

Social Dimensions of Technical Choice in Kalinga Ceramic Traditions

MIRIAM T. STARK

In the late nineteenth and early twentieth centuries material culture studies formed the foundation of cultural anthropological research in North America. Although museum anthropology is now subordinate to academic anthropology, material culture studies were a central force behind the establishment of major museum collections and the employment of anthropologists throughout North America until the middle of this century (Miller 1987:110-112; Pfaffenberger 1992; Wright 1996:81-85). This material culture focus in North American anthropology also shaped the development of early culture theory: culture areas, theories of style, and models of diffusion and migration were all conceptualized through a material culture lens. With the Boasian shift toward historical particularism, interest in material culture studies by cultural anthropologists waned. For many decades that followed, material culture studies were relegated to the research domains of "primitive" art and "primitive" technology (Conkey 1989; Miller 1987; Stark 1998).

In contrast, of course, archaeologists have maintained an active interest in material culture from the mid-nineteenth century to the present. The nature of our database has encouraged archaeologists to study material culture continuously since the inception of the discipline as a recognized profession. Archaeologists describe, illustrate, excavate, record, organize, and seriate material culture; little else unifies archaeological practice

today beyond our shared focus on physical, durable remains of the past. What is perhaps surprising is that archaeologists only began to develop comprehensive theoretical frameworks for understanding material culture in the last 20 years. Some approaches work from the bottom up, using case studies to illustrate principles of an emerging behavioral theory (e.g., Schiffer 1995; Schiffer and Skibo 1997). Others have worked from the top down, applying evolutionary theory to selected artifact classes (e.g., Neiman 1995; Teltser, ed. 1995). Until recently, however, material culture studies in anthropology have been dominated either by narrow discussions of style (e.g., Carr and Neitzel 1995a; Hegmon 1992) or by postmodern approaches (e.g., Dobres and Hoffman 1994; Hodder 1982b; Hodder, ed. 1989; Leone 1992; Shanks and Tilley 1987a; Tilley 1993).

The irony of this situation is not lost on most archaeologists: we all use material culture in our analyses, but most recent efforts to develop a comprehensive material culture theory in our field derive from a postmodernist school of thought. Most of us also agree that in traditional societies today and in the historic past people manipulate(d) material culture through social acts: goods are (and were) used to create cultural categories, to straddle social and cultural boundaries, and to construct social frames (Goodby 1998; Little 1992). The consequences of these individual acts often appear in aggre-

gate as material culture patterning, which is the primary domain of archaeological interpretation.

This narrow scope of material-culture theory in archaeology—which has been dominated recently by postmodern approaches—has alienated many archaeologists who might otherwise be interested in material-culture studies. One important exception to this pattern is found in studies of material culture and technology, an area of research that has grown as rapidly as new techniques are introduced into the field of archaeology. Great advances in archaeological science, in ethnoarchaeological studies of production, and in experimental archaeology have expanded the range of questions that we can ask of material culture. A great deal of ethnoarchaeological research in recent decades has also concentrated on issues germane to material-culture theory. Even there, however, a glaring problem remains: the sophistication of our analytic techniques outstrips the sophistication of our explanatory (or theoretical) frameworks.

The goal of this chapter is to discuss new approaches for understanding social boundaries in the archaeological record. Two questions structure the discussion. First, how are social boundaries reflected in material-culture patterning? Second, what is the nature of these boundaries in nonstate societies? I employ methods from two different schools of thought: one European and one North American. One approach, inspired by the French *techniques et culture* school, explores links among cognition, technical choice, and material culture patterning (see Cresswell 1990; Gosselain 1992a; Lemonnier 1986, 1992, 1993; Leroi-Gourhan 1993). Although initially focused on production sequences (see discussion in Sellet 1993), this approach has now been applied in studies of organizational dynamics in prestate and state societies from the Old World (e.g., Bernbeck 1995; Vidale et al. 1992). Related research has also been carried out recently in the United States as part of an “anthropology of technology” (see, for example, Pfaffenberger 1992) but largely in industrial settings.

A second, Americanist approach (e.g., Childs 1991; Lechtman 1977; Sackett 1985, 1986, 1990) examines formal variation as it is expressed in the goods of everyday life. One of the greatest contributions of this approach is that it challenges the style-function dichotomy that archaeologists commonly use to examine formal variability in artifacts. This analytical division of variability into style and function has its roots in the earliest publications of Lewis Binford (e.g., 1962, 1965). In this technology-oriented approach, which focuses on the production process, functional and stylistic considerations are intertwined. James Sackett introduced the term *isochrestic variation* (1985, 1986) to capture this different picture of variability, and Heather Lechtman’s (1977) notion of “technological style” seems closely related.

Despite active discussions of technology and culture in European circles, North Americanists have restricted most discussion of the subject to debates over the precise meanings of “isochrestic variation” (Sackett 1990) and “technological style” (Childs 1991; Lechtman 1977). Other archaeologists who study style ignore these approaches altogether. This is unfortunate because each perspective focuses on a type of variation that expands the scope of traditional conceptions of style in archaeology (Dietler and Herbich 1998; Hegmon 1992, 1998; Wiessner 1983; Wobst 1977, and this volume). Although these two technologically oriented approaches from opposite sides of the Atlantic seem complementary, little synthetic research has been done to date. This paper attempts such a synthesis.

SOCIAL BOUNDARIES, ETHNICITY, AND THE ARCHAEOLOGICAL RECORD

The identification of social groups has been a perennial concern throughout the history of archaeology. Archaeologists have identified groups in material-culture patterning from scales that range from household and sodality to ethnic group, regional system, and culture area. Not surprisingly, many archaeologists continue to equate stylistic boundaries with ethnic boundaries in their study of non-

state societies (MacEachern 1998). Group boundaries for these social units are generally identified using trait distributions of key artifact types, selected practices and customs that leave physical traces, and architectural traditions. Of course, many archaeologists now acknowledge problems inherent in equating "ethnic groups" with such distributional boundaries in nonstate societies (e.g., Cordell and Yannie 1991; Hodder 1979; Shennan 1989a). Neither the meaning of "ethnicity" as a social phenomenon nor the significance of stylistic variation as an archaeological pattern is adequately understood (Carr and Neitzel 1995a; Stark, ed. 1998; Terrell et al. 1997). Yet persistent questions related to long-term change in social process hinge on identifying such groups.

ETHNICITY IN CULTURAL ANTHROPOLOGY

The notion of ethnicity in cultural anthropology is problematic for those wishing to import theoretical frameworks into their interpretations of the archaeological record. Many anthropologists believe that ethnicity is situational, that ethnic boundaries are inescapably fluid, and that the relationship between ethnic and sociolinguistic boundaries is constantly in flux. Many cultural anthropologists now maintain that "ethnicity" is not a relevant framework for analysis: it is a product of ethnographic field strategies, of European contact, or of a theoretical obsession with finding tribal formations (e.g., Alonso 1994; Lewis 1991). In Asia and the Pacific, for example, some scholars muse that the idea of ethnicity is no more than "western ethnotheory" (Linnekin and Poyer 1990:10), with few referents in societies under study.

"ETHNICITY" IN ARCHAEOLOGY

Many cultural anthropologists tell us that our focus on ethnicity in the past is impractical and unfeasible. Yet many archaeologists believe that ethnicity structured ancient social identity, both in nonstate and state societies, but that we cannot identify ethnic boundaries in the archaeological record (e.g., Ferguson 1992; Hill 1989; Jones 1997; Shennan 1989a). Are we relying on flawed con-

ceptual frameworks when we seek ethnicity in the archaeological record? The answer to this question may be yes—and, perhaps, no. The search for ethnicity per se seems unproductive (if not tautological) for archaeologists who study nonstate societies. Yet efforts to understand patterns of cultural variation, and to identify and explore social boundaries in the material record, are not.

Despite myriad attempts, archaeologists continue to experience difficulties in developing an archaeology of ethnicity (Hodder 1979; Shennan 1989a). One reason, perhaps, lies in our general resistance to using terminology that is still associated with culture historians, terms such as *ethnic group*, *culture area*, and *migration*. The search for cultural difference is a legitimate (if difficult) task in nonstate societies, which commonly have rich traditions of cultural diversity and little evidence for formalized ethnic groups. In the archaeology of nonstate societies, analytical problems that center on two related issues plague this search for ethnic groups (and/or tribes). The first concerns how archaeologists identify these social units in the material record. The second issue concerns how we define relevant units of analysis in studying social formations among nonstate societies. Let us first examine some archaeological approaches to the study of social boundaries.

