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Author(s): Cathy Lynne Costin

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The Use of Ethnoarchaeology for the Archaeological Study of Ceramic Production

Cathy Lynne Costin¹

Ethnoarchaeological studies have longed served as a critical source of hypotheses, comparative data, and explanatory frameworks for archaeologists interested in describing and explaining ceramic production. In this paper, I lay out the central questions addressed by archaeologists studying craft production, discuss how ethnoarchaeology has contributed to our understanding of ancient production systems, and suggest avenues of further research that can benefit archaeological investigation of the organization of ceramic production.

KEY WORDS: production; specialization; ceramics; potters; crafts.

INTRODUCTION

The explicitly stated goal of ethnoarchaeology is to provide ethnographic data and explications of those data that are of direct relevance to the interpretation of archaeological materials and to model-building in archaeological practice (cf. Donnan and Clewlow, 1974; Kramer, 1979, p. 4, 1985; Schiffer, 1987, pp. 229, 230; Schwarz, 1978, p. vii). In this paper, I will comment on some of the areas where the papers in this issue and select other recent ethnoarchaeological studies have contributed to studies of ceramic production, and suggest some direction for future ethnoarchaeological research on pottery manufacture.

In suggesting how ethnoarchaeological data and the conclusions drawn from them might be most usefully applied in studies of ancient ceramic production, I structure the discussion around the three basic objectives of archaeological research on ceramic production. The first is to completely describe specific production systems. Production can be characterized as a system comprising six interconnected components: artisans, means of production (raw materials and technology), principles of spatial and social organization, finished goods, principles and mechanisms

¹Department of Anthropology, California State University, Northridge, California 91330.

of distribution, and consumers (see Costin, in press, for a full discussion). The second objective is to explain why those historically specific systems have developed (technologically and organizationally) and changed as they have. The third objective is to identify and explain cross-cultural regularities and variability in production systems.

To meet these objectives, archaeological studies of craft production address a set of explicit or implicit questions about the character and organizing principles of the production system. These are as follows:

- *Was production “specialized”?* The definition of specialization has recently been much debated (e.g., Clark, 1995), but an over-riding concern among archaeologists studying production is whether all households made a particular item for their own use, or whether a subset of producers manufactured a particular category of goods for transfer to and use by a larger group of nonproducers. Changes in the division of labor have long been tied to the rise of political and social complexity (e.g., Brumfiel and Earle, 1987; Childe, 1950). More recently, the relationship between the division of labor and the nature of social relations relations has come to the fore (e.g., Costin, 1998b).
- *What was the constitution of the production units?* Archaeologists are interested in distinguishing between household and nonhousehold based production; differentiating “workshops” (however defined and identified) from other kinds of production units; and approximating the basic size and composition of work groups. Such differences are of interest because they reflect the organization of labor, the social relations of production, economic networks, and social complexity.
- *How intensive was production?* Linked to the first question, this one is directed at gauging whether production was part-time or full-time. Now recognized as a continuum rather than a dichotomy, the distinction is tied to broader issues of work scheduling and the expansion of societal complexity.
- *Where did the locus of control lie?* Increasingly, archaeologists are interested in determining who was empowered to make decisions about resource procurement and use, technology, visual content, and the distribution of finished goods. The answers to these questions tie studies of craft production into broader issues of political economy and social control, among other things.
- *What was the social identity of the artisans?* Fundamentally, archaeologists interested in this principle of organization seek to identify artisans by gender and class. This question relates directly to issues of social organization, social power, artistic point of view, and communication.

To answer these questions, archaeologists have three basic types of *archaeological* data available: the objects themselves (and their material, technological, and stylistic attributes); the debris from production activities; and the physical contexts

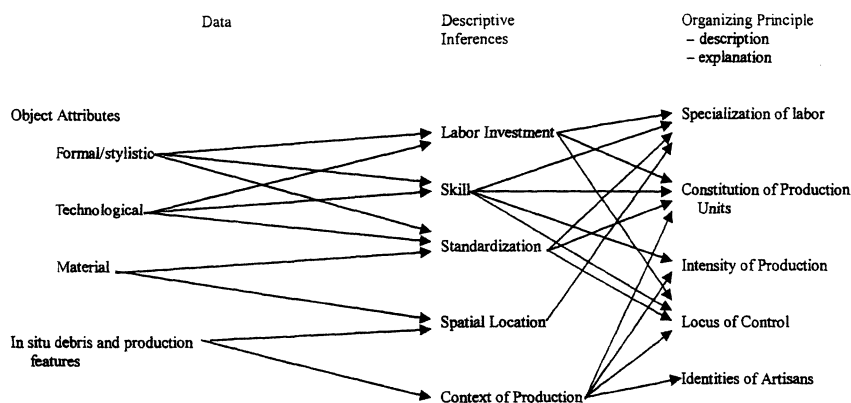


Fig. 1. Chart illustrating the flow of inference in reconstructing ancient production systems, from data to organizing principles.

from which the objects and debris were recovered. From these three types of data, archaeologists make descriptive inferences about certain qualities of the artifact assemblages and the location of production, and from these inferences reconstruct the organizing principles of the production system (Fig. 1). Arnold (2000) points out that many of the links between organizational characteristics (principles) and archaeological “index criteria” (descriptive inferences) remain speculative. Ethnoarchaeological examination of many assumptions about the links between behavior and material patterning is necessary to strengthen these ties.

As should be apparent from the way inferences progress (as outlined in Fig. 1), before the organizing principles are inferred from key descriptive inferences, there is also a more fundamental set of questions that ought to be addressed in studies of production systems:

- Why is production located where it is?
- Why were particular means of production (resources, technologies) chosen by artisans?

I now consider how the papers collected in this issue and select other ethnoarchaeological studies have contributed to our ability to answer these seven questions and others similar to them.

MEANS OF PRODUCTION AND TECHNOLOGICAL CHOICE

The means of production comprises raw materials and the technology (knowledge and tools) used to transform raw materials into usable, culturally meaningful goods. Also to be considered here are intangibles such as principles of resource procurement, and principles of access to tools and knowledge (e.g., the sociopolitics of the learning environment).

Archaeologists regularly use analyses of the means of production—particularly raw materials and technology—to infer characteristics of production such as labor investment, skill, and standardization (Fig. 1). These descriptive inferences are then used to reconstruct organizing principles such as the specialization of labor, the constitution of production units, and locus of control within the production system. Thus, it is essential to understand why potters make the production choices they do.

Why Do People Use the Particular Resources They Do?

