre, 1993; Tani, 1994; Tani and Longacre, 1999). Other ceramic ethnoarchaeological research published recently concentrates either on issues related to cognition and choice in ceramic manufacture (Goto, 1997; Neupert, 2000) or on documenting ceramic production and distribution systems in the Philippines (Ushijima and de la Peña, 1996; Zayas, 1996), Burma (Reith, 1997), Thailand (Lefferts and Cort, 1999), and Cambodia (Cort and Lefferts, 2000; Kojo and Marui, 2000). The world's fourth most populous nation—Indonesia—has seen few Western-language ceramic ethnoarchaeological publications in the last two decades.

THEORY AND CERAMIC ETHNOARCHAEOLOGY

The idea of theory—and its linkage to practice—remains a problem for ceramic ethnoarchaeologists. The term "theory" as used in this paper describes what elsewhere has been called "high-level" or "general" theory (O'Connell, 1995; Schiffer, 1988; Yoffee and Sherratt, 1993), and that determines the kinds of research questions that can be asked of the archaeological record. Although theory shapes ethnoarchaeological practice either implicitly (Simms, 1992, p. 190; Stahl, 1995, p. 404) or explicitly (David, 1992a; O'Connell, 1995), the link between theoretical perspective and ethnoarchaeological application is rarely articulated explicitly in published studies. Ceramic ethnoarchaeologists have embraced a range

of theoretical stances and criticize each other with great vigor (e.g., P. Arnold, 1998, p. 27; O'Connell, 1995, p. 208).

Americanist archaeologists have advocated several alternative theoretical frameworks as the guiding paradigm for ceramic ethnoarchaeological research. At one end of the continuum are "naturalists," who embrace materialist and empiricist approaches and use ceramic ethnoarchaeological research to either develop empirical generalizations about human-behavior relationships or study accumulation processes in the material record (David, 1992a; David and Kramer, 2001, p. 251). At the other end of this theoretical continuum are "antinaturalists" who emphasize humanistic and hermeneutic approaches and use ceramic ethnoarchaeology to study structure and agency through material culture (David and Kramer, 2001, pp. 36–40). Despite the often-combative tone of debates in this realm—away from either endpoint of the continuum—thematic domains overlap, and most ceramic ethnoarchaeologists fall somewhere in between.

The following discussion attempts to answer several questions. First, what should be the role of theory in ceramic ethnoarchaeology? Should ceramic ethnoarchaeological research be theory-driven to produce relevant results for archaeologists? Second, what should be the role of non-Western ethnoarchaeological research? Answering these questions requires some discussion of changing trends in method and theory in ceramic ethnoarchaeological research.

Changing Theoretical Perspectives

Competing theoretical frameworks have structured ceramic ethnoarchaeological research in the Western archaeological literature since its fluorescence. Yet many ceramic ethnoarchaeologists continued their research into the 1980s without paying attention to the theoretical battles that waged around them. Thus these undercurrents have often only marginally influenced ceramic ethnoarchaeological practice.

The "ceramic ecology" approach, coined by Matson (1965), dominated ceramic ethnoarchaeological research in the 1980s (see D. Arnold, 1985, 1999, pp. 321–324; Kolb, 1989; Rice, 1984b, 1996b, pp. 184–185). Its theoretical roots lie in cultural ecology, neoevolutionism, and neofunctionalism (D. Arnold, 1991, p. 326, 1999, p. 59; Kolb, 1989, p. 308). As the 1980s progressed, proponents of "behavioral archaeology" emerged who shared their epistemology with ceramic ecologists and concentrated on ceramic production and use/performance in ethnographic and experimental settings (e.g., Schiffer *et al.*, 1994, 2001; Schiffer and Skibo, 1987; Skibo *et al.*, 1995; Tschauner, 1996). Neither of these approaches developed a sufficiently unified theoretical framework, however, to set the theoretical agenda for ceramic ethnoarchaeological research (Broughton and O'Connell, 1999, pp. 160–161; McGuire, 1995; cf. Schiffer, 1996, 1999; Schiffer and Skibo, 1997).

Changes in archaeology's theoretical landscape during the 1980s stimulated the adoption of alternative frameworks that characterized previous approaches as "narrowly functionalist, optimizing, and biological" (Wobst, 1999, p. 124). Ceramic ethnoarchaeological studies of this ilk focused on symbolic dimensions of power as reflected in material culture (Braithwaite, 1982; Miller, 1985, 1986; Welbourn, 1984).

Since the fragmentation of archaeological theory in the 1980s, different groups have vied for prominence by promoting their approach as the preferred theoretical framework for Americanist archaeology. Reaction to critiques in the following decade has stimulated ceramic ethnoarchaeology's search for a theoretical identity. Increasing numbers of practitioners have called for social theory that encompasses both technical concerns and practice in their historical contexts (Gosselain, 1994, p. 99, 1998, 2001; Livingstone Smith, 2000, pp. 21–22; Pool, 2000; Sillar, 1997, 2000; van der Leeuw, 1993, p. 238). More than a decade later, this critical approach has gained supporters in many quarters (e.g., Rice, 1996a, p. 143; Sillar and Tite, 2000, pp. 15–16; Tite, 1999, p. 225; Valdez, 1997).

By the end of the 1990s, several approaches characterized ceramic ethnoarchaeology: studies using the direct historical approach (by both Western and non-Western scholars) and research under several competing theoretical schools. Most scholars in developing countries document traditional technologies as they undergo significant change. Some eastern European approaches, which are poorly represented in the ceramic ethnoarchaeological literature, employ the direct historical approach in studying surviving "folk traditions" to interpret the archaeological record (Kobyliński, 1995).

Theoretical Tensions in Contemporary Ceramic Ethnoarchaeology

Scholars remain divided regarding the need for theoretically engaged ethnoarchaeological research, with a more pronounced concern with this topic found among Euro-American practitioners (David, 1992a; O'Connell, 1995). Theoretically committed ceramic ethnoarchaeologists in ceramic ethnoarchaeology today work along a messy theoretical continuum (following David and Kramer, 2001). At least two major divisions are evident: one that distinguishes European scholars from their Americanist peers, and another that divides the Americanist group into several competing factions.

Significant differences characterize ceramic ethnoarchaeological research from opposite sides of the Atlantic. Abundant European ceramic ethnoarchaeological research, done primarily in Africa and Asia, eschews the evolutionary approach that still structures most Americanist archaeology and instead prefers an historicist approach (Dobres, 1999a; Loney, 2000, pp. 651–653). The school of "logicism" (sensu Gardin, 1980) characterizes European ceramic ethnoarchaeological research and concentrates on the relationship between technological sequences and

social identity (de Ceuninck, 1993; Gallay, 1989, 1998; Gallay and de Ceuninck, 1998; Gelbert, 1999; Huysecom, 1992, 1994; Mayor 1991/92, 1994; see reviews in MacEachern, 1996, pp. 260–261; McIntosh, 1994, pp. 183–184).

Americanist approaches, in contrast, continue to embrace an evolutionist perspective and to emphasize relationships between behavior and material cultural patterning (e.g., D. Arnold, 1999, 2000; P. Arnold, 1990, 1991a,b; Pool, 2000; Shott and Williams, 2001). Seemingly few Americanists are familiar with the European literature (but see Dobres, 2000). Three modal tendencies in current ceramic ethnoarchaeological research are as follows: (1) the "science" group who uses evolutionary ecology as its theoretical framework; (2) Binfordians and behavioral archaeologists, who use an eclectic evolutionist framework; and (3) neoprocessual archaeologists, whose eclectic background includes numerous theoretical frameworks within and beyond the strictures of anthropology. Each approach is described in more detail below.

Mode 1: the "evolutionary science" group. Proponents of this approach use an evolutionary ecological framework to reconcile the ethnoarchaeological study of short-term behavior with archaeology's goals of explaining long-term change (O'Connell, 1995; Simms, 1992). This neo-Darwinian approach seeks to understand behavior rather than simply its material consequences and is particularly concerned with long-term consequences of decision making (Broughton and O'Connell, 1999; O'Connell, 1995, p. 206). Evolutionary archaeologists have contributed very little to recent developments in ceramic ethnoarchaeology (P. Arnold, 1999; Rice, 1996b, p. 185), perhaps because their interest lies in material patterning rather than in behavior or process (Broughton and O'Connell, 1999, p. 157).