STYLE AND TECHNOLOGY IN THE ARCHAEOLOGICAL STUDY OF SOCIAL BOUNDARIES

Discussions that explore the types and functions of style in archaeology are numerous (e.g., Conkey and Hastorf 1990; Dietler and Herbich 1998; Hegmon 1992, 1998; Wobst, this volume). However, few discussions provide satisfactory definitions of key concepts such as stylistic and isochrestic variation or active and passive styles (e.g., Hegmon 1992:522–529; Sackett 1985, 1990; Wiessner 1985). Stylistic variability, a favorite topic of archaeological ceramicists, is a fickle signature of group membership. In traditional societies we see that stylistic expressions vary according to the media (e.g., ceramics, textiles, baskets, house walls) on

which stylistic information is inscribed, the level of antagonism and interaction between neighboring groups, economic conditions in a local area, and (perhaps) the sociopolitical structure of the society (Dietler and Herbich 1989, 1998; Hegmon 1992:527-528; Hodder 1979; Stark 1995). The relationship between style and social boundaries is highly contextualized (Hodder 1979; Lechtman 1977; Lemonnier 1986; Wiessner 1983), and which (if any) category of material culture marks these boundaries varies from one society to the next. Iconography that expresses aspects of social identity in certain situations may in other cases merge social boundaries to convey information about broader patterns of interregional interaction.

Stylistic studies in archaeology generally focus on active and consciously manipulated aspects of material-culture variability. Style thus has functions, a point made effectively by H. Martin Wobst (1977) in his "information-exchange" model. The approach used in the present study differs from the information-exchange model in its focus and theoretical framework and is inspired by work on an "anthropology of technology" (see Pfaffenberger 1992). In such an approach all goods (not simply those with decoration, as many inferred from Wobst [1977]) convey information about behavior. This technological patterning both embodies and generates meaning in different cultural traditions. Spatial discontinuities in technological traditions—which include but are broader than simply stylistic traditions—should reflect social boundaries in the material record.

Perhaps one reason it is so difficult to find "ethnicity" in the archaeological record of nonstate societies is that we are looking for the wrong kinds of social units. Examination of archaeological materials from these societies confirms the existence of differences in manufacturing techniques and reveals boundaries in distributional patterning. Adopting a technological approach to understanding material culture provides a more holistic perspective than do conventional stylistic frameworks used in archaeology. These goods, precisely because of their ver-

nacular qualities (see Conkey 1989:21), may be more indicative of some types of prehistoric social boundaries than goods that people consciously manipulate for conveying social information, the content of which the archaeologist can only approximate.

A TECHNOLOGICAL APPROACH

How do we go about identifying technological boundaries in the archaeological record? One way is through systematic analysis of how artisans make goods; we can do this by examining the steps involved in manufacture. The sum of these technical choices (embodied in production steps), following Heather Lechtman (1977), is called "technological style." Childs (1991:332) defines *technological style* as the "formal integration of the behaviors performed during the manufacture and use of material culture, which expresses social information." It represents the outcome of repetitive and mundane activities associated with everyday life; artisans often conceptualize technological style as "the way things are always done" (Wiessner 1984: 161, 195). Artisans make technical choices at most stages of the production sequence, from materials procurement to final decoration, and these choices constitute knowledge of a manufacturing tradition that is passed from one generation to the next (Gosselain 1992a, 1998; Lechtman 1977:15; Mahias 1993; Sackett 1986:268-269, 1990:33, 37). Technological styles thus represent the sum of the technical process: raw materials, sources of energy, tools, and scheduling (Lemonnier 1993:4; van der Leeuw 1993).

In this approach, then, formal variability in manufactured goods reflects a series of technical choices that are largely shaped by tradition and constrained by environmental factors. Disagreement exists among archaeologists regarding the relationship between style and intentionality in the manufacturing process. Some archaeologists contend that producers consciously use manufacturing methods to signal group identity (e.g., P. Arnold, this volume; Goodby 1998; Hodder 1982b; Hodder, ed. 1989; Wobst 1977, this volume). Others believe that much of this

social information is encoded unconsciously and that producers are largely unaware of the social signature that their goods bear (e.g., Leroi-Gourhan 1993; Sackett 1985, 1986, 1990). A growing literature on the relationship between human agency and technology reminds us of the complexity of this issue (e.g., Cresswell 1990; Pfaffenberger 1992; see discussion in Jones 1997:116–127).

Because all manufactured objects reflect technological styles, technological variation also characterizes objects laden with symbolic content. These include architecture, clothing, portable and mural art, body tattooing, and, of course, pottery. Understanding the technological styles of goods laden with iconographic complexity, however, is difficult. Let us take the case of decorated ceramics as one example (see also Costin, this volume). Differences in vessel function and value, the addition of production steps to the decorated pottery manufacturing process, and the implicit stylistic information that accompanies the production of decorated ceramics render their variation more enigmatic than are differences among the goods of everyday life.

Technological styles vary across media within a production community (DeBoer 1990; Hodder 1979). Commonly, technological style boundaries are isomorphic with community boundaries. Luo potters of Kenya, for example, employ a “sort of intuitive multi-variant analysis” in assigning pots to a particular technological tradition (Dietler and Herbich 1989:157). Attributes may include the color of fired clay, the shape of the rim, the general vessel shape, and morphological proportions (Gosselain 1992a: 572). Attributes that reflect technological styles are influenced by many factors, including technofunctional considerations, strategies of affiliation (Miller 1986), caste, and dietary preference. For example, the distribution of water jar shapes in Guatemala conforms to geographically discrete methods for carrying jars. These differences reflect distinct cultural values across regions regarding how women, who are the water jar carriers, comport themselves in public (Reina and Hill

1978:238–243). Vessels used to prepare ethnic specialty foods might also have characteristic vessel forms.

RELATED CONCEPTS IN CULTURAL ANTHROPOLOGY

This archaeological notion of technological style is closely related to notions introduced by cultural anthropologists. Foremost among these is Pierre Bourdieu (1977) and his concept of “habitus” (Dietler and Herbich 1998; Hegmon 1998; Miller 1987). Habitus consists of sets of learned behaviors that can be expressed, consciously or unconsciously, in material ways. Whether learned through formal education or through acculturation in daily life, habitus is reflected in the goods that people make. Parallels to the concept of technological style are also found in ethnological studies of Pacific societies. In his research in highland New Guinea, James Watson (1990) has also formulated a similar notion, which he calls “cultural diacritics.” These cultural diacritics “reflect familiarity, custom, habituation, and an acquired accommodation to the creatures, things, spirits, and...powers of a particular locale, aided by the instruction and the ritual and magical proclivities of parents and other elders of a community” (Watson 1990:38).

Some of these diacritics have material correlates, either as places or as goods that are essential elements in a particular culture. Habituation, familiarity, and repetition: these concepts inhere in notions of technological style, habitus, and cultural diacritics. The similarities found among these three discrete concepts suggest the possibility of synthesis in the development of material-culture theory. Whether one prefers to describe habitus, cultural diacritics, or technological style, each idea refers to conscious and unconscious elements of technical choices. Some of these choices are explicit; others are considered too trivial for comment.

All manufactured goods contain formal variability that reflects technical choices involved in the manufacturing process. However, studying meaningful patterns in such variability is easier with utilitarian goods

than with highly decorative items. Utilitarian goods may be more sensitive to cultural boundaries, which vary in their degree of closure (e.g., Hodder 1979, 1982b). Cross-cultural research suggests that social boundaries for fineware ceramics and other non-utilitarian commodities are often permeable because such goods circulate widely and, thus, reach a wide range of consumers (e.g., Larick 1987; Lyons 1987; Sterner 1989). Perhaps contrasting contexts of production and distribution account for scalar differences in how these categories mark boundaries: where artisans make goods for a consumer market, the goods may reveal more about the identity of their producers than about their consumers (Dietler and Herbich 1994).

Utilitarian goods for which technological style is most easily studied include ground-stone tools, chipped-stone tools (e.g., projectile points), and pottery (Chilton 1998a; Dean 1988; Goodby 1998; Sackett 1985; Stark 1995; Stark et al. 1995; Sterner 1989). Extensive recent research by ethnoarchaeologists (e.g., Kramer 1985; Longacre 1991) has shown that utilitarian pottery is a particularly sensitive medium. Vernacular architecture, the most complex and least portable of all artifacts, can be another sensitive indicator of social affiliation (e.g., Baker 1980; Baldwin 1987; Cameron 1998; Ferguson 1992; Stark et al. 1995).