Many archaeological studies use analyses of raw material variation to investigate aspects of the organization of production such as the degree of specialization. Yet, as Rice (1996, pp. 168, 169) has pointed out, archaeologists haven't clearly addressed what compositional patterning really means in terms of social behavior: Are the groupings in the data "economic" (i.e., workshops), social, or political units? As discussed later, the papers assembled in this issue suggest that the answer to the question is, "all of the above."

Arnold (2000) points out that the more fundamental issues of the causes of paste variability and the reason(s) particular resources were selected must be dealt with before higher order organizational principles such as the control of production and the constitution of production units are inferred from compositional data. Many archaeologists take Arnold's (Arnold, 1985) observation that potters use resources close to where they work and assume that potters simply used the *closest* resources. However, as many ethnoarchaeological studies have demonstrated, clay procurement strategies are complex. For example, Bishop *et al.* (1982) have proposed five strategies for selecting raw materials: (1) use equally available clays without discriminating among them; (2) preferentially choose from among equally available clays; (3) use more or less equally available clays of different composition for different kinds of vessels; (4) mix clays to achieve particular paste properties; (5) use more distant sources that are judged qualitatively superior for the potters' purposes. Ethnoarchaeological studies make it clear that clays and tempers are not just picked up randomly; they are consciously procured for particular reasons. Read collectively, the papers in this issue by Arnold, Neupert, and Stark *et al.* enumerate a series of natural and cultural factors that affect raw material selection and paste composition variability. These include the natural chemical and mineralogical variation in clay and temper sources, which is a result of local geology and topography; a variety of factors related to procurement, which reflect selection decisions made by potters (relating to performance characteristics during manufacture and the use of finished vessels, as well as energy expenditure on the part of the personnel who collect resources); control over resources and restrictions on access (which range from usufruct and ownership issues to ritual proscriptions); the organization and technology of procurement,

processing and preparation; and the kin and political relations between those who control the resources and those who transform raw materials into finished goods.

Stark and her colleagues (2000) clearly state that the social (i.e., kin) relations between Kalinga potters and the owners of fields where clays are found are just as important as resource quality (determined by workability and performance characteristics in manufacturing and use) in the decisions about which clays potters use. Similarly, Neupert (2000) notes that although Paradijon potters qualitatively rank clays, sociopolitical factors “dictate” which clays they use. In this instance, clay “choice” is complicated by the fact that the female Paradijon potters do not collect their own clays, but rely on male relatives to bring them processed raw materials. Although different kinds of clays are preferred for different kinds of vessels, potters usually must make do with the clays they receive. This should be a caveat—but not a deterrent—to archaeologists who rely upon experimental archaeology to determine performance qualities and explain resource selection.

Rather than being cause for concern to the archaeologist, the litany of factors affecting resource selection summons forth the necessity of developing methods for identifying these “complicating factors.” In archaeological studies of ceramic production, there is a need for a reasonable assessment of geologic variability, processing practices, and political divisions, among other things. As Arnold (2000) implies, before raw material characterization is used to address questions about the spatial and social organization of production (and distribution), these other factors concerning choice in resource procurement must be considered.

What Were the Organization and Principles of Resource Procurement?

Many archaeological analyses make the assumption that preindustrial artisans owned or controlled the resources they used (cf. Costin, 1998a), unless, of course, *elites* controlled them (Rice, 1981; but see Clark, 1997). However, ethnographic studies suggest that the situation was much more complex. Although most contemporary cases are muddled by modern changes in land tenure principles and mechanized transport, they nevertheless illustrate the complexities of resource procurement.

The issue is important because principles of procurement are implicit in many models explaining the organization of production and the origins of specialization. For example, many explanations for community specialization center on a lack of adequate agricultural resources. Several of the studies collected in this issue describe clays coming from relatively productive agricultural fields; many other ethnoarchaeological accounts do the same. It appears that it is not so much the overall productivity of the soils (i.e., a community problem) as it is individual circumstances and access to land that will affect participation in crafting (see

later). What is needed is a series of systematic regional studies that look at the relationships among agricultural productivity, the presence of suitable clays, and the amount of ceramic production as well as factors such as population density, alternative economic opportunities, and access to labor.

Also poorly understood is the nature of the relationship between those who “control” the fields and those who lack usage of the fields for agricultural purposes but need access to the clays lying therein in order to pot. Models for the emergence of some forms of specialization suggest that craft production was a means by which individuals without adequate subsistence assistance (e.g., widows) could support themselves. Yet it is this same lack of ties to resource-allocating networks that becomes a barrier to crafting, because these individuals may lack access to the resources or to the personnel who collect those resources (e.g., Deal, 1998). I would strongly encourage ethnoarchaeologists to suggest methods by which archaeologists might detect the organization and principles of resource procurement. This issue is critically important, because to the extent resource variability is used to reconstruct the organization of production (see later), there is a danger of confounding the organization of fabrication with the organization of procurement.

Why Do People Use the Particular Technologies They Do?

Technological attributes are frequently used to reconstruct the organizing principles of a production system. From technological attributes the amount of standardization is gauged and the amount of skill and labor investment are inferred. These three measures are thought to reflect the amount of specialization, the locus of control, and to a lesser extent the intensity of production and the constitution of production units (see Fig. 1). Until recently, technological choices were thought to be governed primarily by “economic” factors such as competition and efficiency. Recent studies, such as Arnold’s (Arnold, 1999) analysis of choice of firing facilities, demonstrate the complexity of explaining technological choice, taking into account material and environmental factors such as space and fuel availability, time constraints and scheduling, and microenvironmental conditions. Increasingly, archaeologists and anthropologists have placed emphasis on the social dimensions of technology (e.g., see the papers in Dobres and Hoffman, 1999; Stark, 1999). Here too is an area where ethnoarchaeology can be of significant utility to archaeological studies. Recent work on technological choice—much of it based on the work of ethnographers and ethnoarchaeologists—underscores the complexity of the political, social, and economic contexts within which technology is chosen and deployed.

Longacre (2000) demonstrates that not all technological choices are dictated by the need for “efficiency” in the production process. Rather, in his case the potters of San Juan Bautista add an extra step that requires both extra materials and time

in the production process. This step makes their products distinctive and ensures a more active market for their wares. *Experimental* studies of pots with similar attributes suggest that the most labor and material intensive vessels—those that were both slipped and smudged—were more effective in heating their contents than were vessels with only one of these treatments, or none at all. This may be the underlying reason for the higher demand for the San Juan Bautista pots.