Mode 2: the Binfordians and behavioral archaeologists. Proponents of this approach contend that archaeology constitutes the "science of the archaeological record" (Binford, 2001, p. 669) and that the archaeological record as the appropriate subject of archaeological theory building (P. Arnold, 1990, 1991b; Binford, 1977, 1983; Longacre, 1991, p. 1; Longacre and Skibo, 1994a; O'Connell, 1995, pp. 206–207). Their ceramic ethnoarchaeological research generally involves ceramic taphonomy, with the goal of establishing uniformitarian relationships concerning the "supra-cultural, mechanical, physical, and/or chemical properties of artifact production, use, and discard" (P. Arnold, 1998, p. 26). David (1992a, pp. 336–337) calls this the "scientist" or "Binfordian" approach. This group includes some "behavioral archaeologists" (Walker *et al.*, 1995), who borrow methods from materials science and ceramic engineering and use a cultural materialist framework. Proponents of this approach emphasize the use of rigorous methodology (e.g., Schiffer *et al.*, 2001, pp. 730–733), controlled experimental approaches, and the use of ethnoarchaeological settings as actualistic laboratories for refining and enhancing analytical techniques and the interpretation of data produced through the use of analytical techniques.

Mode 3: neoprocessual ethnoarchaeologists. Neoprocessual ethnoarchaeologists view ethnoarchaeology as a tool for understanding organizational systems,

for identifying cross-cultural regularities in human behavior, and for explaining the formation of the archaeological record (e.g., Costin, 2000, p. 399; Hegmon, 1998, 2000, p. 135; Kent, 1996, p. 23; MacEachern, 1996, p. 250; Rice, 1996a,b; Sinopoli, 1991, p. 184; Skibo and Feinman, 1999; Stark, 1993, pp. 94–95). Examples include models of ceramic production and ceramic distributional systems, and of various frameworks for understanding stylistic patterning and social boundaries.

Neoprocessual ethnoarchaeologists use a holistic framework that examines both technical factors (i.e., ecological and economic factors, mechanical and functional properties of artifacts) and cultural factors (historical, political, and social) that generate variability in ceramic systems (see also Costin, 2000). Increasing numbers of neoprocessual archaeologists embrace some variant of Pierre Bourdieu's practice theory (Bourdieu, 1977; Dietler and Herbich, 1998, pp. 244–248; Dobres, 1999b, pp. 130–148; Porr, 1999, pp. 8–10) and use approaches lumped under the rubric of "technology and culture" (see, e.g., Lemonnier 1986, 1992, 1993).

Scholars within ceramic ethnoarchaeology remain mildly fractious and advocate opposing viewpoints (compare, e.g., Hegmon, 2000, p. 135, with P. Arnold, 2000, pp. 121–122). It remains possible to transcend the intradisciplinary squabbles and claim staking that make for rich reading and lively debate, because ceramic ethnoarchaeologists share more philosophical and pragmatic research goals than they might initially imagine. Some of these shared goals are evident in the literature review that follows.

RESEARCH THEMES IN RECENT CERAMIC ETHNOARCHAEOLOGY

The range of topics that ceramic ethnoarchaeologists have studied in the last decade includes many of the same issues that Kramer (1985, p. 78) initially identified: technology, taxonomy, vessel function, longevity, recycling and disposal, division of labor, learning, style, ethnicity, distribution, and technological and stylistic change. Much research focuses on low-fired handmade earthenwares, but fieldworkers also have studied wheel-made ceramics and stonewares. Both market and nonmarket (occasionally called "tribal") ceramic production systems have been the object of recent research, contrast to previous decades. The following section examines aspects of ceramic production, technological change, distribution, consumption, and social boundaries.

Ceramic Production

Ceramic ethnoarchaeological research continues to focus intensively on aspects of ceramic production and manufacturing technology (see also P. Arnold,

2000, pp. 107–113; Costin, 2000; Rice, 1996a,b; Tite, 1999). One theme underlying of many recent studies concerns the relative importance of nontechnical vs. technical factors throughout the manufacturing process (see especially D. Arnold, 2000, pp. 339–351; Arthur, 1997, pp. 287–289; Deal, 1998, pp. 37–41; Gosselain, 1994, 1998; Gosselain and Livingstone Smith, 1995; Neupert, 1999, 2000; Sillar, 1996). Research has increasingly focused on raw materials procurement and use to help archaeological ceramicists strengthen the assumptions that structure their compositional studies (Costin, 2000, pp. 379–384; Rice, 1996b, pp. 168–169). Accordingly, recent efforts have focused on identifying behavioral correlates of compositional signatures or "petrographic footprints" (following Walde *et al.*, 2000, p. 92). Thus far, most successful studies of this ilk have concentrated on the relationship between compositional variability and production communities (D. Arnold *et al.*, 1999, 2000; Druc, 2000; Druc and Gwyn, 1998; van den Bel *et al.*, 1995) and on behavioral factors that influence raw materials selection (Aronson *et al.*, 1991, 1994; Druc, 2000, p. 80; Efstratiou, 1992, p. 322, Table 2; Stark *et al.*, 2000; van den Bel *et al.*, 1995). Other studies, following Owen Rye's pioneering study (Rye, 1976) among Papuan potters, have focused on factors that govern raw materials preparation techniques (e.g., Krishnan and Rao, 1994).

Ethnoarchaeological studies of ceramic production locations and associated activity areas have been approached from several angles (see also P. Arnold, 2000, pp. 109–110; Costin, 2000, pp. 384–385). Philip Arnold (1991b, pp. 120–137) examines surface artifact patterning from potters' houselots in two Mexican communities. Ethnoarchaeologists working in South Asia (Kramer, 1997, pp. 183–212), Upper Egypt (Nicholson and Patterson, 1992, Figure 2.4), Mexico (P. Arnold, 1991b, pp. 105–119; Williams, 1995), Central America (Deal, 1998, pp. 71–76), and South America (Cleland and Shimada, 1998, Figures 8 and 13; Joffre, 1999, p. 23) have published plans of potters' workshops and discussed associated spatial patterning and material residues. Most of these studies concentrate on full-time specialists who manufacture ceramics by hand, mold, or wheel. Some studies have also concentrated on firing technologies (Gosselain, 1992a; Hosler, 1996; Livingstone Smith, 2001; Nicholson and Patterson, 1992; Pool, 2000). Others have examined the physical configurations and performance of firing facilities like kilns (Cleland and Shimada, 1998, Fig. 14; Duncan, 1998, p. 179; Livingstone Smith, 2001; Pool, 2000; Sillar, 2000, pp. 179–184).

Studying the organization of production remains common in ceramic ethnoarchaeological research (Costin, 2000, pp. 385–394; David and Kramer, 2001, pp. 311–315). Topics within this theme include specialization (e.g., Kramer, 1997, pp. 72–80), the division of labor and constitution of labor units (Costin, 2000, pp. 389–392), and social relations of production (e.g., LaViolette, 2000, pp. 66–67). Comparative information on the intensity of production, as measured by output, is now available for hand-built ceramic traditions like those in Ethiopia (Arthur, 1997, p. 285), for mold-made technologies in Mexico (Druc, 2000, p. 84), and for some wheel-made industries (e.g., Duncan, 1998, p. 157; Tekkök-Biçken, 2000,

p. 99; Underhill, 2002; see also Costin, 2000, p. 392). This research suggests that production volume multiplies 10-fold when potters use the wheel, although production scale and intensity can vary greatly among communities within the same region (LaViolette, 2000, pp. 58–70)

Gender is another topic of recent ceramic ethnoarchaeological research (P. Arnold, 2000, p. 108; David and Kramer, 2001, Table 11.1). In Colombia, women in rural Ráquira make utilitarian pots by hand, using prehispanic techniques, while urban men use the wheel and mold (two Spanish introductions) to engage in commodity production (Duncan, 1998). This gendered division of labor is also evident at the household and village level in Andean South America (Chávez, 1992; Hosler, 1996), in parts of India, Egypt, Tunisia, and Morocco (Bala, 1997; Hudson, 1997, p. 134), and also historically under the Ottoman Empire (Kalentzidou, 2000a, pp. 177–178). In some cases, potters use discrete manufacturing technologies to make different forms; Ticul potters, for example, use two kinds of turntables and a two-piece mold to supply different sets of consumers (e.g., P. Arnold and Nieves, 1992, p. 96).