STABILITY AND CHANGE IN TECHNOLOGICAL STYLES

Change in technological style occurs on different temporal and geographic scales than does iconological style. Whereas iconological style often exhibits extensive distributions (or horizons) in the archaeological record, technological styles commonly have restricted distributions that reflect local technical systems and their populations of human producers. Boundaries of these technical systems conform to local communities, an important and previously overlooked social scale of analysis for those who study iconological style. Two qualities of technological variability are thus important: (1) its inherent stability through time and (2) its po-

tential role in differentiating groups from one another in the archaeological record.

Ethnoarchaeological research has shown that technological styles are more resistant to change than are decorative aspects of material culture because change in technological style requires a change in the manufacturing process (Gosselain 1992a:582-583; Rice 1984:252; Wiessner 1985). Because technological styles tend to be conservative, they are ideal for studying social boundaries in the archaeological record. One example from the American Southwest illustrates this point. When Tohono O'odham potters were asked why they did not adopt flat bases for their cooking pots (which could then be used on modern stoves), "the universal answer was laughter, as if doing it any other way would be ludicrously unthinkable....[They] made convex-based pottery because that is the way their cultural dictates would have it" (Fontana et al. 1962:49).

Both the types of goods used (Welsch and Terrell 1991, 1998; Wiessner 1983) and variation in the styles of widely used goods may reflect social boundaries (Sackett 1986:270). Examination of a specific class of material culture provides clues regarding a particular technological style. Spatial variability should be evident, then, at two scales: in the technological style that shapes each artifact class and in the suite of technological styles that constitute a culture's technical system.

Although technological styles are generally stable, changes do occur within the bounds of a particular technological tradition. Producers may manipulate technological styles in conscious attempts to instigate change, or external forces may compel them to change aspects of their manufacturing technology (Childs 1991:337; Roe 1980; Stark and Longacre 1993). Understanding differences in manufacturing techniques offers a means to reconstruct the technical choices made during the manufacturing process. Factors that affect vessel forms in each functional category are many and include socioeconomic considerations and also individual idiosyncrasies. Changing subsistence strategies and the subsequent demand

for different functional categories, demographic changes that lead to the establishment of aggregated communities with many mouths to feed, and changing patterns of social interaction and social integration may affect the forms that potters produce. These factors (as well as others) influence the forms of variation that are expressed as a technological style.

Change in technological style may be rapid or gradual. Unique technological styles develop and change in response to local influences on technical choices by individuals or groups. Individual expressions of technological style may change when potters are adopted (Lathrap 1983), married (Miller 1985), or even abducted (DeBoer 1986) into new communities. Groups may change in response to colonization (Ferguson 1992:38-41) or in response to consumer demand for new products (Annis 1985; Glick 1977; Hallifax 1894:40; Mossman and Selsor 1988:221). When change occurs in response to external pressures, the nature of this external influence determines the tempo of change.

EXAMINING TECHNOLOGICAL STYLE IN ARCHAEOLOGICAL CERAMICS

THE OPERATIONAL SEQUENCE

Cross-cultural research on technology helps bridge the analytic gap between ethnoarchaeological and archaeological ceramic studies. For various reasons ceramic manufacturing traditions have been studied more extensively than other categories of material culture. The "operational sequence" or *chaîne opératoire* (Lemonnier 1986) of ceramic manufacture involves multiple technical steps, each of which poses problems that artisans can resolve in many ways (Gosselain 1992a, 1998; Leroi-Gourhan 1993; Mahias 1993:165; van der Leeuw 1993:243). As noted previously, this arbitrariness in some technological steps generates variability in material culture patterning.

Previous approaches have examined the operational sequence to compare production complexity across different ceramic traditions (Feinman et al. 1981; Hagstrum 1988). Production steps structure the ceramic man-

ufacturing sequence from materials procurement onward, and many steps are sensitive to local variations in how goods are made. Parameters of this technical variability can be compared by examining operational sequences among technological traditions. The task is to identify steps in the operational sequence of ceramic manufacture and then to evaluate which of these steps display variability that is visible on archaeological ceramics.

The ceramic manufacturing sequence for hand-built technologies is divided into seven tasks, which are summarized in Table 3.1 (Rice 1987; Rye 1981). Materials procurement and preparation are the first two tasks. The third and fourth tasks are forming processes: vessels are shaped using primary forming techniques, and vessel proportions are refined using secondary forming techniques (Rye 1981:62). The fifth task, the decorative forming process, modifies the vessel's surface, often through changes in texture. Drying and firing processes, included in the sixth task, affect shrinkage rates (and susceptibility to cracking), as well as relative vessel strength and hardness. Postfiring techniques, such as smudging, are the final steps in the manufacturing sequence.

FACTORS THAT AFFECT TECHNICAL CHOICES IN CERAMIC MANUFACTURE

Because production technologies often involve compound manufacturing techniques (Rice 1987:124; Rye 1981), potters may use multiple production steps in some tasks, such as materials procurement, forming, and decoration. Some of these steps are more sensitive to the local manufacturing idiom than are others (Table 3.1). Factors that influence the potter's decision-making process are complex, and ceramic ecological studies (e.g., Arnold 1985) tend to privilege ecological and functional considerations over the influence of local manufacturing traditions. Ecological factors include the nature and accessibility of raw materials, climatic regime, and the intended vessel function. However, the relationship between these functional/environmental considerations and the local

SOCIAL DIMENSIONS OF TECHNICAL CHOICE

TABLE 3.1.
Steps in the Operational Sequence of Hand-built Utilitarian Ceramic Manufacture

Operational Task	Production Step	Determinants in Relative Order of Importance
Materials procurement	Collection of raw materials (clay, temper, slips, paints, glaze)	Local environment, local manufacturing tradition
Materials preparation	Crushing (clay, temper, or both)	Materials, local environment
	Cleaning (clay) and/or size sorting (temper)	Materials, local environment
	Blending (clay and temper)	Materials, local environment, local manufacturing tradition
	Kneading (combination of clays or clay and temper mixture)	Materials, local environment, local manufacturing tradition
Primary forming techniques	Pinching and drawing	Materials, local manufacturing tradition
	Coiling	Materials, local manufacturing tradition
Secondary forming techniques	Beating/Paddling	Materials, local manufacturing tradition
	Scraping	Materials, local manufacturing tradition
Decorative forming techniques	Smoothing—polishing	Local manufacturing tradition, materials
	Slipping	Local manufacturing tradition, environment
	Texturing (includes corrugation and incising)	Local manufacturing tradition
	Painting or glazing	Local manufacturing tradition, materials
Drying and firing	Creation of fire clouds	Local manufacturing tradition
	Use of reducing atmosphere	Local manufacturing tradition, environment
Postfiring treatments	Smudging	Local manufacturing tradition, materials, environment

manufacturing traditions is complex and understudied.

In some cases the range of locally available resources largely determines the procurement of ceramic production materials among sedentary groups, whereas other factors, such as local manufacturing tradition and social considerations, may be secondary determinants (see Arnold, this volume; Mahias 1993). Exceptions to this generalization include societies that rely on water transport and those that use pack animals for transport. Likewise, drying and firing decisions are affected by climate and available fuels (Arnold 1985). In each case environmental factors play an important role in constraining the technological choices that producers make.

Production steps in other parts of the manufacturing sequence have more freedom to vary. There is a certain element of arbitrariness in how the potter selects among several equivalent technical choices during the manufacturing sequence (Table 3.2). Clearly, production steps reflect a combination of local tradition and environmentally constrained considerations. For example, postfiring treatments to decrease permeability in vessels might be restricted to certain types of clays found in a narrow range of ecological zones (especially the tropics). As another example, raw materials used for hand-built pottery are often inappropriate for making wheel-thrown pottery. Yet the decision to use certain types of hand-building techniques—and the resistance that producers show toward

TABLE 3.2.
Technical Variation in Utilitarian Ceramic Manufacture:
Some Examples of Production Steps and Vessel Attributes

Operational Task	Production Step	Vessel Attribute
Primary and secondary forming techniques	Coiling and scraping Beating/paddling	Temper orientation Vessel form Rim shape Angle of eversion
Decorative forming techniques	Smoothing/burnishing Texturing	Degree of luster Corrugation Corrugation with obliteration
Postfiring techniques	Smudging Application of organic materials	Blackened surface

adopting alternative techniques—reflects the idiomatic nature of forming techniques.