Gosselain (2000) suggests that many African potters were almost nonchalant about the specific form and material of their rouletting tools, so long as they were cheap, easy to make, easy to use, and allowed them to achieve the desired regular, all-over designs. Gosselain sees tools and processes as having a “style,” which in his formulation is a conscious operation that can be chosen and manipulated. Yet, he argues that technical systems do not have internal coherence. This stands in contrast with the observations of Lechtman (1984, 1993), who suggests that technical systems are meaningful and can even cross *material* boundaries. She argues that in both their metallurgical and textile technologies, Andean peoples were concerned with internal structures (created through complex weaves and elaborate processes for alloying and gilding metals) whose complexity could not necessarily be perceived or appreciated from the surface appearance alone. This technological system is tied into the broader Andean world view and an ideology of the essence of things and how surfaces related to inner structures. Thus, in the Andean case, technologies might be adopted or rejected primarily based on the degree to which they conformed to this world view.

Ethnoarchaeological studies of technological choice have been instrumental in pointing out that variation in different kinds of attributes can reflect different aspects of social and economic behavior (see also Costin and Hagstrum, 1995). This theme is evident in Gosselain’s (2000) classification of manufacturing steps into three categories that differ from one another in terms of the perceptual salience of the techniques involved; the nature of the social interactions among producers and consumers; their learning and performance environments; and the degree of technical malleability. Gosselain differentiates between production steps that are amenable to conscious manipulation and modification and those that are not; those that are visible to consumers and/or other potters; those that are performed individually or in groups; and between those characteristics that are likely to be influenced by consumers or other potters and those that are not. He argues that these groupings are in turn related to different aspects of social identity and social relationships. In theory, technological steps could be arranged in a sequence that proceeds from those that reflect the most “situational” or incidental contexts and expressions of identity to those likely to reflect more stable groups and identities. To the extent that such relationships between technology and social context are consistent cross-culturally, distinguishing among different types of technological characteristics will be valuable for archaeologists trying to sort out what “types” of affiliation underlie the variability in their data. Some of these affiliations will clearly relate to the organizing principles of the production system.

One possible obstacle to generalizing from this observation is that the aspects of identity which are ascribed (stable, durable) and those which are achieved (more likely to be situational or changeable) varies somewhat from society to society.

LOCATION

The location of production activities must be identified before archaeologists can adequately reconstruct the social organization of production, largely because the spatial context of production is used as primary data for inferring the social context of production. Archaeologists regularly turn to ethnoarchaeological accounts of ceramic production to develop their understanding of the material correlates of productive behavior such as facilities and debris (e.g., Deal, 1998; Stark, 1985), the use of space in domestic production (e.g., Arnold, 1991; Hagstrum, 1989), and community-wide distribution of work locations (Neupert, 2000).

Additionally, more indirect approaches to the identification of production locations used by archaeologists are also grounded in the results of ethnoarchaeological studies. The use of compositional analysis to identify production communities by matching raw materials with finished pottery is particularly salient. Generally, the assumption is made by archaeologists that pottery used in a number of communities would have been made at the community closest to the raw materials. Although this mainstay of archaeological inference makes logical sense, a more rigorous test of the hypothesis, using cross-cultural ethnoarchaeological data, would greatly strengthen the argument.

In yet another application of compositional analysis, Stark and her colleagues (2000) tested the composition of raw materials and finished products to demonstrate that individual production communities can be distinguished from one another, even when they are geographically close. For archaeologists, this might prove more difficult, given the long list of factors that affect the final composition of clay pastes. Ethnoarchaeological studies demonstrate that in order to plausibly use raw materials to identify (different) production communities and link specific vessels to specific clay sources, a detailed geological survey is needed to identify potential sources; reconstruction of the organization of procurement is highly desirable; and processing should be reconstructed.

In addition to identifying production locales, it is desirable to know why producers are located in particular places. Archaeologists tend to use a materialist paradigm, focusing primarily on resource distribution and secondarily on considerations such as population density and transportation. The ethnoarchaeologists suggest there is a significant element of historicity and idiosyncraticity in the location of production. Stark and her colleagues (2000) note that differences in the scale of production among Kalinga villages are related to historical factors such as alternative opportunities for wage labor. A similar point is made by Deal (1998) for

the location of ceramic production in parts of highland Guatemala. Kalenditzou (2000) implies that some Evros villagers took up the craft when they were cut off from their former supplies after the political upheavals at the turn of the twentieth century. These ethnoarchaeological cases serve as a reminder that “economic” models—resource allocation, and so forth—alone are insufficient to account for the spatial organization of production. It would be useful if ethnoarchaeologists might suggest ways that archaeologists can identify the likelihood that historical factors generally made a strong contribution to determining production locales, even if they cannot effectively identify the specific historical factors at work.

SPECIALIZATION

Implicitly or explicitly, most archaeological studies of craft production center on the issue of whether production was “specialized” or not; indeed, this is what is usually meant by the phrase “organization of production.” However, as Clark and Parry (1990) and others (Costin, 1991; Santley *et al.*, 1989; Sinopoli, 1988) have pointed out, there is no one kind of “specialist” or “specialization.” This observation is based largely on the ethnographic record.

A key objective in most archaeological studies of craft production is to identify the “organization of production” or the degree of specialization. This entails determining the relative number of “production units” that served a specified consuming population. Because these units—architectural or human—are rarely recovered in the archaeological record, archaeologists regularly turn to indirect data such as material and technological variability, skill, and labor investment as proxy measures for the organizing principles of production systems. At the core of these analyses is a presumption that there is a correlation between patterns in raw material use and/or technology, and the structure/composition of the groups of people making the pottery. A key contribution of ethnoarchaeological studies can be to illustrate how material compositional patterns relate to human organizational structures.

Many of the papers in this issue deal with ceramic materials, particularly using compositional analysis to consider the assumption archaeologists make about the correlation between observed patterns of homogeneity/heterogeneity in clay resources and the organization of production. Arnold (2000) points out how rarely the “speculative” propositions that link human organization and the material record have been tested with ethnographic data. What Stark and her collaborators (2000) refer to as an “analytic luxury”—the ability to actually observe the social groups that correlate with compositional groups—is an analytic *necessity* if ethnoarchaeology is to make a lasting contribution to this element of archaeological inference. The body of ethnoarchaeological work demonstrates that compositional groups may not always correlate with the “economic” production units archaeologists variously refer to as workshops, production loci, production groups, or production centers. Arnold (2000) asserts that the correlation is highly imperfect, and he

counsels that compositional variability may reveal little about the organization of production beyond the general region. I suggest that if ethnoarchaeology were to demonstrate that there were *rarely or ever* a correlation between ceramic compositional groups and human production units, archaeologists would be forced to abandon a key presumption and analytic tool, something Arnold comes close to advocating. However, several ethnoarchaeological studies reported in this issue (particularly those of Stark *et al.*, Neupert, and Arnold) and elsewhere do show that compositional groups correspond to human groups, which interact economically, socially, or politically, although these groups may not be the “workshops” (production groups) for which archaeologists are looking.