Ceramic ethnoarchaeology has contributed substantially to research on cultural transmission, a key topic in current archaeological theory (e.g., Neff, 2001, pp. 279–281). Studies of learning patterns (Deal, 1998, pp. 27–31; Duncan, 1998, pp. 61–86; Herbich, 1987; Kaplan, 1994, pp. 33–36; Kramer, 1997, p. 69; LaViolette, 2000, p. 61; Wallaert-Pêtrie, 1999a,b, 2001) shed lights on processes of vertical transmission. Processes of horizontal transmission, through marriage or migration or contact, also have been the subjects of recent studies (e.g., Gelbert, 1999; Gosselain, 1998, 1999, 2001). Technology is a process that is replicated and transformed through learning; comparative research on apprenticeship, like that done by Hélène Wallaert-Pêtrie (1999a,b, 2001), thus contributes to archaeological theory building and interpretation (Minar and Crown, 2001).

Some recent research contends that nearly every stage of the manufacturing sequence is imbued with ritual meaning from South America and Africa to Asia (e.g., Barley, 1997, p. 141; Gosselain, 1999, pp. 209–211; Huyler, 1994, pp. 331–332; Sillar, 1997, pp. 6–7; Wandibba, 1995, p. 165). Significant events in the life cycle—like birth, marriage, and death—may be signaled by the creation of ceramic vessels in North Africa (Hudson, 1997, p. 139). Ceramics are used as ritual vessels throughout the Old World (Huyler, 1994; Lefferts and Cort, 1999, p. 25; Norman, 2000). The production of ritual objects may be restricted to certain groups of artisans (e.g., Blurton, 1997; Huyler, 1994) or made by only one gender, as in West Africa (Berns, 1993, pp. 136–141). In other cases, menstruating and pregnant women are prohibited from making pottery (e.g., Misago, 1996, p. 122) or approaching operating kilns (Duncan, 1998, p. 63). Even the act of firing may be rich with ritual significance: followers of Sufi Islam in South and Central Asia, for example, use the *Professional Book of Potters*, which contains prayers that potters must recite to ensure successful firings (Matson, 1995b, p. 15).

With changing theoretical perspectives in the 1990s has come an increased ethnoarchaeological interest in the social identity of artisans: their socioeconomic status, their gender, their caste, and other social categories. Despite archaeologists' and art historians' affinity for potters, most are independent specialists who occupy the lower rungs of most status hierarchies (LaViolette, 2000, p. 91; London, 2000a, p. 105; Sillar, 1997, p. 7; Stark, 1995). Rare exceptions exist, in cases where ceramic production becomes a recognized and profitable art form, as has happened among the Pueblos of the North American Southwest.

Recent ceramic ethnoarchaeological studies examine gender as part of the potter's social identity (see a review in Costin 2000, pp. 394–395; see also Kramer, 1997, pp. 47–52). Cross-cultural research on the sexual division of labor among potters (Byrne, 1994) suggests that the locus of production moves from women to men, as access to traditional resources decreases and ceramic production becomes a more lucrative economic livelihood. A close link exists between male potting and the wheel (Kramer, 1985, pp. 79–80; see also Byrne, 1994, pp. 230–231), although exceptions have been noted (e.g., Mahias, 1994). In parts of South America (Chávez, 1992, p. 51; Duncan, 1998, pp. 68–90) and Southeast Asia (Lefferts and Cort, 1999, p. 28), we see that women from the same general community use hand-building techniques while men use the wheel.

Recent studies have also examined the widespread association of potters with castes or castelike groups, ethnolinguistic units, or particular religious backgrounds (David and Kramer, 2001, p. 308). Casted potters throughout South Asia provide the clearest example (Blurton, 1997; Ghosh and Bhattacharya, 1997, pp. 135–136; Huyler, 1994; Kramer, 1991, 1997): these subcastes tend to be endogamous, patrilineal, and virilocal (Kramer, 1994, p. 315). Endogamous smith-potter "castes" are found in much of sub-Saharan Africa (David and Kramer, 2001, pp. 215–216; Frank, 1993; Gelbert, 1999; Herbert, 1993; LaViolette, 2000) in which female potters marry male artisans, from blacksmiths and woodworkers to weavers and traditional praise singers called "griots." These women often cross village and language boundaries to find suitable marriage partners within their caste. Producer identity, expressed through religious affiliation (Bourges, 1993, p. 10; Ghosh and Bhattacharya, 1997, p. 134), economic niche (de Ceuninck, 1993), and ethnolinguistic group (Ahern, 1993; Gosselain, 1998, 2001; Lefferts and Cort, 1999), is reflected in the range or variants of goods produced.

Increasing numbers of ceramic ethnoarchaeologists have concentrated on cases of village-based ceramic specialization, or what Rice (1991) calls "site specialization." Specialization may involve either wares or ceramic forms within the same region: western Turkey (Tekkök-Biçken, 2000), the Philippines (Stark, 1991b; Zayas 1996, p. 113), Ghana (Cruz, 1996, pp. 32–34), Mali (de Ceuninck, 1993), and Mexico (Druc, 2000, pp. 86–87). This pattern is especially pronounced in the Andes, where community-based specialization creates horizontal

dependencies within, and vertical dependencies between, ecological zones (Chávez, 1992, pp. 79–84; Sillar, 1997, pp. 13–14; Valdez, 1997).

Studies of ceramic specialization remain popular at the levels of both manufactured product and producer community (e.g., P. Arnold, 2000, pp. 110–112; Longacre, 1999, pp. 44–45; Rice, 1996b, pp. 177–182; Stark, 1995a, pp. 231–234; Underhill, 2002). The link remains strong between production intensity and product standardization, but recent research identifies several factors other than producer skill that affect the relative variability of goods produced: the number of producers involved in creating the assemblage (or what B. Stark (1995) calls the "ratio effect"), the products themselves (the problem of multiple authorship; Kramer, 1985, p. 79), and the intended market (e.g., Arnold and Nieves, 1992, p. 110). Even the variables measured and statistical techniques used to assess homogeneity in assemblages will affect the utility of the outcome (Kvamme *et al.*, 1996; B. Stark, 1995, pp. 238–240). Most studies focus on independent specialists (following Rice, 1991), rather than on attached specialists, because the latter are rarely found among contemporary ceramic-producing societies.

Technological Change in Ceramic Production Systems

The study of technological change should be one of ceramic ethnoarchaeologists' top priorities, as the focus of so much archaeological research concerns tracking change in the archaeological record. Recent reviews treat this topic only lightly (e.g., P. Arnold, 2000, pp. 113, 118–119; Hegmon, 2000, pp. 133–134; Stark, 1991a, pp. 194–195), and Carol Kramer's discussion of ceramic change (Kramer, 1985, pp. 92–95) remains the most comprehensive discussion available. Loney's recent article (Loney, 2000) on technological change provides some ceramic examples that update previous source guides by Rice (1984a, 1987, pp. 449–459).

Ceramic ethnoarchaeologists use direct historic analogy to identify focal points of continuity and discontinuity through time. Ethnoarchaeologists have examined continuities in several regions where complex societies have flourished for millennia, in Asia (Bala, 1997; Lugli and Vidale, 1996; Underhill, 2002), Eurasia (Efstratiou, 1992; Kalentzidou, 2000a,b; Tekkök-Biçken, 2000), northern and sub-Saharan Africa (LaViolette, 2000; Lindahl and Matenga, 1995; Misago, 1996; Ndoro, 1996; Nicholson and Patterson, 1992, pp. 25–26; Redmount and Morgenstein, 1996; Stahl, 1999; Stahl and Cruz, 1998; Walde *et al.*, 2000), and the New World, including Mexico (Kaplan, 1994, pp. 2–13; McQuade, 2000) and Andean South America (e.g., Cleland and Shimada, 1998). Some documented ceramic traditions have enormous time depth, like the nearly 2000-year span of Iñupiat pottery in the Arctic (Lucier and Van Stone, 1992) and the 2200-year pottery span of Chinese pottery in Guizhou province (Underhill, 2002), and even older traditions in South Asia that trace back to Harappan times (Blurton, 1997; Krishnan and Rao, 1994).