A wide range of decorative forming techniques also reflects technological styles. Although surface treatments such as painting and glazing are generally considered decorative, other forms of surface treatment are also informative. Smoothing—particularly when it involves lustrous burnishing—and texturing are two examples of decorative forming techniques. One of the most common types of texturing in the prehistoric Southwest, for example, is corrugation, but other types, such as carving, incising, stamping, rouletting, and sprigging, are used worldwide (Rice 1987:140–141; Rye 1981:90–92). Additive techniques, such as appliqué or inlay (Rice 1987:148), also distinguish various ceramic technological traditions from each other.

MATERIAL PATTERNING AND TECHNOLOGICAL STYLE

The collective material outcome of these production steps throughout the operational sequence constitutes a technological style. Which production steps are most free from constraints imposed by the local environment, including raw material composition? Ethnographic case studies (DeBoer 1990; Dietler and Herbich 1989; Gosselain 1992a; Reina and Hill 1978; van der Leeuw 1993) suggest that particular vessel forms within a functional class of pottery may be hallmarks of a technological style. Vessel forms also

reflect mechanical agencies, ideographic requirements, and aesthetic forces (Holmes 1903:61). The use of specific decorative forming techniques, such as corrugation, might also provide technological markers. Technological styles, rather than ceramic subvarieties, may become evident when we view ceramics as combinations of technological attributes rather than simply as types (see also Wobst, this volume).

Can researchers identify ceramic attributes in archaeological assemblages that reflect these production steps in a consistent fashion? Measurement of such attributes should entail low-cost but accurate techniques to ensure that variability is examined across large samples. Table 3.2 lists some relevant production steps and potential material correlates for the analysis of utilitarian ceramics in archaeological contexts. What remains unclear is how well these attributes can be used to identify technological styles in traditional societies. Technological traditions among the Kalinga of the northern Philippines provide a case study in which social and material boundaries can be compared. In the ethnoarchaeological case study reported here, patterns of social affiliation are reflected in utilitarian ceramic traditions of neighboring Kalinga communities.

BACKGROUND TO THE KALINGA AREA

Nearly one million people live in small villages (and an occasional town) in the Philippine Cordilleras, which is the highest moun-

tain range on the island of Luzon (Figure 3.1). This area consists of rugged mountain valleys with steep slopes that Cordillera populations use for terraced irrigation agriculture. The absence of paved roads in much of this region limits contact among areas, and lingering intertribal animosity (which formerly involved headhunting) hampers efforts to establish stronger communication networks. The Cordillera Central (approximately 20,000 km² in area) houses a diverse population that has remained culturally and socially distinct from the surrounding lowlands. Lowlanders and colonial administrators in the last three centuries have subsumed all highland peoples under the single (previously pejorative) label of *Igorot* (for history of the term, see Scott 1969:154-172).

ETHNICITY AND SOCIAL BOUNDARIES IN THE CORDILLERAS

For decades ethnographers and historians have commented on similarities among various groups who occupy the Philippine highlands. The integrity of these groups is reflected in the fact that less than 10 percent of Cordillera residents today are Ilocano immigrants from the lowlands (De Raedt 1991: 355). Cordillera populations have a long tradition of resisting outside influence. From the sixteenth through nineteenth centuries all highland groups were formidable opponents to the Spanish colonial administration (Scott 1977). Not until the 1880s, after the introduction of the bolt-action repeating rifle, did the Spaniards establish permanent garrisons in the area (Scott 1977: 274). Lowland travelers in the Cordillera Mountains were thus not guaranteed protection until the very end of the Spanish colonial period. Efforts to incorporate the Igorot populations into the domain of American colonial administration relied on traditional economic and social institutions, and the Americans encouraged Philippine highlanders to participate in this development (Magannon 1984:254; Wilson 1956).

Great cultural diversity also characterizes this aggregate of separate linguistic groups. The region houses seven major ethnolinguis-

tic groups (Ifugao, Kalinga, Tingguian, Isneg, Bontok, Kankaney, and Ibaloy), each of which speaks a distinctive language. The area also contains many minor language groups and closely related local dialects (Reid 1994). Major differences exist in economic strategies (e.g., shifting cultivation, wet-rice farming, commercial vegetable cropping), as they do in social structures and settlement patterns. By the eighteenth century, Spanish accounts identified subareas of the Cordilleras by their settlement names rather than by ethnonyms (Keesing 1962: 224, 234; Scott 1969:161-162); this pattern hardly changed for 200 years.

Cordillerans were known first in a generic sense as "Igorottes" or "Igorots" (by the Spanish) and then as "Non-Christian Tribes" (by the Americans). American administrator Dean Worcester divided the Cordilleras into seven tribal groups using ethnolinguistic boundaries when the Philippines came under American colonial control (Scott 1969:165-166; Worcester 1906). This administrative policy of assigning ethnonyms where none had existed previously was common throughout colonial Southeast Asia (Anderson 1991: 163-178; Hutterer 1991). Ironically, these political subdivisions contributed to a new "tribal" consciousness among Cordillerans by the 1930s (e.g., Keesing and Keesing 1934:130) that was absent before the twentieth century. These groupings were problematic and ill founded (Lewis 1991:616-617); even provincial names used by the American administration lacked indigenous referents (Scott 1969:157-165).

Recognized recently as "cultural minorities," many Cordillerans actively maintain their highland traditions and beliefs. With this maintenance comes a sort of pan-Cordilleran solidarity, and recent incursions by the Philippine government and by zealous clergy have strengthened this sentiment (De Raedt 1991:356; Drucker 1977; Rood 1991). However, notions of pan-Cordilleran identity, and of coherent ethnic boundaries among the five provinces in this mountain chain, remain vague (Lewis 1991:618-619; Rood 1991).

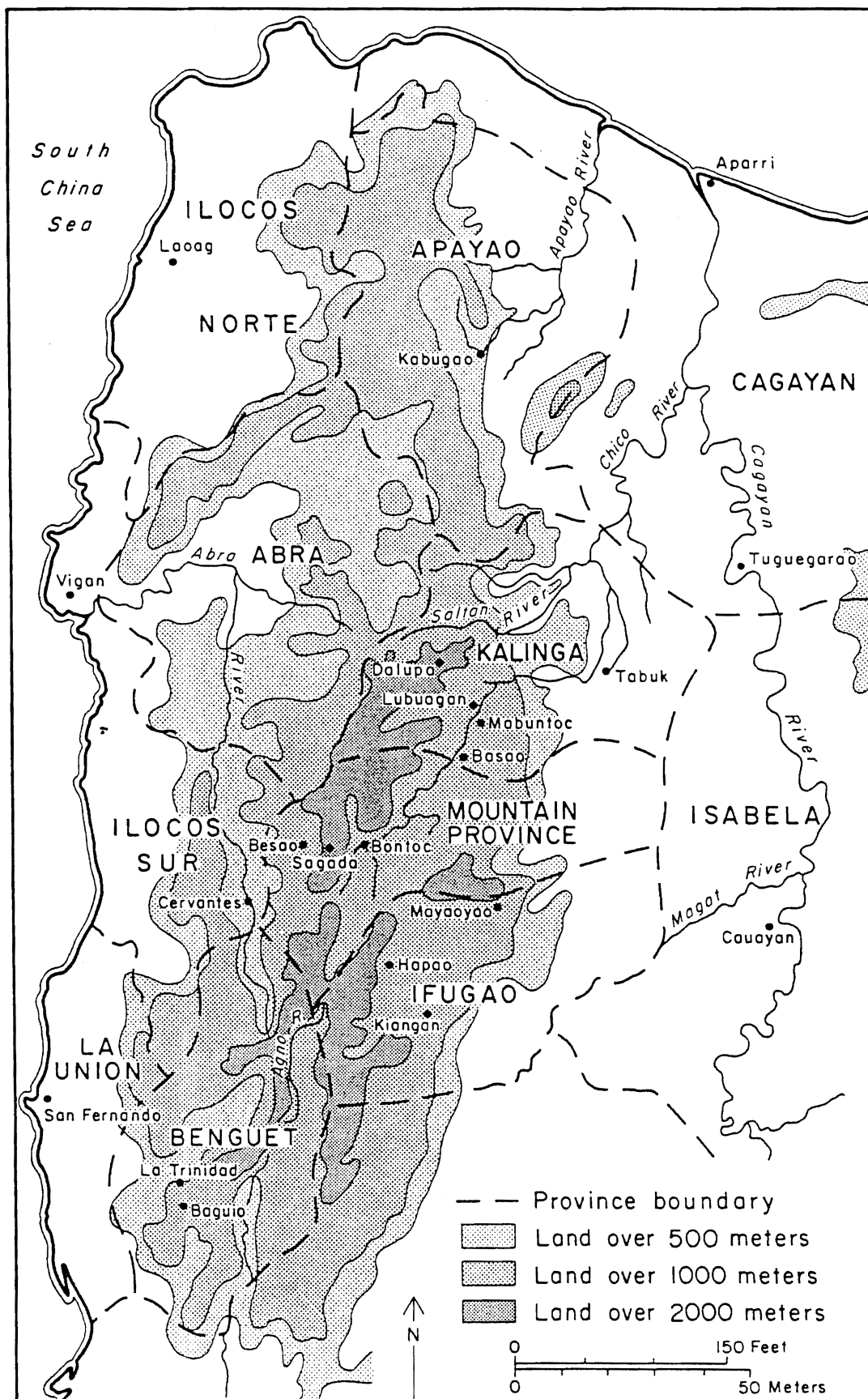


Figure 3.1. The Philippine highlands (northern Luzon).