The studies reported by Neupert in this issue and Bowser elsewhere (1996, 1998) demonstrate that material analyses may identify social groups or political factions. Neupert (2000) documents how political factionalism leads to strongly patterned use of specific resources in Paradijon. Bowser (1996, 1998) demonstrates that the same correlation between style groups and political alliances among Conambo villagers reported in this issue holds for political alliances and clay sources as well, with members of one political faction primarily collecting their clays from one main source and the members of the other political faction primarily using another clay source (see Table I). If one were to perform a compositional analysis on the village ceramics, it is likely that two clusters would emerge. Of course, in neither the Paradijon nor the Conambo case are the clay source-using groups “production groups” in the way archaeologists think about them. An archaeologist looking only at the Conambo material record, for example, might be inclined to suggest that in the village there were two (social) divisions, each served by its own (specialist) potter. This is not, however, the organization of production in Conambo. In fact, all adult women in all households make their own pottery; but certain potters share clay sources based on their social and political alliances. The good news is that the archaeologist *would* have identified two groups that are economically (and politically) distinct from one another. Importantly, this case allows observation of how economic networks relate to social and political networks and obligations, something of interest in recent studies of production.

Table I. Correlation Between Household Political Affiliation and Clay Source Utilization in Conambo, Ecuador

Clay source	Political affiliation	
	Achuar	Quichua
Gloria	—	8
Yauna	13	—
Yulanda	—	3
Other	2	2

Note. Data taken from Bowser (1998).

There is similar cause for cheer in Neupert's (2000) seemingly cautionary study. Neupert argues that, in the case of the Paradijon potters, resource selection is based largely on social and political factors, rather than principally on economic considerations (i.e., distance to resource) or on the technical (i.e., mechanical or chemical) properties of the clays, factors which are usually foremost in archaeological models of resource procurement. This study does not negate conventional models, rather, it adds nuances to them. Others (e.g., DeBoer, 1985) have shown that factors such as distance and clay quality often do account for a large proportion of resource variation. Rather than seeing Neupert's results as a blow to the models long used by archaeologists, those for whom the "economic" models have not fit the data should find inspiration. Van der Leeuw (1991) has argued that no one model (technological, economic, functional, or social) should take precedence over another. Rather than accepting his view that we *cannot* choose among them, I suggest that patterns identified through comparisons of many ethnoarchaeological studies may make it possible to develop means for distinguishing those which are more satisfactory from those which are less so in each particular case. More important, Neupert's compositional analysis *does* identify two groups of potters. As in Bowser's Conambo case, the compositional groups identified in the Paradijon data do not represent "workshops" or production units; in fact, the organizational criterion is not economic, but based on political alliance. Nevertheless, there is a "reality" to the groups the compositional analysis identified. It is just not the conclusion to which traditional interpretive frameworks would have led. In both cases, there are meaningful social units consistently associated with compositional groups. What is needed by archaeologists is a framework of contextual analyses to aid in distinguishing the criteria that define those groups.

Even with added insight from ethnoarchaeology, in the absence of complementary and contextual data, the specific organizing principles of the groups identified through materials analysis may not be known fully by archaeologists. Rather than label them with misleading titles, they might best be neutrally called "resource-sharing" or "resource use" groups (Arnold calls them community signature units). If there are many resource use groups within a defined region, it is likely that there are many production units—economic entities—as well. However, a single resource use group might comprise one or many production units. In the later case, other data would be necessary to test the internal homogeneity and structure of the group.

Many archaeological analyses assume a correlation between specific potters and particular raw material sources. Several of the papers collected herein illustrate how potters often change sources frequently—even within the span of these relatively short studies. Although archaeologists might be concerned that this would obscure patterning related to the organization of production, Arnold (2000) points out that only resource shifts "of the greatest magnitude" are evident in chemical analyses, demonstrating the robustness of such measures. Moreover, because the archaeological data are a palimpsest of decades or centuries of resource selection,

the patterning that does emerge will reflect social divisions that have strength, consistency, and meaning over a relatively long period of time.

There remains a fundamental disagreement as to the level of resolution possible in chemical, mineralogical, and technological analyses. Arnold (2000) is cautious about using technology (specifically, characterization studies of paste composition) to reconstruct human behavior and the organization of production. He argues that paste variability is more closely tied to environmental and technological factors than to the organization of production. In contrast, Gosselain (2000) and Stark *et al.* (2000) are significantly more sanguine. Gosselain's perspective differs from Arnold's for two key reasons. First, Gosselain works at a much larger geographic scale than does Arnold; Arnold does admit to the possibility of using compositional data to determine the organization of production at the *regional* level. Second, Arnold works primarily with the chemical characterization of pastes, whereas Gosselain works with a much broader suite of technological characteristics in his analysis. Stark and her colleagues use data sets similar to Arnold's, but they support the position that "characterization studies of archaeological ceramics can reach higher degrees of spatial resolution than archaeologists generally attempt." The implication is that individual production units (households or workshops) might be recoverable through paste analysis. Ethnoarchaeologists could make a significant contribution toward sorting this out if someone would take a far-reaching, comparative perspective in which a clear test of the assumption about the relationship between variability and the number of distinct production units at different levels of analysis was developed and carried out.

Although ethnoarchaeological studies do show that paste composition is useful for distinguishing groups of some sort or another, future ethnoarchaeological research might focus profitably on one of the central uses of material variability in archaeology, which is to characterize the relative number of production units in two or more assemblages. I would encourage a multicase comparative study that characterizes the relationships between the amount of compositional variability and the specifics of the organization of production (i.e., the number of production units, the degree of specialization). For example, using the marvelous data from Arnold's (2000) cases, would it be possible to quantify variability and relate this to the number of different potters, production units, or workshops in the different communities? Arnold's work hints at the likelihood that the amount of ceramic variability does [crudely] reflect the number of production units. As the number of potters and the number of production units in Ticul, Guatemala, has risen, the number of ceramic sources has indeed expanded (Arnold, 2000). Similarly, Stark and her colleagues (2000) imply a correlation between the number of potting units and the number of clay sources used, because there appear to be both more active potters *and* more clay sources in the village of Dalupa than there are in the village of Dangtalan.