These studies have grown increasingly systematic and quantitative in recent years and identify both continuities and discontinuities between the archaeological target of study and contemporary practices (see also P. Arnold, 1999, pp. 119–120). In some cases, comparisons of the archaeological record with ethnoarchaeological patterning identify situations in which ancient ceramic systems exhibited greater variability than do those operating today (e.g., Balkansky *et al.*, 1997; Feinman, 1999).

Excellent research on ceramic change has been published recently that combines ethnoarchaeology with documentary data (e.g., Aronson and Fournier, 1993; Duncan, 1998, pp. 16–45; Kalentzidou, 2000a,b). Studies by individual researchers on longitudinal projects provide time depth on ceramic traditions under study (e.g., D. Arnold, 1999; D. Arnold *et al.*, 2000; Chávez, 1992; Cleland and Shimada, 1998). So does research by long-term research projects that involve multiple researchers as they focus on complementary aspects of change, by the Mandara Archaeological Project in West Africa (e.g., David, 1992b; MacEachern, 2001; Sterner, 1992; Walde *et al.*, 2000), the Kalinga Ethnoarchaeological Project in the northern Philippines (Skibo, 1994; Stark, 1991a; Stark and Longacre, 1993), and a University of the Philippines project in the central Philippines (Paz, 1996; Ushijima and de la Peña, 1996; Zayas, 1996).

Ceramic ethnoarchaeologists have recently explored why, and under what conditions, potters decide to change their technological practices. Some studies suggest that the most avid innovators are the least technically skilled artisans (D. Arnold, 1999, pp. 65, 72; M. Stark, 1995, pp. 213–214; Stark and Longacre, 1993), and that rates of change vary by functional category (e.g., Stark, 1991a, pp. 201–208). Persistence in technical systems also requires explanation. Some reasons may involve technofunctional performance characteristics (e.g., Skibo, 1994), yet even such cases entail nontechnical factors that play decisive roles in potters' decisions to modify or retain aspects of their technologies.

Broad-scale political changes (like decolonization, national economic reform, and monetization of the local economy) are an important category of nontechnical factors that induce change in ceramic systems. In some cases, the state may promote certain types of ceramic production as one form of craft industry (e.g., Allchin, 1994, p. 5; Aronson and Fournier, 1993, p. 47; Duncan, 1998, p. 91). Fluctuating governmental landholding policies for nearly a century have affected ceramic production in Mexico (Aronson and Fournier, 1993, pp. 45–46), and unsuccessful governmental efforts to construct dams in the Philippines left their mark on Kalinga ceramic traditions (Stark, 1991a; Stark and Longacre, 1993, pp. 16–19). State-level policies may also have unintended consequences for ceramic systems that lead to local technological extinctions, as occurred with the collapse of the Ottoman Empire in the 1920s (Kalentzidou, 2000a,b) and in Cambodia during the Khmer Rouge era in the 1970s (Kojo and Marui, 2000, p. 5).

Recent processes of modernization have also stimulated ceramic change. Some traditions are disappearing, in northeastern Greece (Efstratiou, 1992,

pp. 314–315), Nepal (Lugli and Vidale, 1996), and the central Philippines (Ushijima and de la Peña, 1996). Others are undergoing extensive shifts in their organization of production and the products their artisans manufacture (e.g., Aronson and Fournier, 1993, p. 49; Stahl and Cruz, 1998, pp. 212–213; Stark and Longacre, 1993). The case studies illustrate that ceramic traditions experience differential rates of change that reflect cultural values rather than rote responses to external pressures. Notions of what constitutes a proper container for different functions, from mixing medicines (Deal, 1998, p. 90) to various rituals (Barley, 1997, p. 140; Bowser, 2000, p. 26; Hardin, 1996, pp. 40–41), explain some reasons for the differential persistence of certain ceramic types in particular traditions. So do particular qualities of ceramics, from their low cost (which makes them less attractive to thieves than their metal counterparts (Cruz, 1996, p. 36) to their close fit with traditional cuisines (Kalentzidou, 2000b, p. 75).

Ceramic Distribution

Most recent studies of ceramic distribution discuss mechanisms by which ceramics circulate, including residential selling (e.g., Druc, 2000, p. 86; Vander Linden and Gosselain, 1996), workshop selling (Kaplan, 1994, p. 47; Kramer, 1997, pp. 81–107), market vending (Druc, 2000, p. 85; Duncan, 1998, pp. 187–199), and itinerant peddling by the producers or by intermediaries (Kaplan, 1994, pp. 47–48; LaViolette, 2000, pp. 67–68). Potters in a single production system often use several strategies to circulate their vessels and distribute their goods to multiple and discrete consumer markets (e.g., D. Arnold and Nieves, 1992, pp. 95–96). Some Andean potters, for example, circulate their pots through a variety of mechanisms, including annual fairs held in conjunction with Catholic religious festivals (Chávez, 1992, pp. 68–79), daily and weekly markets, and sales from their homes (Sillar, 1997, p. 15, Tables 3 and 4). Potters may also be itinerant; they move their goods and their families from one village to the next in Mali (LaViolette, 2000, p. 68). In the Andes, potters even transport their clay to consumers' households, up to 100 km from the original clay source, by either llama caravan or, more frequently, by truck (Sillar, 1997, p. 7, 2000, pp. 92, 98).

Recent research also explores the social relations of ceramic distribution, including institutionalized relationships between producers and consumers. *Jajmani* relationships have been documented across South Asia (e.g., Kramer, 1997, pp. 25–27, 120–123; Kramer and Douglas, 1992; Miller, 1986). In some countries like Nepal, these *jajmani* relationships are being replaced by governmental structures (Lugli and Vidale, 1996, p. 353). In the Philippines, patron–client (*suki)* relationships characterize potters and consumers (Stark, 1992), or between potters and the intermediaries to whom potters sell their goods (Ushijima and de la Peña, 1996, pp. 142–143). Institutionalized relations of distribution that

involve intermediaries have been documented elsewhere like West Africa (e.g., LaViolette, 2000, pp. 69, 86–87) and the Andes (e.g., Sillar, 2000, pp. 93–94), and require additional study.

Ethnoarchaeologists also have discussed the scale of ceramic distributional systems (Costin, 2000, pp. 396–398). Selected ethnoarchaeological studies have systematically mapped the spatial configuration of ceramic distribution (Duncan, 1998, pp. 187–200; Kramer, 1997, pp. 31–38, 109–119; Nicholson and Patterson, 1992, pp. 41–44; Stark, 1994), have identified distributional zones by vessel type (e.g., Deal, 1998, pp. 63–65, Table 3.15), and have provided scalar estimates for distributional networks (P. Arnold, 2000, p. 109). Kalinga potters, for example, circulate their vessels within distributional networks stretching over an area of about 75 km^2 (Graves, 1991, p. 142). Potters commonly circulate their wares within a 15- to 50-km radius of their homes, with a tendency toward the lower end of the range (e.g., Gallay *et al.*, 1996; Kalentzidou, 2000b, p. 79; Kramer, 1997, p. 153; Livingstone Smith, 2000, p. 34; Stark, 1994, p. 187; Underhill, 2002; Vander Linden and Gosselain, 1996, p. 19). In parts of West Africa, this figure also characterizes the average distance that female potters move upon marriage (Gosselain, 1998, p. 95). The distributional scale increases in cases where ceramics are transported by water: Soa potters in the inland Niger delta travel nearly 100 km to sell their goods (LaViolette, 2000, p. 94), and Maripipi traders (central Philippines) still engage in 9–14 day pottery-vending boat trips that circulate anywhere from 800 to 1400 vessels per trip (Ushijima and de la Peña, 1996, pp. 148–151).

Aspects of Ceramic Consumption

Limited ceramic ethnoarchaeological research has been devoted to studying ceramic consumption, despite the fact that consumption patterns form the basis of much archaeological research. Some of the most useful ethnoarchaeological research on ceramic consumption involves household-based pottery censuses (e.g., Arthur, 1997, 2002; Bourges, 1996; Deal, 1998; Deal and Hagstrum, 1995; Hildebrand and Hagstrum, 1999; Longacre and Stark, 1992). When such work is done at least once (e.g., DeBoer and Lathrap, 1979; Nelson, 1991), it provides valuable information on archaeological assemblage formation. The repetition of such censuses over a period of decades allows ethnoarchaeologists to begin to approximate the small intervals of an archaeological time scale.