Although ethnic boundaries are fuzzy in and across Cordilleran provinces, social boundaries are remarkably distinct at the local and regional levels; even more remarkable is the tenacity of Cordillerans within these boundaries throughout the twentieth century. The history of tribal wars and subsequent peace pacts among villages is kept alive by elders of each village and extends back several generations (e.g., Dozier 1966:Appendix IV). Until recently, Kalingas reckoned identity at multiple levels, from the household and village to the drainage system (see Jenks 1905:65; Kroeber 1943:68; Lewis [1991:618] describes a Kankaney-speaking area of the Cordilleras). This pattern, in which social characterization focused on the settlement and community rather than on a larger grouping that anthropologists often associate with ethnicity, was common throughout the Cordilleras (Hutterer 1991:21).

Even 60 years ago the Kalingas used more localized group names to describe populations living in separate drainage systems (Dozier 1966:240; Keesing 1962:221-224). Of the Kalinga, Kroeber observed differences in custom and idiom from one river valley to the next (Kroeber 1943:68). Fortunately for ethnoarchaeologists, these earlier ethnologists established a precedent for studying social boundaries with respect to earthenware pottery. They observed that "a great diversity in the pattern of such material objects exists, and even in the same culture area there are all kinds of minor variations between the work of different communities and family craftworkers, over which they have a kind of tacitly recognized patent right" (Keesing and Keesing 1934:202).

Kalinga communities continue to engage in community-based craft specialization in a variety of goods, from manufactured crafts to forest resources (Stark 1991). Complex trading relationships link individuals and communities to one another within regional networks in contiguous river valleys (Stark 1994). Many items circulate through this elaborate exchange network, which we can divide grossly into two spheres. The prestige-goods exchange sphere involves water buffalo, heirloom porcelain, and gold jewelry;

these goods are costly, move vast distances, and carry with them symbolic and social status (e.g., Takaki 1977). The utilitarian-goods exchange sphere involves pottery, baskets, raw materials, and foodstuffs; these goods circulate in limited distribution networks and (although essential) lack the cachet associated with prestige goods (Stark 1993a). Utilitarian goods also have either short use lives or low visibility: foodstuffs are quickly consumed, and pots and baskets obtained through trade rarely stray far from their consumers' homes (see Sterner 1989 for an African parallel on pottery).

My research during the 1980s confirmed that regional traditions observed by the Keesings six decades earlier are still alive and well. From one river valley to the next, utilitarian goods are sensitive to local social boundaries; one reason for this, perhaps, lies in their restricted circulation networks. Do such boundaries reflect Bourdieu's (1977) *habitus* and Watson's (1990) cultural diacritics? To what extent are these consciously maintained boundaries? Although differences in regional traditions may appear subtle to the archaeologist, producers and consumers of these goods clearly recognize technical differences in their goods. In fact, neighboring groups are generally well aware of each other's technological practices and occasionally copy neighboring traditions. Terms such as *habitus*, *cultural diacritics*, and *technological style* begin to converge when we examine spatial patterning of this technological variability in southern Kalinga.

KALINGA SOCIAL BOUNDARIES AND MATERIAL CULTURE PATTERNING

This research focuses on Kalinga communities in the southern portion of Kalinga province (e.g., Stark 1991, 1993a, 1994; Stark and Longacre 1993). The most important social unit in Kalinga is what Dozier (1966:65-70) called the kinship circle or kindred, which consists of a bilateral grouping of family. A broader effective social unit in Kalinga is a multisettlement, an autonomous territorial unit or region (following Takaki

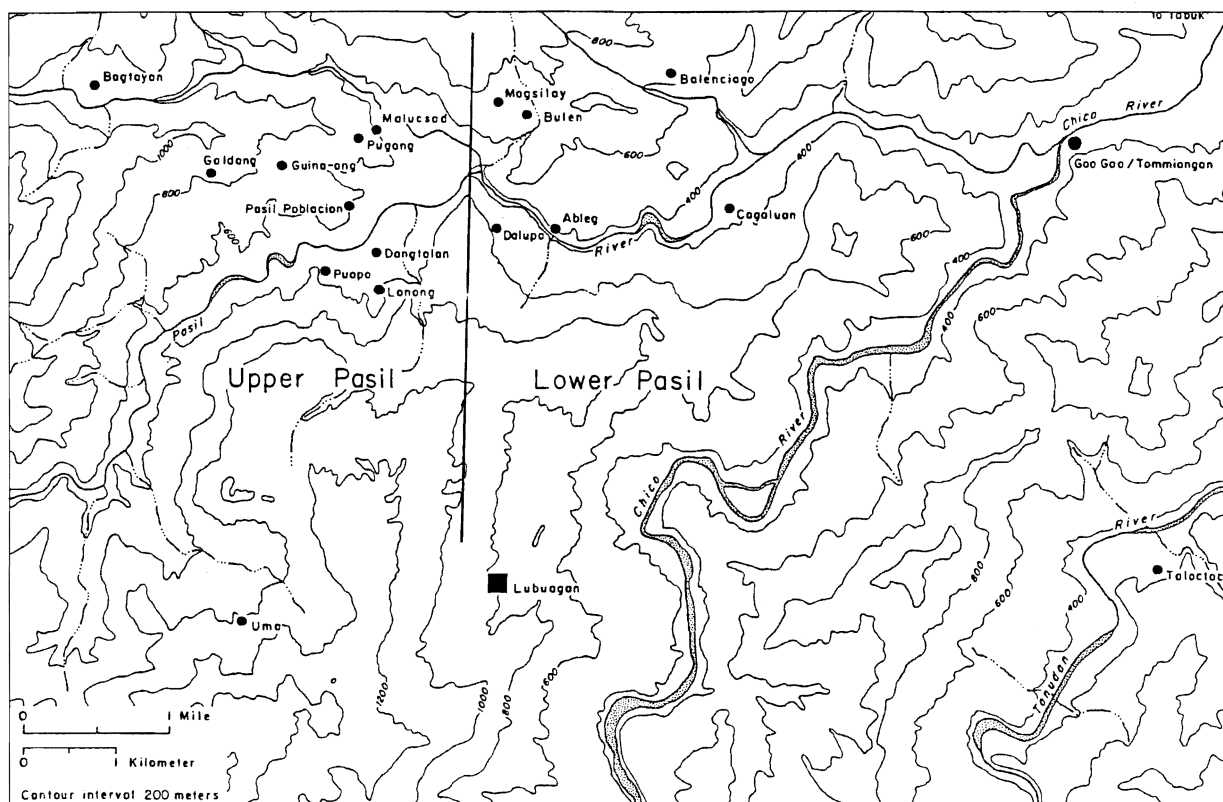


Figure 3.2. Upper Pasil vs. Lower Pasil.

1977) that consists of one or more villages and satellite settlements. Languages throughout the northern Philippines, including the Kalinga dialect, share the same term, *ili*, for this concept of community (also see Reid 1972). The Kalinga *ili* involves one or several settlements and local groups of kinsmen rather than simply a localized kin group and was traditionally endogamous (Dozier 1966: 66–70). Kalingas equate each *ili* (or local system) with a collection of extended kin groups that must bond together for protection against enemies.

Webs of social relations, such as marriage, tie each local system to some of its neighbors in a broader social network. Today local systems are laced together at a broader level into a web of obligation, custom, and familiarity that crosscuts kin ties. Contemporary tribal warfare commonly involves two warring local systems from different river valleys, and neighbors to each adversary join in the conflict as tensions mount through time. Kalingas maintain a complicated system of peace

pacts, inherited from one generation to the next, to minimize and resolve intergroup conflict (Bacdayan 1967; Barton 1949; Dozier 1966).