Indeed, there are many "hints" in these papers that Stark and her colleagues are correct when they argue that it is possible to get at much finer differentiation than

that currently attempted. Arnold (2000) notes that potters perceive less variability in their materials than chemical and mineralogical analyses can measure. He also implies that mineralogical composition reflects more intentional technological choice than does chemical composition, because mineralogical properties reflect the physical and performance characteristics more likely to be chosen consciously by potters and/or consumers. Arnold's work suggests that different kinds of behavior are reflected in mineralogical and chemical variation. Thus, there often might be an element of unconscious variability in the compositional data that relates to individual work groups. Arnold also provides anecdotal evidence that the specific, distinct behavior of individual potters contributes to the overall variation in the data. For example, in Mixco, Guatemala, potters process their clays differently from one another. Similarly, new processing techniques were adopted in Ticul without the loss of the old ways. It would be interesting to examine this or similar data to see if there are distinctions in "micro-technology" that can help differentiate among different work groups.

In using measures of variation to characterize the organization of production, there are two issues that require more input from ethnoarchaeologists and more measured discussion from archaeologists. The first of these, mentioned already, is the relationship between standardization and the relative number of production units. Stark and her colleagues (2000) list examination of relative standardization as one of the overall objects of their compositional research; the full results will be of great interest and utility for archaeologists. It would be extraordinarily useful if ethnoarchaeologists would pursue analyses of cases where several households or communities used the same raw material source, to see if there are other ways besides general composition (e.g., the details of preparation, formation, morphology) to distinguish among the products of different potters or work groups. These issues are of significance to archaeologists interested in reconstructing the organization of production. Archaeologists today are not likely to use a single variable—whether it is composition, technology, skill, or morphological variation—in isolation to characterize the organization of production. Rather, the trend is to combine different types of evidence for the organization of production, looking for overlapping patterns of material, technological, and morphological variability. Stark and her collaborators refer to the value of using complementary studies of style and form in their paper on clay use in this issue. Gosselain (2000) demonstrates how technology and style can have different distributions, albeit on a much larger scale than that with which the other papers deal. Clearly, ethnoarchaeology has the potential to make a strong contribution toward a fuller understanding of the meaning of differential spatial patterning among attributes.

CONSTITUTION AND ORGANIZATION OF PRODUCTION UNITS

Archaeologists are interested in determining the social relations of production, consisting of relations within production units and the relations between producers

and consumers. They are also interested in the internal dynamics of production units, including task allocation, power, and control.

Household, Kin-Based, and Workshop Production

Although some of the more theoretically based literature takes care to distinguish among different relations of production and uses terms like “domestic production” and “workshop” in explicitly defined ways, many substantive studies do not rigorously distinguish among different modes of production. Ethnoarchaeological data have the power to demonstrate for archaeologists the relationship among the spatial contexts of production and the social relations among producers.

Arnold's (2000) paper demonstrates the resilience of household- and kin-based organization. In Ticul, Guatemala, Arnold documents a fairly radical change in the “demand” for pottery, from local, indigenous consumers acquiring utilitarian vessels to extra-regional tourists and hotel designers. In response, there was an expansion in the number of potters and the number of production units. Although still centered on the nuclear family, production units were expanded by hiring kin and using specialized space outside household living quarters. A similar process in which nonresident kin are recruited to expand ceramic production is documented by Kleinberg (1979). This work serves as a reminder that even radical changes in the types of goods produced, the nature of consumers, and the mechanisms through which goods are distributed need not necessarily be accompanied by significant changes in the organization and constitution of work groups. The Ticul example contrasts with another of Arnold's cases, the potters of Quinua, Peru (see also Arnold, 1993). The Quinua potters established large pottery workshops when they relocated to Lima. It would be interesting to understand why the Quinoa artisans formed large workshops when they relocated. There is a broad need to identify the other factors that might induce a change in the organization of production, such as changes in access to resources, to distribution channels, and in control over the “content” of the goods (control that cannot be exercised through a patron-client/commissioned relationship). To some extent this is being done by ethnographers and art historians who are studying change in the traditional arts. This is documented in a literature of potential value to ethnoarchaeologists and archaeologists (e.g., Errington, 1998; Graburn, 1976; Nash, 1993; Tice, 1995).

How is Labor Organized Within the Production Units?

Ethnoarchaeological studies make it apparent that some archaeologists have rather simplistic notions about how tasks are allocated and production steps coordinated. Several of the papers in this issue—particularly those of Longacre and Stark and her colleagues—provide a rich description of the production sequence

and the division of labor. Indeed, this careful description, often provided as background, is an invaluable contribution to craft studies made by ethnoarchaeologists. Often, archaeological studies of craft production would benefit from a deeper understanding of how crafts are made, in terms of the tools and procedures involved, the base knowledge required, and the amount of time expended, and how these are operationalized by artisans and their helpers. This is a point that has been made most adamantly by Clark (1996). Taken together, the papers in this issue underscore how “complex” the organization of production can be. Neupert points out that even a “simple” organization is complex, and this is also evident in the rich descriptions of division of labor in the papers by Stark *et al.* and Longacre. As a point of detail, ethnoarchaeological studies also demonstrate that the sequencing of steps will vary by material, even with a single craft type. For example, in their study of contemporary Indian stone beadmakers, Kenoyer *et al.* (1991) document a different sequence of steps (e.g., drilling, polishing) depending on the specific raw materials. They note that some materials allow greater flexibility in the order of the production sequence, which strongly affects how labor is managed within the workshop. Sometimes, archaeologists give insufficient attention to the full range of tasks necessary to make a pot (or a piece of cloth), the specific sequence in which those tasks might occur, and all the people who participate in getting those tasks completed. With the increased interest in division of labor, ethnoarchaeology can provide examples of how task allocations are negotiated, scheduled, and publicly acknowledged. Careful analysis might indicate whether these allocations have visible correlates in the material record.

Another area where ethnoarchaeology has added value is in the recognition of the general importance of “hidden” labor (cf. Mills, in press; Wright, 1991)—the tasks performed by individuals other than the identified “potter.” However, examination of the ethnoarchaeological literature suggests that there are no hard and fast rules about the identities or contributions of these “invisible” laborers. London (1991) presents a case from the Philippines in which helpers do everything except form pots. She suggests that this invisible labor—used for many of the finishing tasks after the vessels are formed—adds a significant amount of variation visible to the eye. For the archaeologist, such a system would affect measures of variation, inflating estimates of the number of production units based on the amount of variation in the assemblage. In contrast with the organization of labor that London details, Kramer’s study of potters in Rajasthan, India, documents that one category of helpers often form the vessels whereas another (women and children) perform such tasks as attaching handles, modifying rims, and scraping (Kramer, 1991, 1998). Interestingly, in both cases, it is the person who forms the body of the pot who is emically identified as the “potter,” an observation also made by Longacre (2000) and Neupert (2000).