Particularly useful research has been undertaken recently on typology, vessel function, use alteration, use life, and recycling (P. Arnold, 2000, pp. 114–118; David and Kramer, 2001, pp. 91–115; Rice, 1996a, pp. 138–141). Some work has examined typology (e.g., Carvalho *et al.*, 1996; Kaplan, 1994), and more research has focused on vessel classification and function (e.g., Akinade, 1995; Arifin, 1991, pp. 379–383; Arthur, 2003; Chávez, 1992, pp. 52–56; Choksi, 1995;

Deal, 1998, pp. 58–59; Kramer, 1997, pp. 39–43; Lindahl and Matenga, 1995, pp. 39–47; Skibo, 1992). Using Kalinga data, Tani (1994, pp. 58–59) identifies a correlation between household size and ceramic vessel volume. At the aggregate level, information on household pottery assemblages can be divided by activity sets (following Deal, 1998, p. 84) to study the location and contexts of pottery use.

Ethnoarchaeological work also has been published recently that examines ceramic use-life and use-alteration (Arthur, 2002, pp. 344–350; Mayor, 1991/92, 1994; Nelson, 1991; see review in Rice, 1996a, p. 143–147). Recent studies have discussed the relationship between use life and vessel size (Shott, 1996) and between pottery use life and annual replacement rates (Deal, 1998, pp. 91–97; Shott and Williams, 2001). Selected studies have focused specifically on traces of use alteration on ceramics from the northern Philippines (e.g., Kobayashi, 1994, 1996; Skibo, 1992), South Asia (Lugli and Vidale, 1996, pp. 364–375), and in Africa (Arthur, 2002; Smith, 1993) with goal of providing directly analogous patterns for interpreting archaeological ceramics.

The fact that people recycle ceramics through almost innumerable activities (e.g., Deal and Hagstrum, 1995, pp. 113–188 and Table 9.3) could conceivably cause problems for archaeologists who want to study household assemblages or identify activity areas on the basis of vessel function. In Maya and Wanka households, for example, vessels that no longer serve their original use represent about 20% of the ceramic inventory (Deal and Hagstrum, 1995, p. 122). Most case studies that have concentrated specifically on pottery disposal behavior have been done in Latin America (e.g., Arnold, 1990; Deal, 1998, pp. 116–140; Hildebrand and Hagstrum, 1999).

Other studies of ceramic consumption have focused on household assemblages and factors that generate variability in them (e.g., Bourges, 1996; Deal, 1998, pp. 79–83; Longacre and Stark, 1992; Tani, 1994; Trostel, 1994). Recent research also has concentrated on the role of consumer preference vis-à-vis consumption patterns (e.g., Aronson *et al.*, 1994; Arthur, 1997; Longacre *et al.*, 2000). Producers may manufacture discrete sets of goods for different sets of consumers (D. Arnold and Nieves, 1992, p. 103), and potters' social and ethnic identities also may affect the range of consumers who obtain their products (Bourges, 1996; Choksi, 1995, pp. 97–106).

Recent ethnoarchaeological studies also outline ritual contexts that require earthenware ceramics (e.g., Bowser, 2000; Hardin, 1996; Norman, 2000; Sterner, 1992). For example, potters in eastern India make earthenware planters to contain basil plants, which to Vaisnavite Hindus represent the embodiment of their goddess *Tulasī* (e.g., Huyler, 1994). Other caste potters in eastern India manufacture large clay sculptures (some more than 4 m tall) that embody Hindu gods and goddesses and that feature in annual religious celebrations (Blurton, 1997, p. 171).

Ceramic Production, Distribution, and Social Boundaries

Ethnoarchaeologists and archaeologists alike continue to be interested in the relationship between ceramic production, ceramic style, and social boundaries (e.g., P. Arnold, 2000, pp. 113–114; Bowser, 2000, pp. 220–222; Carr, 1995; Carr and Neitzel, 1995; David and Kramer, 2001, pp. 183–224; Hegmon, 1992, 1998, 2000, pp. 130–133; Rice, 1996a, pp. 148–153; Welsch and Terrell, 1998; Wobst, 1999). Much recent work focuses on style in its many manifestations: adjunct, instrumental, isochrestic, iconological, active, passive, technological emblemic, assertive, vernacular, latent, and deep (see a review in David and Kramer, 2001, pp. 170–173).

This interest in style unites archaeologists of many theoretical stripes, including "evolutionary archaeologists" (sensu Lyman and O'Brien, 1998), who measure the "interrelatedness" of ceramic assemblages using seriation techniques (e.g., Neiman, 1995). This unity fractures, however, in competing interpretations of style and function. What the selectionists separate, the neoprocessualists believe may overlap (e.g., Sackett, 1990; Schiffer and Skibo, 1997, p. 43; Wobst, 1999, p. 126). Ceramic ethnoarchaeological research illustrates that style has function and function has style (David and Kramer, 2001, pp. 140–141; Hegmon, 1998, pp. 264–271).

Increasing numbers of ethnoarchaeological studies concentrate on the relationship between technical choices and finished product, which Lechtman (1977) first described as a "technological style." This approach draws from two intellectual lineages: (1) the work of Leroi-Gourhan and (to a lesser extent) Mauss on châine opératoire, and (2) work by Bourdieu (1977) and others on practice theory and structuration (see reviews in Dietler and Herbich, 1998, pp. 234–248; Stark, 1998, pp. 5–7). Proponents of this approach examine the cultural construction of technologies and the importance of historical context and contingency (Dobres, 1999b; Lemonnier, 1992, pp. 25–50, 1993, p. 7; Loney, 2000; Sillar, 1996, p. 283). This approach uses empirical and comparative approaches and envisions a sophisticated dynamic of causality that emphasizes intentionality and choice. In this perspective, artisans have great latitude in the production process and make a series of technical choices that determine the appearance of the final product (following Lemonnier, 1986, 1992, 1993). The entire manufacturing sequence or *chaîne opératoire*, from raw materials procurement to the addition of postfiring coatings to the vessel (e.g., Goto, 1997; Lugli and Vidale, 1996), creates a single, measurable entity that is called technological style. One current weakness of the "technology and culture" approach (Roux, 2001, p. 282; van der Leeuw, 1993, p. 238) lies in its practitioners' lack of adherence to a coherent theoretical framework.

Recent ceramic ethnoarchaeological research has nonetheless made great advances in measuring technical choices involved in selecting and preparing clays (Gosselain, 1994, 1999; Livingstone Smith, 2000) and nonplastics (e.g., Efstratiou,

1992; Sillar, 2000; van den Bel *et al.*, 1995), in shaping the vessel (de Ceuninck, 1994; Gelbert, 1999, p. 217; Gosselain, 1998; Gosselain and Livingstone Smith, 1995; Stark, 1999), and in choices regarding firing technology and facility (e.g., Pool, 2000). Some aspects of the shaping technique leave microtraces that are visible to the ethnoarchaeologist in the field (De Crits, 1994; Huysecom, 1992, 1994) or in the laboratory (e.g., Courty and Roux, 1995; Roux, 1994). The shaping stage of the manufacturing process may contain the greatest amount of information about potter's social identity, in part because motor habits involved in the shaping process are so resistant to change (D. Arnold, 1998, p. 358; Reina and Hill, 1978, p. 230; Rice, 1984a; van der Leeuw *et al.*, 1992).

Other steps in the manufacturing sequence are more sensitive to change, like decoration, firing techniques like smudging, and most postfiring treatments (e.g., Gelbert, 1999, p. 219; Gosselain, 2000, pp. 191–193). Stylistic differences in ceramic decoration distinguish ethnolinguistic groups and production communities from each other in a single region (Ahern, 1993; DeBoer, 1990; Graves, 1994a,b; Walde *et al.*, 2000) or factions within a single community (Bowser, 2000, 2002; Neupert, 1999, 2000). Technological styles in ceramic production also are echoed in other domains of life and reflect core cultural concepts like containment in Africa (e.g., Hardin, 1996) or transformation in Andean South America (Sillar, 1996). How artisans choose one alternative over another, however, requires more investigation (van der Leeuw, 1993, p. 241).