In the Pasil municipality (where I conducted my research) the river's settlement system is split into two roughly equal parts: Lower Pasil and Upper Pasil (Figure 3.2). Social and economic interactions are more intense within each of these sections than between them, as was clear from the voting patterns for municipal offices during 1988. Residents of Lower Pasil tended to vote as a bloc for Lower Pasil candidates, whereas residents of Upper Pasil voted for candidates from their section of the drainage system. In Kalinga, then, affiliation is reckoned at the kindred level, the village level, and then at the level of the interaction network. Although people in the study area occasionally called themselves *I-Pasil* (or members of the Pasil system), their primary allegiance is to their kindred and local systems.

Pasil residents are not alone in reckoning

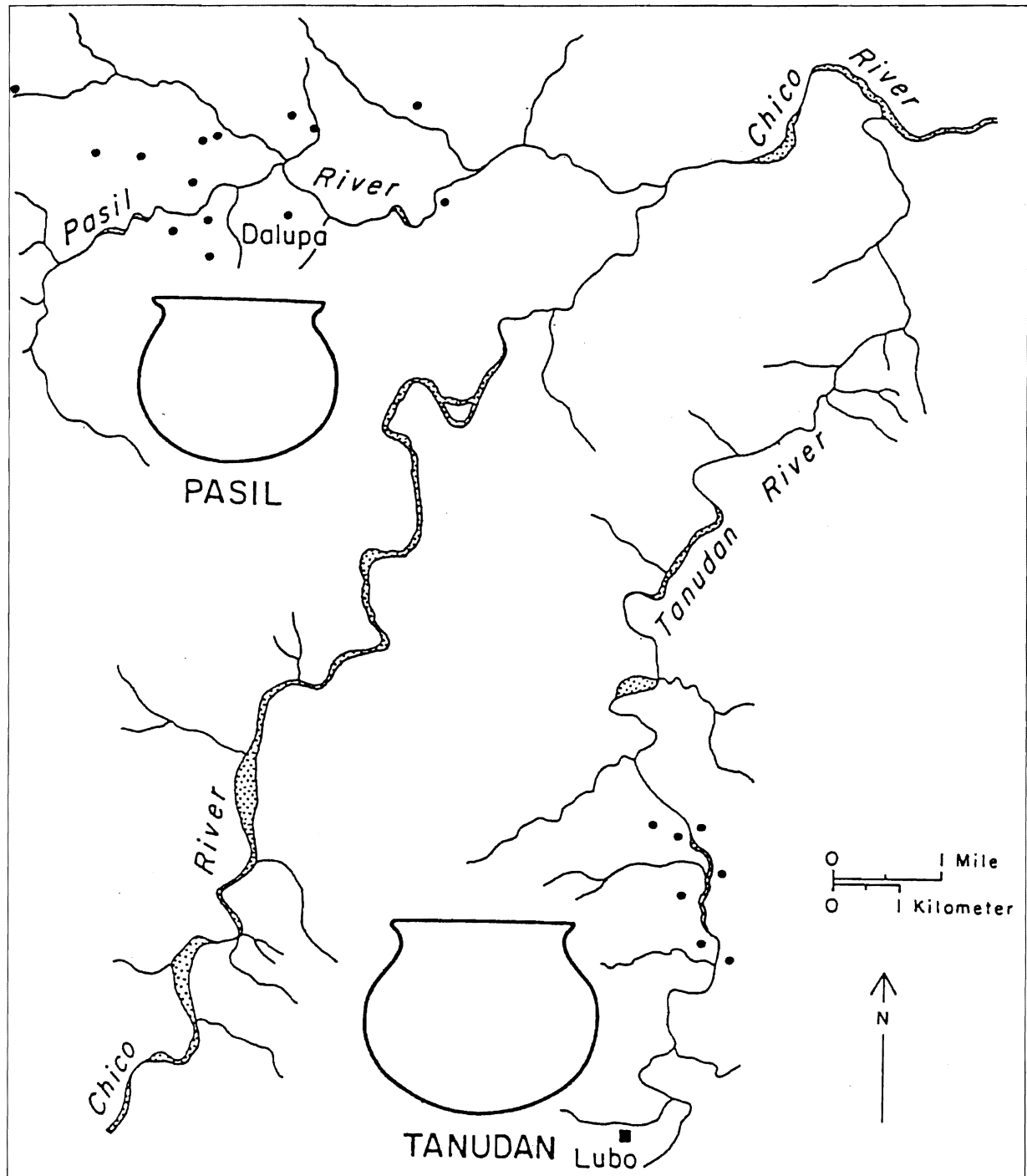


Figure 3.3. Variation in water jar profiles from neighboring river valleys in southern Kalinga.

their social affiliation to their drainage system; this is clear not only from daily behavior and interactions but also from Kalinga material culture. In several river valleys of southern Kalinga (Figure 3.3), the distribution of one technological style, utilitarian ceramics, largely corresponds with differences in regional economic networks. Kalingas interact

socially and economically with other members of their regional system; members of local systems throughout the region attend celebrations and funerals for others in the general area. Marriages tie together kindred from different local systems, and a continuous stream of exchange transactions (e.g., gift giving, barter) reinforce these intercom-

munity links. Most individuals in each regional network share a similar accent and use colloquialisms that may not be understood outside their area. They joke about differences in dialect and custom that distinguish neighboring networks from their own.

Regional boundaries today correspond roughly to externally imposed municipal boundaries. Within each regional network is at least one pottery-making village, which supplies the needs of most consumers (Stark 1994); consumers on each system's periphery are an exception because they may sample products from multiple systems. The products of each network exhibit the "tacitly recognized patent right" (Keesing and Keesing 1934:202) that the Keesings noted half a century before in the region. These are subtle differences that characterize the technological styles of goods made by potters from different villages in the same network (e.g., Graves 1985, 1994; Stark 1993a). Most potters know, and manipulate, these differences through the manufacturing process.

THE OPERATIONAL SEQUENCE OF KALINGA POTTERY MANUFACTURE

Let us turn to the earthenware pottery of the Pasil River valley. It is simply decorated with incised patterns; traditional Pasil cooking pots lack appliqué decorations, appendages, elaborate vessel forms, or elaborate painted designs. This valley contains two pottery-making communities: Dalupa and Dangtalan (see Longacre 1981, 1991). Cooking pots and water-storage containers are made in each village. Construction steps in the manufacturing process are similar in these two villages and involve a combination of paddle-and-anvil and coil-and-scrape techniques. The potter first shapes a lump of clay into a cylinder. To form the vessel the potter pulls the clay away from the cylinder's center to begin the building process. She then adds a series of coils to the vessel, and when it reaches a sufficient height, she scrapes it smooth using a piece of bamboo. The neck and rim are shaped using a wet cloth to produce an everted rim. The potter sets the vessel out to dry; when the clay is leather hard, she scrapes

excess clay from the vessel's interior, paddles the base into a globular shape, and applies ocher. She incises a simple decoration around the vessel's neck, which ranges from one to three bands in width (Graves 1985).

Dalupa and Dangtalan potters use different techniques to paint and water-seal their vessels. For cooking pots Dalupa potters use ocher around the perimeter of the exterior and interior surfaces of the vessel's lip (Stark 1991). Dangtalan potters decorate their cooking pots with ocher around the perimeter of the exterior and interior surfaces of the vessel's lip in combination with a band of red immediately below the neck (Longacre 1991). Dalupa potters decorate the exterior surfaces of their water storage jars with elaborate ocher designs and only coat the interior surface with resin (Stark 1991). Dangtalan potters cover their water jars' exterior surface with ocher first and then with resin. Both Dalupa and Dangtalan vessels are dried and fired in an open setting for no longer than an hour (also see Aronson et al. 1994).

Although Dalupa and Dangtalan pots are similar in general morphology (Graves 1994:158), their basic dimensions are significantly different (Stark 1993a). Dalupa pots are taller and lighter than Dangtalan pots. Producers and consumers alike recognize these differences, and Pasil consumers occasionally express preferences for products of one village based on these morphological differences (Aronson et al. 1994). Slightly different technological traditions thus characterize Dalupa and Dangtalan (Graves 1985, 1994; Stark 1993a), differences which might be described simply as stylistic (e.g., Longacre 1991) in form. However, each requires different manufacturing technologies to obtain the end products.