Task allocation is clearly a complex issue, one perhaps not always amenable to attribution through analogy, even in relatively narrowly defined areas. Comparing the data on task allocation in the papers by Neupert and Stark *et al.* in this issue

make this caution clear: Among the potters of the Philippines, in one region clay is collected by men, whereas in another, clay is collected by women.

Task allocation is important because it affects broader conclusions drawn about the nature of economic networks and social relations. For example, Neupert (2000) documents that for the female potters of Paradijon, work is autonomous and household-based, although women might occasionally help one another fill large orders. In contrast, the male relatives who collect and prepare clay and later fire finished vessels for the women do so in groups, making use of shared activity areas. Thus, the contexts for work and the social relations that work entails are different for women and men. Although Neupert is more interested in the effects on material patterning, there are also strong implications for social and political participation. Longacre mentions similar gendered work patterns, as do Stark and her colleagues (2000). Gosselain (2000) also demonstrates that different production stages entail different processes of social interaction.

Several of the papers in this issue illustrate a degree of fluidity in work group organization, as well as different social contexts for different stages of production, especially resource procurement, formation, and firing. For example, several of these papers document collective firing, although vessel formation takes place individually. Thus, archaeological studies should try to reconstruct the "organization" of production based on evidence from several stages of production.

INTENSITY OF PRODUCTION

Archaeologists are very interested in the intensity of production, particularly because of the perceived relevance of part- as opposed to full-time production to the issue of "specialization." There is a need for more systematic work by ethnoarchaeologists on the material correlates of work intensity. A cross-cultural, comparative study of ethnoarchaeological data might indicate what full-time production looks like when compared with the remains of part-time production. Location, spatial arrangement of activities, and disposition of debris might all be investigated and the results applied archaeologically. I (Costin, 1991, in press) have argued that intensity should not be confounded with scale (as measured by the size of work unit and amount of material produced) analytically. Comparative ethnographic analysis might provide useful insights into the ways in which these factors covary, if at all.

CONTROL OF THE PRODUCTION SYSTEM

When archaeologists discuss the sociopolitical context of production, they often use the terms *attached* and *independent* production. In somewhat simplistic terms, in systems of attached production, elites or political institutions have the

authority to directly control some or all components of the production system, including raw materials and technology, the location of production activities, labor deployment and organization, object appearance, and/or the distribution of finished goods. In systems of independent production, artisans are unconstrained by such direct institutional or elite control.

It has been suggested that ethnoarchaeological studies might have limited utility in modeling and explaining attached production because the vast majority of contemporary artisans produce utilitarian goods for general markets. Partially, this is a function of the types of cases most ethnoarchaeologists have chosen for study. However, there are some ethnographies of craft/art production that provide valuable insight into production in socially stratified traditional contexts (e.g., Ben-Amos, 1971). Ethnoarchaeologists should be encouraged to seek out those situations where traditional crafts are produced and used in stratified societies.

Neupert's work (Neupert, 2000) lends voice to the many studies that underscore the point that using attached-independent as a dichotomous variable is far too simplistic. Indeed, I have argued that the sociopolitical context of production be viewed as a continuum characterizing the degree of elite involvement in the components of production (Costin, 1991, *in press*). Neupert's paper demonstrates how, almost inadvertently, elites can become mixed up in an "independent system" with far-reaching effects on the material patterning in the products. It is important to note that in the Paradijon case described by Neupert, elites facilitate access to resources but exert no influence or control over the production or distribution of goods. In this example, the elites want political support, and facilitating access to clays is part of their repertoire of patronage behaviors. Clearly, this would not constitute a form of attached production.

Ethnoarchaeologists need to consider how their data might help archaeologists recognize control. Currently, the most reliable material indicators of direct elite control are written records, the recovery of evidence for crafting activities within clearly elite or institutional structures, or the recovery of administrative items in production locales. Indirect data such as standardization, labor investment, and skill have been proposed by archaeologists as criteria for determining the locus of control. I would encourage systematic examination of ethnoarchaeological data to provide evidence to support or challenge these assumptions.

Arnold (2000) challenges Rice's (Rice, 1981) suggestion that paste homogeneity is a consequence of elite control, primarily by arguing against elite monopoly control of clay resources in the first place. The work of Arnold (2000) and Neupert (2000) demonstrates that elites really can't or don't "control" ceramic resources in the way postulated by Rice for two reasons. First, clays are generally ubiquitous. The ethnoarchaeological literature indicates that potters are adept at finding other sources when denied access. Therefore, at least in the cases described by Arnold and Neupert, elite "control" over clay resources (through their more generalized control over access to agricultural fields) does not result in control of

production. Second, there is little reason for elites to exert tight control over pottery production. There is ample opportunity for ethnoarchaeologists to contribute to the discussion on the relationship among resource distribution, resource control, and control over other components of the production system and over the appearance of the objects themselves. In particular, ethnoarchaeologists might want to look at new forms of patronage, the effects of tourism, globalization, and commodification, and consider parallels between these processes and more ancient processes that resulted in diminished artisan autonomy. Returning to Rice's proposal, I would suggest that homogeneity in elite-sponsored ceramics is likely the result of elites' providing raw materials to potters.

THE SOCIAL IDENTITY OF ARTISANS

The identity of the artisans is of central importance in studies that focus on power, economic organization, and on the role of material culture in social relations. Artisans play a central role in materializing ideology and social meaning through the creation and transformation of material objects. To the extent that craft objects are central to studies of social and political relations, it is important to understand the social identities (class, gender, ethnicity, legal status, and the like) of those who made them, so as to understand the perspective from which material meaning and communication is fabricated. As Gosselain (2000) points out, social distinctions, and social relationships, are expressed and discerned in the making and using of material culture (see also Hodder, 1982).

Increasingly, archaeological studies do address the identities of the workers (Costin, 1996; Costin and Wright, 1998). Unlike in ethnographic studies, in archaeological research the artisans themselves are rarely directly visible or observable. There are many methodological and substantive issues in artisan identification that remain, and ethnoarchaeology may provide insight, particularly because ethnographic analogy has traditionally been a primary means of identifying artisans. Ethnographic analogy has been much maligned as a method for speculating about the social identities of prehistoric artisans (e.g., Gero, 1991; Wright, 1991); it is only with more thoughtful analysis of extant divisions of labor and their material and sociopolitical correlates that greater confidence can be built in this method.

Who Crafts, and Why?

Few studies have paid attention to the principles of recruitment and conditions under which certain individuals or classes of individuals come to craft, although diffuse assertions are made about access to other productive resources, broadly defined ideologies of work, and generalized divisions of labor. Although ethnoarchaeological studies usually characterize the social identities of potters by

gender, age, and marital status, they rarely systematically investigate the underlying principles of recruitment and task allocation.