Ceramic ethnoarchaeological work indicates that technological style, reflecting gender and other social identities, can be studied within individual communities, within regions, and even across parts of continents (e.g., Cort and Lefferts, 2000; De Crits, 1994; Gelbert, 1999; Gosselain, 2000, pp. 204–207; Hosler, 1996; Mahias, 1993; Sillar, 1997, pp. 12–13; Vander Linden and Gosselain, 1996, p. 19). Massive population movements involving large populations may leave their traces in technological traditions. Historical archaeological research on African earthenware ceramic traditions in colonial and plantation sites (Ferguson, 1992; Garrow and Wheaton, 1989) has inspired recent ethnoarchaeological research in the source areas like southern Benín and Zaire (Norman, 2000; Smith, 1993; see a review in Singleton, 1995, pp. 131–133). Technological styles of West African Kadiolo potters also may reflect the slave status of their nineteenth-century female ancestors, who were forcibly moved to the region (Frank, 1993, p. 387), while entire Greek potting communities were moved involuntarily after the collapse of the Ottoman Empire (Kalentzidou, 2000a, p. 173).

Technological styles also can cross and thus smear social boundaries. In Zaire, Elinga potters trade their wares with neighboring groups of farmers and foragers from different groups, producing material culture patterning that does not distinguish between these occupationally and socially discrete populations (Misago, 1996, pp. 112–114). The operation of exchange relationships between foragers and farmers in the Congo has a similar effect (e.g., Mercader *et al.*,

2000, pp. 180–181). So can patrilocal postmarital residence rules, as potters from other villages (using other technological styles) move into their husbands' villages and introduce new techniques to their affinal relatives (e.g., de Ceuninck, 1993).

SOME RECENT CONTRIBUTIONS FROM CERAMIC ETHNOARCHAEOLOGY

Increasing numbers of ethnoarchaeologists (e.g., P. Arnold, 1998, 2000, p. 123; Huysecom, 1992; O'Connell, 1995; Simms, 1992) call for research that is more directly guided by explicit archaeological questions. Some criticisms of the current literature stem from the fact that differing theoretical frameworks structure ethnoarchaeological practice; it is not therefore surprising that hardline Binfordians believe that recent ceramic ethnoarchaeological literature that does not seek to develop general laws through relational analogy unimportant. Not all scholars, however, agree (e.g., Gallay *et al.*, 1992). Regardless of theoretical bent, closer linkages between archaeological questions and ethnoarchaeological practice are clearly possible: the challenge lies in identifying questions that merit ceramic ethnoarchaeological inquiry.

Ceramic ethnoarchaeological research has direct utility to scholars studying ceramic production, consumption, distribution, social boundaries, and change (see also Deal, 1998, p. 3). For example, recent work provides models and expectations regarding material culture patterning that should be incorporated into research designs (e.g., D. Arnold, 2000, p. 365; Gosselain, 1992b, 1998; Sackett, 1990; Stark, 1998). In regions that have an unbroken tradition of ceramic manufacture, ethnoarchaeological studies also can provide conventional analogies—often focusing on aspects of technology—that directly enhance archaeological research (e.g., Redmount and Morgenstein, 1996).

Ethnoarchaeological research, coupled with materials science research and experimental archaeology, provides valuable insights into the reconstruction of ceramic manufacturing systems (e.g., Rice, 1996b, pp. 168–169; Sillar and Tite, 2000). Some behavioral factors, or "vulgarities of idiosyncratic expression" (Bishop, 1992, p. 167), affect material compositional variability and can be studied using ethnoarchaeological strategies (D. Arnold *et al*., 2000; Costin, 2000, p. 379; Krishnan, 1997, p. 187; Neupert, 2000; Stark *et al.*, 2000). Ceramic ethnoarchaeological studies also provide controlled samples that yield valuable comparative data sets for technical studies on subjects ranging from ceramic compositional variability to the reconstruction of manufacturing techniques (e.g., D. Arnold *et al.*, 2000; Blackman *et al.*, 1993, p. 60; Courty and Roux, 1995; Krishnan and Rao, 1994; Livingstone Smith, 2001; Roux, 1994; Tite, 1999, pp. 183, 208; Velde and Druc, 1999, pp. 238–240; Walde *et al.*, 2000).

Ethnoarchaeological research on manufacturing techniques, coupled with controlled experimental studies, also helps define the relative importance of different performance characteristics. In their review of technical studies, Tite *et al.* (2001, p. 321) conclude that ancient potters were clearly concerned with thermal shock resistance, but not as concerned with ceramic strength and toughness as are experimental archaeologists who like to study these physical properties of ceramics (see also D. Arnold *et al.*, 2000, p. 342; Longacre *et al.*, 2000, p. 287). In some areas, these performance characteristics involve trade-offs: some griot potters in the inland Niger delta produce thin-walled vessels which have higher heating effectiveness, but are more fragile and thus less valued by consumers (LaViolette, 2000, p. 62).

Ethnoarchaeological research on ceramic consumption helps archaeologists model production scale in fourteenth- to-sixteenth-century south central India (Sinopoli, 1999) and develop models of regional ceramic production systems in the North American Southwest (e.g., Stark and Heidke, 1998). Comparative analyses using dimensional standardization data from ethnoarchaeological examples comprise one of the most common archaeological applications of ceramic ethnoarchaeological data in recent years (e.g., Blackman *et al.*, 1993; Crown, 1995; B. Stark, 1995). Ceramic ethnoarchaeological data also help archaeologists estimate the accumulation rate and volume in the archaeological record (e.g., Varien and Mills, 1997; Varien and Potter, 1997). In such work, archaeology and ethnoarchaeology have a symbiotic relationship (Varien and Mills, 1997, pp. 144–145). Excluding those areas of the world with "strong archaeological cases" (well-dated sites, established chronologies, and ideal deposits) like the North American Southwest, ethnoarchaeological data provide the best parameters for modeling accumulations rates.

Making Ceramic Ethnoarchaeology More Relevant

Ceramic ethnoarchaeology can be made still more relevant; it need not be restricted to cautionary tales (following D. Arnold, 1991) or taphonomic correlates. Reconciling spatial scales of ethnoarchaeological and archaeological study is a prerequisite. Some questions concerning ceramic production, consumption, and assemblage formation are best addressed at the household or community levels, which are the scales at which most ethnoarchaeologists and ethnographers work. Studying topics like ceramic distribution and social boundaries requires larger geographic areas to approximate archaeological scales of analysis (MacEachern, 2001, p. 95), and some recent studies have attempted such work (e.g., D. Arnold *et al.*, 2000; Chávez, 1992; De Crits, 1994; Gosselain, 1992b, 1994, 1998, 2001; MacEachern, 1998; Stark, 1994, 1999).

Ceramic ethnoarchaeologists can also improve the relevance of their work by reading each other's research more closely. Too much of the current research

is couched in a "case study" (rather than a comparative) format, in which the author ignores substantial research on the topic. Adopting a more comparative framework, as some scholars have done (e.g., D. Arnold, 1989, 1999; Gosselain, 1998, 2001; Mills, 1989; Nelson, 1991; Shott, 1996), strengthens each case study by contextualizing it in its broader literature. Linguistic limitations also curtail the relevance of ceramic ethnoarchaeological research. The fact that recent papers cite so few publications in foreign languages suggests that most Americanists largely overlook the non-English ceramic ethnoarchaeological research. Such oversight contributes to the fragmentation of the field.

Not only do most ceramic ethnoarchaeologists study the small scale; they study the short term: research projects rarely last long enough to approximate archaeological time. This discrepancy is a problem, and some archaeologists argue that irreconcilable differences exist in time scales of ethnoarchaeological and archaeological research. Neff (2001, p. 278), for example, contends that focusing on issues like technical choices in the manufacturing process addresses only proximate causes while the goal of selectionist archaeology is to understand ultimate causes. Can ceramic ethnoarchaeological research ever be useful in understanding long-term patterns of human change? Increasing numbers of studies use a multidecade or century-long time span that parallels time units used by archaeologists (see also Hardin and Mills, 2000).