Kalinga potters peddle most of their pots in consumer villages that they can reach by foot, and most of their bartering destinations are found within a day's journey. As recently as the 1970s Dangtalan supplied several Pasil villages with most of their utilitarian pottery (Graves 1991). Since the mid-1980s Dalupa has become the ceramic production center in the Pasil economic network (Stark 1993a,

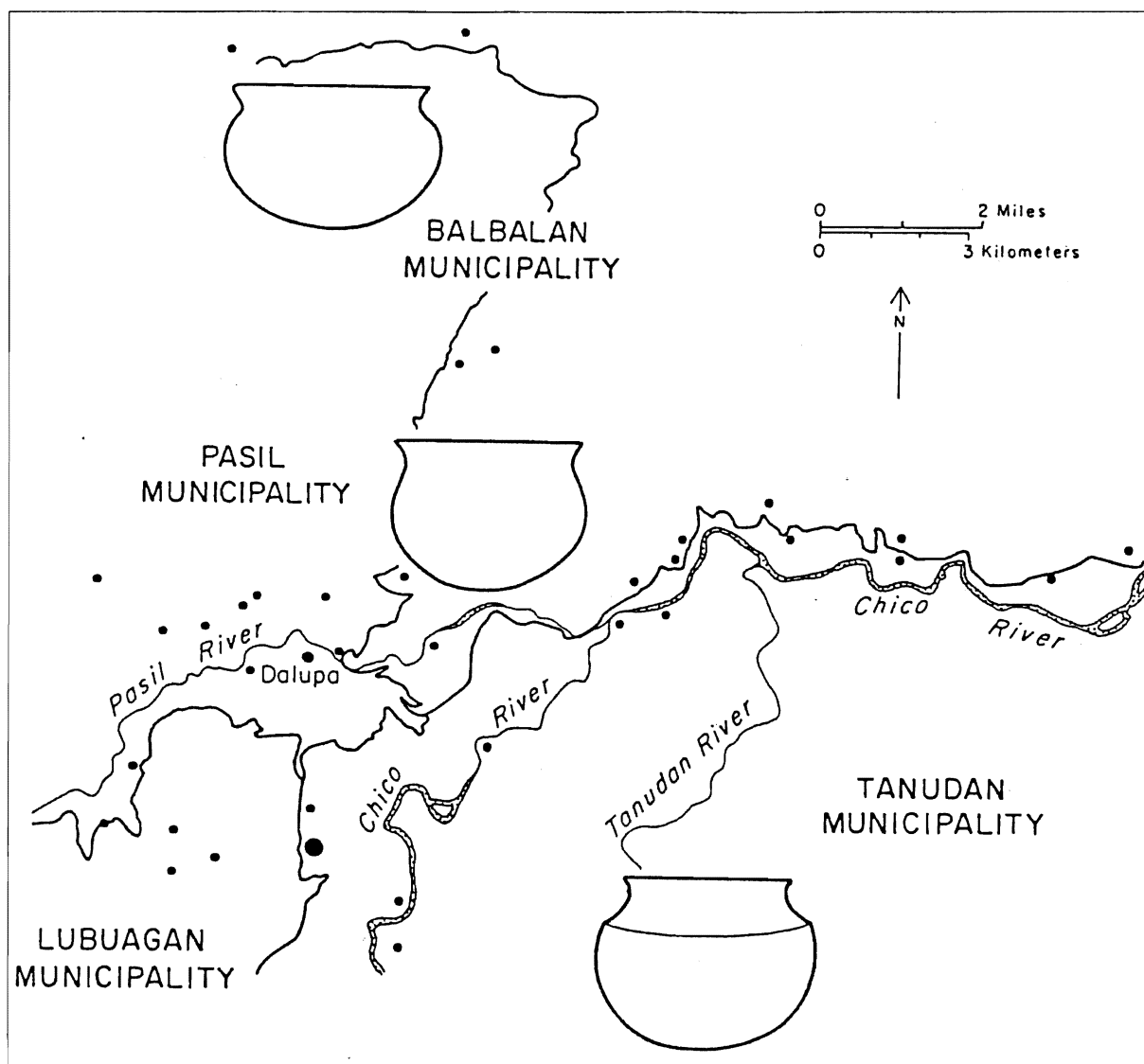


Figure 3.4. Vessel profiles of cooking pots from three different river valleys (municipalities) in southern Kalinga.

1994). Dalupa potters today peddle their wares by foot and by truck and often travel beyond the boundaries of their own municipality to seek customers for their goods.

FACTORS THAT AFFECT TECHNOLOGICAL TRADITIONS AND THE ISSUE OF TECHNOLOGICAL CHANGE

When we expand this technological perspective beyond Pasil to encompass river valleys across the southern portion of Kalinga, patterned differences in vessel form become even clearer. Variation in ceramic morphology in cooking pots and water jars is isomorphic with variation in subdialect and politi-

cal affiliation. We can see this clearly by examining cooking vessels from two neighboring drainage systems: the Pasil River valley and the Balbalan municipality. To producers and consumers from each network the differences are sufficiently distinct to be discussed and debated among consumers. Potters from some areas occasionally emulate the traditions of potters in neighboring regions but always revert to the technological style that characterizes their own area.

Potters from one regional economic network occasionally bring their goods on visits to settlements in other regional networks. Most consumers recognize the technological

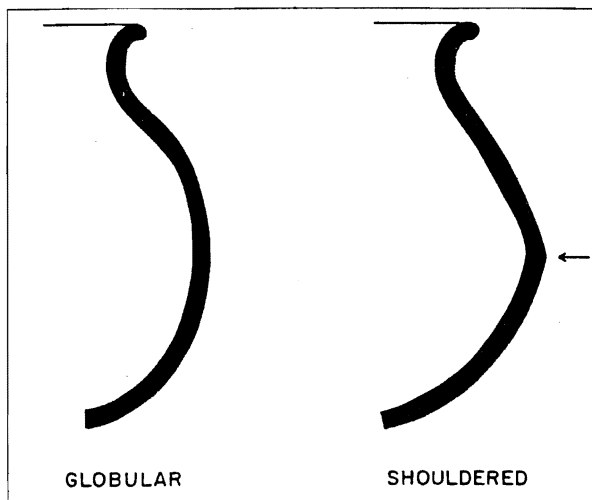


Figure 3.5. Vessel profile of Binontoc style shoulder that some Dalupa potters adopted.

styles of pottery from neighboring networks (Figure 3.4). Profiles shown here from three Kalinga river valleys illustrate morphological differences in cooking pots that reflect distinct shaping techniques. Balbalan pots are more squat than Pasil or Tanudan pots; the height of the vessel is determined during the primary forming process (through coiling and scraping) and through the secondary forming process (through paddle-and-anvil techniques). Tanudan pots have a pronounced shoulder that Pasil and Balbalan pots lack. To make a Pasil-style pot, the potter paddles the semidried vessel into a globular shape. To make a Tanudan style pot, the potter retains a pronounced shoulder during the paddling process.

These technological differences do not result from isolation and divergent evolution in the pottery manufacturing traditions. No long-standing animosity has prevented Pasil and Balbalan Kalingas from traveling between their respective river valleys; in fact, Dalupa potters regularly barter their goods in some Balbalan municipality villages that lie farthest from the Balbalan pottery-making villages (Stark 1994). Tanudan potters live at a greater distance from Pasil, and warfare sporadically rages between intervening communities that prevents Pasil-Tanudan travel. However, marriage ties between the two communities have brought Tanudan people (and, occasionally, their pots) into

Dalupa in recent decades, and Dalupa potters are familiar with Tanudan-style pots. Subsistence regimes are nearly identical in these three areas, so we cannot attribute the differences to diet.

One hallmark of technological traditions, mentioned previously, is their inherent stability (e.g., Rice 1984); such stability in utilitarian pottery from different Kalinga river valleys is evident through comparisons with Eduardo Masferré's photographs from the 1940s (housed in the National Anthropological Archive, Smithsonian Institution). Some of these photographs, taken in southern Kalinga villages, illustrate morphological characteristics in pottery that parallel differences seen today.

Even technological traditions are subject to change, and some steps of the operational sequence are more sensitive to innovation than are others. Changes in some production steps do not affect the success of the production process or require the development of qualitatively different motor habits (Gosselain 1992a:582). We can see such change as it occurred in the village of Dalupa. In the early 1980s enterprising potters added a pronounced shoulder to the water jar's previously globular shape. Dalupa potters call this style *Binontoc*, and it emulates ceramic morphology in the Bontoc community just south of the provincial boundary (Figure 3.5). Dalupa potters had also begun to decorate the exterior surfaces of water jars with geometric and floral designs in ochre. At the same time, a Dalupa potter whose father was from the Tanudan River valley (13 to 14 km southeast of Pasil) introduced a carinated (or ridged) Tanudan-style shoulder for cooking pots to Dalupa potters (Longacre 1991:107-108). Several other potters experimented with this carinated Lubo style, so named for the Tanudan pottery production center where such carinated shoulders are found (Figure 3.4). Dalupa potters who make the Lubo-style shoulder do not wholly replicate the Tanudan technology, but the vessel shape they produce looks more like Tanudan pots than Pasil pots.