Ideally, future ethnoarchaeological studies will identify who crafts, and explain why particular individuals or categories of persons become artisans. It is rarely the case that participation in crafting activities is not shaped to some degree by elements of social identity such as age, gender, social status, ethnicity, ritual status, legal status, and the like.

Archaeologists often assume that economic circumstances are the most important criteria in determining who will take up crafting (in lieu of subsistence food production), particularly where pottery production is specialized. Stark (2000; also 1991, 1995) has long dealt with the issue of why certain categories of persons become craft specialists. Her ethnographic work supports the often repeated assumption that specialized pottery production is a strategy turned to out of economic necessity (see also Arnold, 1985; David and Hennig, 1972; Deal, 1998; Hodder, 1982). Kalentzidou (2000) also mentions that the potters of many Evros villages took up the craft out of economic necessity. Given that the adoption of potting in the village of Metaxades is documented for the early part of the twentieth century, there is an opportunity to investigate more fully the process of craft adoption in at least one case. The conclusion that crafting is considered an "inferior" choice is supported by the observation that the Metaxades and Souffi potters abandoned their craft when presented with the opportunity to pursue wage labor in Germany.

Although much of the ethnographic information suggests an association between crafting and economic marginalization, some anecdotal ethnographic evidence suggests that potters are not universally disadvantaged in terms of access to agricultural land or other, alternative economic strategies. For example, Arnold mentions a "wealthy" potter among the potters of Ticul, a man with sufficient capital to purchase a clay source and truck. Importantly, some ethnographic studies suggest that the observed marginalization of peasant artisans is a result of their incorporation into the capitalist global economy (e.g., Byrne, 1994; Cook and Binford, 1991). Thus, care must be taken as recent ethnography might not provide the most unambiguous models for this topic.

Gender is the second aspect of social identity that is tied closely to the division of labor. Elsewhere, Mills (1995, in press), her students and colleagues (e.g., Senior, in press), and others (e.g., Byrne, 1994; Hosler, 1996; O'Brien, 1999; Rice, 1991; Skibo and Shiffer, 1995) have grappled with the issue of the contexts in which potting and other types of craft production are undertaken by one particular gender or another. Although some cross-cultural regularities have been noted, there is likely insufficient uniformity to consistently identify the gender of potters; some plausible *speculation* might be warranted because, particularly on a regional level, for potting there is a high correlation between gender and crafting (see Murdock and Provost, 1973, Table 3; also Byrne, 1994; Rice, 1991).

OTHER CONSIDERATIONS: DEMAND AND DISTRIBUTION

Demand

Archaeologists often refer to the “demand” for particular classes of goods, thereby making consumers and consumption contexts active participants in the production system. “Demand” is an abstract concept that can be characterized by archaeologists in part by the quantities and functions of objects and in part by the social characteristics of the people who used them.

Demand includes the amount of the objects used. The studies of ceramic use-lives and household inventories conducted by ethnoarchaeologists are important because they provide descriptive data against which archaeologists can model the quantitative demand for ancient ceramics. The conditions discussed by Nelson (1985, 1991), Deal (1998), and others underscore the complexity of assessing demand in general and particularly in a world where household inventories are changing. These complicating factors include introduction of new materials and factory made goods along with changes in diet and food processing practices. Nevertheless, careful studies reveal that it is possible to model premodern vessel usage. This is ably demonstrated by the work of Hagstrum (1989) in highland Peru. Hagstrum inventoried the vessels used in contemporary farming households and, after considering how modern materials had replaced some older ceramic forms, extrapolated the modern data into the past to reconstruct likely household pottery assemblages during the late prehispanic era. These data then proved invaluable in her model of the organization of ceramic production.

Perhaps most importantly, studies of contemporary assemblages collectively suggest that there are cross-cultural regularities in the use-lives of particular functional classes of pottery, with cooking vessels being the most short-lived and ritual/feasting vessels being the longest lived, with the exception of vessels used in (ritual) alcohol consumption (see Hardin and Mills, 2000; also Deal, 1998, p. 92; DeBoer, 1985, Varien and Mills, 1997). Thus, even in the absence of regionally and historically specific data, archaeologists can use these observations to make reasonable assumptions about relative replacement rates, combining this general finding with the quantities of material recovered from specific sites or regions. This conclusion underscores how valuable the contribution of a comparative ethnoarchaeology could be to archaeology.

The paper by Kalentzidou (2000) demonstrates how political change can radically affect the demand for objects and the organization of production. In her case, the collapse of the Ottoman empire led to a change in the demand for certain kinds of wares. This political collapse also led to the collapse of the structured guild system (a form of more “attached” production), which had controlled production and distribution, and its replacement with a more “independent” form of production. The political changes cut artisans off from the urban elite, and the agricultural

peasants who became the potters' main consumers had little need for fine wares. Also, ethnic Greek potters were forced to relocate because of the complex political settlement of national boundaries. Kalentzidou's paper is important because it describes two different industries with two different types of products and different demands and demonstrates how changing conditions affect them differently. Kalentzidou reminds us that "cost" is not a meaningless factor. Cost affects demand, which affects what will be made. As she states in her paper, "Poverty . . . prompted them to buy the undecorated variety."

Principles and Mechanisms of Transfer

Exchange is a major focus of archaeological research and the organization of production cannot be fully expressed without a discussion of how products get from producers to consumers (Costin, in press; compare Pool, 1992). Indeed, "exchange" (or transfer) is an implicit part of all "specialization" because in "specialized" systems producer and consumer are not the same individual. Few ethnoarchaeological studies have addressed this relationship between production and exchange in any detail, but narrative discussions contain interesting and important observations that will affect interpretations. For example, several studies (e.g., Deal, 1998; Kramer, 1991; Longacre, 1991) indicate that even in situations where most/all households make their own pottery, significant quantities of pottery may circulate among members of a defined social group through gift-giving or ad hoc exchange. Thus, "potting" households are likely to have pottery made by others, and this form of circulation will surely affect assemblage variability and how the degree of variation within and among households is measured.