Most ceramic ethnoarchaeologists actively seek linkages between human behavior or daily practice and the material record, but they must work more diligently to make their work relevant to archaeologists. Archaeologists can help make ceramic ethnoarchaeology more relevant by identifying key questions that ethnoarchaeological work might answer (sensu Costin, 2000). Doing so would produce more problem-oriented ceramic ethnoarchaeological research, with greater interpretive returns for those studying archaeological ceramics.

ISSUES FOR THE FUTURE OF CERAMIC ETHNOARCHAEOLOGY

Disappearing Ceramic Traditions in a Postcolonial World

Ongoing globalization is one of the greatest challenges for ceramic ethnoarchaeology's future, since our work requires functioning pottery economies. People whose technological organization and technical systems we study are engulfed in a massive set of cultural changes: economic development, educational reform, and ensuing population pressure are some examples. These factors stimulate changes in traditional ceramic systems in tandem with massive urban-to-rural shifts.

Ceramic systems continue to shift or to disappear altogether—in some cases, during the study period of the ceramic ethnoarchaeologist (e.g., Tekkök-Biçken, 2000, p. 100). It is already too late to work in most areas of Oceania, where

previously rich ceramic traditions have ceased (Descantes, 2001; May and Tuckson, 2000). For these reasons, scholars must heed Carol Kramer's call for descriptive research (Kramer, 1985, p. 97) and documentation of these technologies before they disappear (Hegmon, 2000, p. 134). Doing so requires theoretically committed scholars to accommodate both explicitly ethnoarchaeological studies and research that does not have explicitly taphonomic goals (see also Sinopoli, 1991, p. 178). This may prove difficult for Americanists who define ethnoarchaeology exclusively as Binfordian middle-range research. Such theoretical myopia is, however, no longer acceptable. Widening ceramic ethnoarchaeology's scope is intellectually ethical (to enable international colleagues to make meaningful contributions), scholarly (to broaden the range of literature available for building models), and necessary (to document rapidly disappearing traditions).

Methodological Concerns

Lack of attention to methodological concerns (e.g., research design, sampling, and relative merits of different data collections) continues to characterize ceramic ethnoarchaeology despite periodic calls for greater rigor (David and Kramer, 2001, pp. 63–85; Deal, 1994, pp. ix–x; Schiffer, 1978; Tani and Longacre, 1999). Several recent studies, for example, compare informant-derived data with observational data and identify problems inherent in relying on the former (e.g., Aronson *et al.*, 1994, pp. 98–102; Arthur, 1997, pp. 281–296; Hildebrand and Hagstrum, 1999, p. 41; Neupert and Longacre, 1994). High-quality research requires a careful balance of observational and informant-derived data collection strategies.

High-quality ceramic ethnoarchaeological research also requires clear articulations between research questions and carefully selected research methods. One reason why the subfield has been criticized is that—as Dietler (1999, p. 194) points out—many archaeologists undertake such work without adequate training in ethnographic field methodologies. Yet literature is available: work by the Coxoh Ethnoarchaeological Project (Deal, 1998, pp. 4–7; Hayden and Cannon, 1984, pp. 1–39) provides exemplary models of research methodology. So, too, does research in Africa (e.g., Arthur, 2002; LaViolette, 2000, pp. 13–17) and Mexico (e.g., Kaplan, 1994, pp. 65–81). Other researchers provide valuable guidance for why study sites were chosen (e.g., Shott and Williams, 2001, pp. 102–103) and how research was conducted (e.g., Arthur, 1997, pp. 284–285; Kramer, 1997, pp. 6–7; Shott and Williams, 2001, pp. 104–105; Stark *et al.*, 2000, pp. 306–307).

Making methodology explicit not only helps readers interpret resultant data, but also enables researchers to replicate methodologies in different field settings to produce stronger comparative studies. Examples of such work include research on consumer preferences vis-à-vis raw materials selection (compare Arthur, 1997, with Aronson *et al.*, 1991, 1994) and vessel reuse behavior in Central and South America (Deal and Hagstrum, 1995). Similarly, comparative studies of vessel use

life and size (e.g., Nelson, 1991; Shott, 1996) are only possible when similar data collection techniques have been implemented. Posting research protocols electronically could also advance efforts to standardize ethnoarchaeological data collection techniques.

We also need a closer fit between the analytical units that archaeologists and ethnoarchaeologists study (e.g., Deal, 1998, pp. 141–148; Shott and Williams, 2001, p. 101). Doing so requires attention to both the spatial and organizational units that ethnoarchaeologists study (individual, household, community, and region) and also the material culture that these units generate. Ethnoarchaeologists must also become more quantitative and less anecdotal in their data collection. Ethnoarchaeological studies of dimensional standardization provide a good model: most studies measure similar dimensions and use similar quantitative measures of variability, which facilitates comparison with archaeological assemblages (e.g., Blackman *et al.*, 1993; Eerkens and Bettinger, 2001; B. Stark, 1995).

A final methodological issue concerns the length and intensity of field research. Regrettably few ethnoarchaeological studies involve the kind of long-term commitment at the field season level that characterizes ethnographic work (David and Kramer, 2001, p. 64; Kramer, 1994, p. 320; but see Arthur, 2000; Bowser, 2002), and that provides valuable insights regarding the nature of human–material culture interaction. While some role exists in salvage ethnoarchaeology for regional surveys of ceramic traditions (e.g., Huyler, 1996; May and Tuckson, 2000; Reina and Hill, 1978), the most useful ethnoarchaeological research requires a sustained commitment to a host community and its population. Ceramic ethnoarchaeology produced through short field visits to the field of a few weeks to a few months is often inadequate for carefully documenting the cultural and environmental contexts of technological change (David and Kramer, 2001, p. 406).

Greater commitment is needed to long-term research projects (D. Arnold, 1991, pp. 327–328; London, 2000b, pp. 6–7; Rice, 1996b, p. 188), despite resistance from some scholars (e.g., P. Arnold, 2000, p. 122). Several different strategies can be used to obtain this level of commitment. For example, conducting fieldwork repeatedly over several years, mitigates against problems inherent in short-term research (D. Arnold, 1991, p. 327). So, too, does conducting short-term research as part of a longitudinal project, where the broader project provides a research foundation and context (see also David and Kramer, 2001, pp. 50–51).

More integrated research is also needed that embeds ceramic production systems into their particular historical contexts. Ethnoarchaeological research done in the context of the direct historical approach is more likely to be integrated into archaeological insights. Some recently published ceramic ethnoarchaeological research uses the direct historical approach to dictate one's research location and combines locally relevant research questions with a more general framework of study. Work by the Coxoh Ethnoarchaeological project in Guatemala (e.g., Hayden and Cannon, 1984) exemplifies this framework: Michael Deal's ceramic ethnoarchaeological research (Deal, 1998) through the project provides important insights

both for interpreting the local archaeological record and for building comparative models (see also Deal and Hagstrum, 1995). So, too, does work by the Banda Research Project in Ghana (e.g., Cruz, 1996; Stahl, 1999; Stahl and Cruz, 1998).

Researchers also should place ceramic ethnoarchaeological studies into their broader cultural contexts because ceramics carry less information than we would like (see also Wobst, 1999, p. 131) and form one part of a larger social and material world. Researchers can examine a wider range of artisans in a particular society (e.g., LaViolette, 2000) or work in teams with multiple specialists who examine different traditions within the same society. This latter approach has been done by members of the Mandara Archaeological Project (e.g., David *et al.*, 1988; MacEachern, 1998; Walde *et al.*, 2000) and the Kalinga Ethnoarchaeological Project (e.g., Longacre and Skibo, 1994b). Combining ethnohistorical and ethnoarchaeological approaches with archaeological research, as the Banda Research Project (Stahl, 1999, 2001) has done, also generates on long-term patterns of change.

More interdisciplinary collaboration is needed to bring together ethnoarchaeological, experimental, and analytical approaches to study topics of archaeological concern (e.g., Deal, 1998, p. 174; Longacre, 1992; Picon, 1992; Sillar, 2000, p. 57). Comparative ethnoarchaeological research provides a necessary complement to controlled research in the laboratory (Livingstone Smith, 2001, p. 1001) and occasionally offers superior results to those obtained through simulations (Rice, 1996b, p. 170).