Both the shouldered-water-jar form and

the carinated-cooking-pot form were introduced after Dalupa potters had encountered foreign potters and their goods. Dalupa potters observed Bontoc potters' styles during visits to the former provincial capital of Lubuagan. Alterations in the operational sequence required for shaping a Bontoc-style shoulder are minor, and many potters make this *Binontoc*-style water jar. Making a Lubo-style carinated cooking pot requires changes in the shaping process and additional incised decoration on the vessel's exterior. Although the pots are harder to scrape, they are easier to paddle.

These two technological innovations have fared quite differently in the Dalupa manufacturing tradition: shouldered, decorated water jars are extremely popular among consumers, whereas potters have abandoned the Lubo-style carinated shoulder. The different success rates of innovations in certain production steps is intriguing. Why were shouldered water jars embraced but carinated pots rejected? Dalupa potters provided some answers. First, the long-term success of these stylistic innovations depended on their marketability (Gosselain 1992a:176). Experimentation with new forms is a hallmark of Dalupa pottery production today (Stark 1991; Stark and Longacre 1993) as potters test new products for a wider consumer market. Painted, shouldered water jars proved popular with consumers throughout the exchange network and are now entrenched in the Dalupa technological style. On the other hand, carinated Lubo-style cooking pots captured only a small consumer market. Few Dalupa potters continue to make the Tanudan-style carinated shoulder because this innovation proved to be just a passing fancy.

I was able to visit an enclave of Lubo (Tanudan) potters in the provincial capital of Tabuk before my departure from the area in 1988. In this Tanudan enclave transplanted potters continue to make Lubo-style pots. Lubo potters in this enclave are not only familiar with the Dalupa technological style, but they showed me experimental versions of the globular (or "Pasil") shape. When ques-

tioned, Lubo potters observed that Dalupa-style pots were easier to scrape and faster to manufacture because this style of pottery requires less incised decoration. I asked them why they did not abandon their Tanudan style for the easier Dalupa style; the Tanudan potters laughed and responded that being from Tanudan, they must make Lubo-style pots. These potters held strong cultural sanctions against changing a particular technological style (see also Mahias 1993 concerning India). Kalinga potters from various regions share different ideas about technical process, and these ideas figure into their wider symbolic systems (see also Lemonnier 1993:4).

SCALES OF SOCIAL BOUNDARIES AND THEIR MATERIAL REFLECTIONS

This discussion of social identity and social boundaries began by asking how we define relevant units of analysis in the study of social formations among nonstate societies. In the Cordillera highlands of the northern Philippines, households are linked into village wards or divisions, which are then linked into villages and local systems or peace-pact-holding units. The local system is the integral social unit in Kalinga beyond the family. However, local systems occasionally unite at a broader level to lend political support for an insider or to wage political opposition against an antagonistic outsider. These levels of social identity characterize every Cordilleran group that has been studied, be it Ifugao, Kalinga, Tingguian, Bontok, or Kankaney (e.g., De Raedt 1991; Dozier 1966; Jenks 1905; Keesing 1962; Kroeber 1943; Lawless 1978; Lewis 1991; Takaki 1977). It is reasonable to suggest that similar social units are found in small-scale societies today in Southeast Asia and, perhaps, in the Pacific.

In the Kalinga area and throughout the Cordillera highlands, then, at least two levels of social identity exist beyond the household: the local system and the broader network. The fact that these scalar units are not synonymous with ethnic groups may frustrate more traditional anthropologists: these

boundaries circumscribe smaller demographic units and subdivide ethnolinguistic groups. Individuals identify with this nested hierarchy of affiliation in everyday discourse and maintain these boundaries through everyday acts. The prominence of kin and kin-like relations in these boundaries provides them with some temporal stability. Temporal stability is what archaeologists crave, of course, because our diachronic perspective is notably different from the synchronic (or snapshot) view that most cultural anthropologists employ.

Recall that the second concern here is with methods for identifying these social units in the material record. Social boundaries demarcate local systems and regions and are frequently exhibited as boundaries in material culture, although this is unintentional and asymmetrical. Archaeologists would be most delighted, of course, if stylistic boundaries (inscribed in painted pottery, monumental architecture, and other emblematic forms of material culture) conformed to these social boundaries in some neat, Wobstian arrangement (at least as Wobst has been commonly interpreted; see Wobst, this volume). Cases in which they do not are indeed intriguing. Yet we see boundaries become evident when analytical concepts are applied to the patterning from an anthropology of technology (Pfaffenberger 1992). The next section of this paper illustrates ways in which social and material culture boundaries, at the levels of local system and region, coincide in the Philippine highlands.

The notion of technical choices as maintaining social boundaries is not simply an archaeological phenomenon. Ethnologists working in the Pacific and in Southeast Asia have also observed that social boundaries are linked to material culture differences. Lemonnier's (1986) research in the central New Guinea highlands identifies localized technical systems in architecture and wild animal procurement with clearly maintained social boundaries. Watson (1990) describes cultural diacritics that mark different social groups in the eastern New Guinea highlands that include (but are not limited to) produc-

tive specialties and distinctive local artifacts (reed bustle skirts, bark cooking drums, carved tree-fern figurines). Rosaldo (1988: 163-164), for example, concludes his examination of social boundaries by noting that cultural practices (such as agricultural techniques) define and sustain Ilongot identity from one generation to the next.

Artisans express technical choices through their selection of particular raw materials and through variation in the manufacturing process. Technical choices that Kalinga potters make reflect an internalized understanding that they pass on (with or without modification) to the next generation. These technical behaviors are not passive responses to environmental or functional pressures, nor are they entirely unconscious. Kalinga potters observe and occasionally imitate neighboring styles of pottery technology. Yet even the innovations that they impute to neighboring styles have a distinctly local imprint. To be a Pasil potter, one must make pots according to Pasil methods.

CONCLUSIONS

I have stepped outside various theoretically opposed positions to focus on technology with respect to material culture. The examination of technical choices provides insights for archaeologists who study many topics in a wide variety of settings and periods. One insight from the Kalinga case study is that dichotomies blur between style and function, and between the technological and the social. In many traditional societies these qualities are contextually and analytically intertwined. We must move beyond heuristic divisions between style and function to gain a more nuanced understanding of the social dimensions of material culture (see also Schiffer and Skibo 1997).

Another insight from the Kalinga vessel form study is that technological styles provide more stable and resilient patterning of social boundaries than does iconological style, which archaeologists commonly study. Kalinga culture does not lack media that carry iconological style: traditional techniques of weaving and tattooing both involve

intricate designs, for example. In this ethnoarchaeological study we see that everyday goods inform on social boundaries in different ways than do iconologically complex materials. The study also suggests that use of technological approaches has potential for progress in the study of the archaeological record.

It should be clear from this exercise that developing material-culture theory in archaeology requires a great deal of hard work. We need to concentrate more ethnoarchaeological research on two areas to understand the meaning of multiple social boundaries that are present in the archaeological record. The first involves detailed studies that examine the relationship among contexts of production, distribution, and use. The second area involves systematic, long-term research on spatial scales of social boundaries and their material expressions. We can extend our time depth through longitudinal ethnoarchaeological research in particular societies. Long-term field projects in Central America (e.g., Arnold 1985; Arnold and Nieves 1992; Arnold et al., this volume), West Africa (David and Hennig 1972; David and MacEachern 1988; MacEachern 1992, 1998; Sterner 1989), and Southeast Asia (Longacre 1981, 1991; Stark 1991, 1993a, 1994) have begun to yield insights on technological and organizational change at scales that approach that of archaeological time. Research that combines old museum collections with contemporary field research (e.g., Welsch and Terrell 1991, 1998) extends our time depth even further.

In this era of rapidly expanding theoretical approaches we are learning that deference to social theory from outside our discipline's confines is rarely adequate for interpreting archaeological data. It is time for us to develop an explicit material-culture

theory from the vantage point of archaeology. The approach discussed here is unique and timely in its attempt to bridge divergent approaches from North American and European archaeology and to build a unified study of material culture. European research on technical choices still occupies a marginal place in North Americanist archaeology, largely because of the lack of European literature in English translation. Use of innovative methods—and an emphasis on understanding how technological behavior generates and reflects social boundaries—is critical to our continuing efforts to build a uniquely archaeological theory of material culture.

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