Neupert's paper in this issue also presents interesting issues regarding the effects of distribution mechanisms on the patterning visible in the pattern of distribution. Although his compositional data clearly reflect social groups at the locus of production, the products of both groups are transferred through the same networks—indeed the same shops and markets—to a single consuming population. As a result, he states, the "compositional signals" of these two production groups are largely eliminated. But this isn't really the case. The conclusion that there are several compositional sources for the pottery distributed through the major markets remains valid. What would appear archaeologically is that "all" consumers are served by "both" of these sources, which is, in fact, the case. Figure 2 schematically contrasts what household assemblages would look like under two different scenarios. In both hypothetical cases there are two production sources, but they have different distribution channels. What is needed from ethnoarchaeologists is further cross-cultural investigation to describe and model socioeconomic systems in which there is no unitary relationship between production "source" and market,

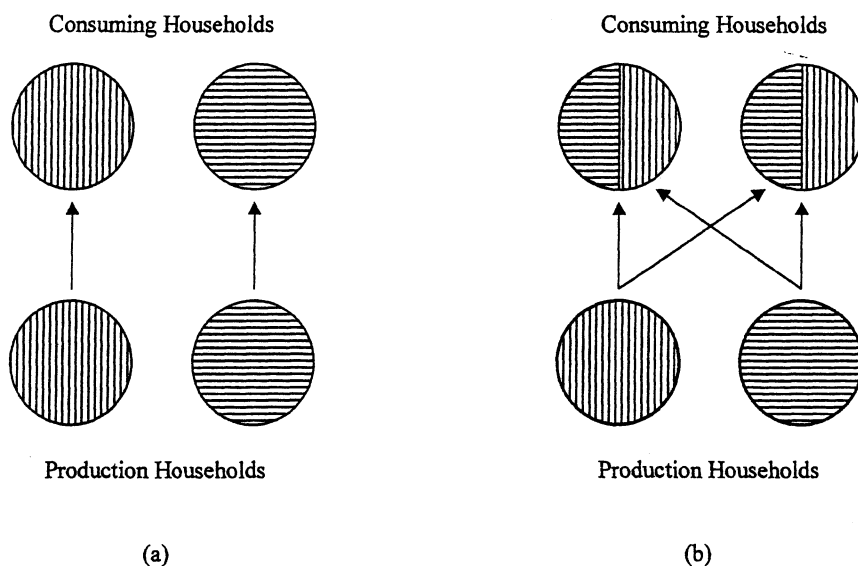


Fig. 2. Hypothetical results of chemical characterization from production locales and consuming communities with different distribution mechanisms: (a) Two production groups, each serving different consuming communities; (b) Two production groups, both serving both consuming communities. Note that in the later case, households will yield products of both production groups.

but rather broader regions including more than one distribution network are served more or less similarly by multiple production sources (see Feinman, 1985). A second way in which ethnoarchaeologists can make a contribution in this area is to investigate more loci of consumption—houses—in addition to production loci, because archaeological data are much more likely to be derived from the places where pottery was used, not made, so studies of production and distribution work “back” from loci of consumption.

SUMMARY AND CONCLUSIONS

Ethnoarchaeological studies have provided critical data for archaeologists interested in addressing a range of questions about ceramic production. This includes questions about the location of production, the choice of particular technologies, and the specific spatial and social organizing principles. And, as discussed in this paper, there is a great potential for ethnoarchaeologists to go further in their studies, to address specific methodological and theoretical issues that have come to the fore in recent archaeological studies of production.

As an archaeologist looking to ethnoarchaeology for models, methods, and inspiration in my studies of craft production, several general issues come to the forefront. First, in building general models for the organization of production, it is

advisable to look across an array of crafts, rather than building from a single object category, such as ceramics. Similar points have been raised by others, notably Hodder (1991) and DeBoer (1991). Interestingly, almost all the ethnoarchaeological studies of craft production deal with *ceramic* production, which tends to reinforce this tendency in archaeological studies to build general models of production for all crafts based on ceramics. Although this journal issue deals specifically with ceramics, I would encourage more ethnoarchaeological studies of the full array of crafts, including baskets, textiles, beads, wood, and stone.

Second, as Arnold (1998) has pointed out, we don't want to simply make the past look like the present. Not all the activities or modes of organization operating in the past are represented in the ethnographic present, and vice versa. Things change!! For example, the papers in this issue by Longacre, Kalentzidou, and Hardin and Mills all demonstrate how demand, for example, affects production and the wares produced. And demand has changed from the archaeological past to the ethnoarchaeological present. Once elites demanded fine luxury wares; now tourists demand *tshotchkes* to take to folks back home. Potters today do not characteristically produce the same range of wares for the same range of uses or users they did in the past. Technology changes, transportation changes. These are just some of the reasons why many archaeological reconstructions of craft production only faintly resemble the observations of organization that ethnographers make. Thus, as anthropological *archaeologists*, it is imperative to use judgement of the context to know when our ethnographic analogies will be appropriate and applicable and recognize when a specific case in the past is quite different from anything in the present.

For ethnoarchaeology to be used as more than a collection of anecdotes or as a source of hypotheses to be tested, there must be more explicit mechanisms to link present and past material patterns and behaviors (compare Arnold, 1998). Many of these studies reported in this issue do open our minds and eyes to the realm of possibilities and implicitly provide hypotheses to be tested. I encourage all ethnoarchaeologists to detail their relevance and applicability to studies of the past and to suggest means for actually evaluating archaeological data.

When ethnoarchaeological studies themselves take a comparative approach, comparing and contrasting the material correlates of two or more different organizational systems, they will provide interpretive data that are of the greatest use to scientific archaeology. I encourage large scale comparative studies where data are taken from many cases and more general patterns and systematic variation are identified.

Ethnoarchaeology is "good to think." Reading this literature keeps archaeologists from thinking too simplistically. My advice to archaeologists is to read ethnoarchaeology in the way we have always read ethnography: as a source for analogies and for a finer background appreciation for technological processes, organization, and social context. As intended, ethnoarchaeology is preferable to standard ethnography in many ways, because the former incorporates a more material

perspective and some of the more rigorous data collection techniques of scientific archaeology.

Archaeologists and ethnoarchaeologists can also read more broadly in the ethnography of the arts, far beyond those works labeled "ethnoarchaeology." These studies deal with a much broader array of goods and contexts than those typically chosen by ethnoarchaeologists. These studies are much more "anthropological" than they were a generation ago, and they increasingly deal with *change*. They also often deal with high status objects or ritual objects, a much broader range of goods than those at the core of many ethnoarchaeological studies. And finally, their emphasis on the use and meaning of material objects appropriately contextualizes the organization of production.

I remain heartened and inspired by the kinds of ethnoarchaeological work pursued today. What is needed is a even greater dialogue between field archaeologists and ethnoarchaeologists. In this paper, I have identified a number of areas and approaches to ethnoarchaeological data, which I suggest would improve my ability to identify and explain the organization of production in past societies. I encourage other archaeologists to give ethnoarchaeologists their own explicit suggestions for the data and contexts that need exploring. Ethnoarchaeologists can then better work with archaeologists to develop a collaborative research programme that is achievable. Both fields will be benefit from this type of dialogue.

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