The Ethical Imperative

Archaeologists' autocritique in the 1980s and 1990s (e.g., Earle and Preucel, 1987; Yoffee and Sherratt, 1993) and key legislative changes in cultural resources management have compelled archaeologists to recognize their responsibilities to the communities in which they work. Nowhere are such responsibilities greater than when one works in a "living community." Ethnoarchaeologists must consider research ethics (e.g., David and Kramer, 2001, pp. 72–75, 88–90). In a transnational world, our extraordinarily tolerant friends and "consultants" who welcome us into their homes and their pottery workshops increasingly have access to print and electronic media; many of them will read what we write. Ceramic ethnoarchaeologists must exercise care in using sensitive economic and personal data, how we reference our study location, and whether we name our consultants. Adopting new media techniques, from videography (Deal, 1998, p. 173) and other digital recording mechanisms to web-based media, will make research more accessible to several publics that include members of host communities.

Ceramic ethnoarchaeologists work in communities that are not simply "laboratories within which to test and sharpen methods of archaeological inference"

(Lane, 1996, p. 730); they contain people and households and factions with long memories. We must exercise caution to avoid objectifying the people whose material culture we study (Gosden, 1999, p. 9; MacEachern, 1996, p. 246). Some ethnoarchaeologists may even abandon their research to assume advocacy roles at different points in their careers (David and Kramer, 2001, p. 87; Kent, 1996, pp. 25–26).

Relationships that ethnoarchaeologists form in their study communities are meaningful to the residents; care is needed in these relationships during and after research (David and Kramer, 2001, pp. 85–87). Contributing back to the study communities, both during and after the fieldwork experience, is an ethical imperative (David and Kramer, 2001, p. 87). So is respecting indigenous protocol and knowledge, and considering the short- and long-term impact of our research on the people who host us (David and Kramer, 2001, pp. 75–77). In some cases, respect involves refraining from publishing studies on sensitive topics and seriously considering how we depict our host communities in print. Adhering to such ethics is a small price to pay for the wealth of knowledge and experience that our host communities so willingly share with us as we continue our efforts to understand what happened in the past.

Ceramic Ethnoarchaeology of the Future

Myriad topics merit future ceramic ethnoarchaeological research in many regions of the world. The world's pottery-manufacturing systems remain to be studied in vast areas of the world, including much of East and Southeast Asia. Research also is needed in industrial urban settings, like those described in parts of the Old World (Hudson, 1997; Kramer, 1994, 1997; Nicholson and Patterson, 1992), to provide comparable material for archaeologists working in complex societies.

Costin's recent discussion (Costin, 2000) cogently summarizes key issues in ceramic production that merit future research. Studies are needed to document variation in clay-mining technologies, the spatial configuration of ceramic production activity areas (workshops and firing locales), and production facilities (like tanks for slaking and levigating clays, trampling floors for preparing pastes, potter's wheels, kilns and ovens for firing (following Pool, 1992, p. 298). We need research on the scale and nature of production units with respect to compositional variability and physical characteristics of the manufactured products (Costin, 2000, pp. 388–389; David and Kramer, 2001, p. 358; Livingstone Smith, 2001, p. 1001). Continued studies of product standardization and producer specialization could refine models and measurements for archaeological application (Eerkens, 2000, p. 667). More comparative research that follows Dean Arnold's precedent (1985) could refine our understanding of relationships between agricultural

productivity, raw materials, and demographic and economic variables (Costin, 2000, p. 382).

More research is needed on social and behavioral factors that influence ceramic variability (David and Kramer, 2001, p. 418; Rice, 1996b, p. 169; van der Leeuw, 1993, pp. 240–241), from the relative salience of different manufacturing steps in signaling cultural affiliation to the relative importance of different physical properties in raw materials selection and preparation (Costin, 2000, p. 383; Rice, 1996b, p. 169; Shott and Williams, 2001, p. 110; Tite, 1999, p. 218). Developing a systematic, cross-cultural database on clays, tempers, and firing temperatures used worldwide, as Tite *et al.* (2001, p. 322) recommend, also would provide valuable information to compare against experimental data.

Future research also should concentrate on ceramic consumption: in particular, more work is needed using pottery inventories on variability in consumer assemblages at the household and community levels. Additional long-term projects are necessary to monitor life histories of individual ceramic vessels (Shott, 1996, p. 480). The collection of additional data on ceramic discard and recycling also would refine models.

Little recent ethnoarchaeological research has concentrated on ceramic distributional patterning. Recent studies by Chávez (1992) and Kramer (1997) provide models for future research at the regional scale, which might be organized using GIS techniques. More work is also needed that examines the social relations of distribution in order to evaluate extant archaeological models (see Kramer, 1997, pp. 170–176, for model).

Ceramic ethnoarchaeological research on ceramic production, consumption, and social boundaries is integral to archaeological interpretation. Ethnoarchaeologists, like their archaeologist counterparts, still struggle with notions of ethnic groups as static entities and currently work to improve their methods for studying technological style (Hegmon, 2000, pp. 131–132). Future research could investigate differences in manufacturing techniques within communities, and from one generation to the next. More work also is needed on the nature of material correlates for social boundaries, which are complicated (e.g., Dietler and Herbich, 1994; Gosselain, 1998, 2000; MacEachern, 1998; Stark, 1999; Stark *et al.*, 2000; Sterner, 1992; Welsch and Terrell, 1998) and exhibit clinal variability that remains poorly understood (Graves, 1994b, pp. 48–49; Kramer, 1997, p. 181).

Ceramic ethnoarchaeological research can help also construct theoretical units that can be identified in the archaeological record (Dunnell, 1995, pp. 41–42). Such units may characterize production communities (D. Arnold *et al.*, 1991, 1999, 2000; Stark *et al.*, 2000) of one or multiple villages and that cover geographic areas as large as $8 \times 5\ \text{km}^2$ (Druc, 2000, p. 87). Ceramic ethnoarchaeologists contribute to the identification of "low-level principles" and "material–behavior correlates," and also to studies of physical and technological

properties of raw materials, manufacturing techniques, and motor skills (Rice, 1996b, pp. 189–190).

SUMMARY AND CONCLUSIONS

This paper has surveyed recent advances in ceramic ethnoarchaeology by focusing first on the field's current definitions, competing approaches, and regional traditions. Theoretical tensions within ceramic ethnoarchaeology were highlighted to illustrate how adherence to some theoretical frameworks significantly affects how we define, undertake, and apply ceramic ethnoarchaeological research. Discussion then turned to salient research themes and contributions that recent research has made to archaeological interpretation. Whether—and how—future ceramic ethnoarchaeologists will conduct their research remains an open question, given the rapid disappearance of ceramic systems worldwide. A host of methodological concerns confronts each future ethnoarchaeologist, in terms of both research design and ethics; some of these issues were addressed. This paper's last section identified many potential areas for future research and provides a springboard rather than an authoritative source.

Ceramic ethnoarchaeological research today is dynamic and popular worldwide. One index of this field's health lies in the large number of publications summarized here. Another is the existence of several thoughtful recent reviews; still another is the lively debate that surrounds the practice and application of ceramic ethnoarchaeological research. This paper's central objective has been to demonstrate the viability and vibrancy of ceramic ethnoarchaeology and to present this approach as an integral component of world archaeology. Its many applications, including those outside the processual, Americanist framework, strengthen archaeological interpretation globally. We have much to learn from looking beyond our own theoretical and national borders.

ACKNOWLEDGMENTS

This paper is dedicated to the memory of Carol Kramer: it could not have been written without her many years of advice, assistance, and extraordinary mentoring. Gary Feinman is gratefully acknowledged for his patience with me in finally producing this document. Deep thanks also go to Bill Longacre for his continuous encouragement and support of my participation in the Kalinga project. Several colleagues also provided valuable bibliographic research support: Sutee Veerawan, Nic David, and Charles Kolb. Thanks also go to Dean Arnold, John Arthur, Brenda Bowser, Cathy Costin, Olivier Gosselain, and Anne Underhill for sharing their recent research with me, and to Maria de Dores Cruz for translation assistance with

Portuguese publications. The following colleagues provided particularly useful comments on various iterations of this review: Brenda Bowser, Nic David, Ann Stahl, Dean Arnold, Jim Bayman, Carla Sinopoli, and Michael Galaty. I followed many of their recommendations, as well as those of others. Faults with this review, however, rest squarely on my shoulders.

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