

reflects diverse analytical approaches and methodological strategies for examining the role of glaze ware pottery in the social lives of the late precontact and early contact Pueblos. By tracing the circulation of specialized knowledge, raw materials, and the glaze-painted pots themselves, through interactive networks of varying sizes and scales, these researchers reveal how glaze ware production, distribution, and use articulated with a variety of dynamic historical and social processes, including migration, community formation, constructions of local and regional identity, inter-community interaction and alliance, organization of production, and the proliferation of new religious systems and ritual practices. What is emerging from these studies is a diverse and complementary series of local “social histories” of the glaze wares that allow us to track both similarities and differences in how these articulations played out in different times, places, and contexts across the late precontact and early contact Southwest. Finally, by comparing and contrasting these diverse social histories, we hope to move toward a more synthetic understanding of the mutually constitutive relationships that linked material culture, technological practice, and the complex processes of social formation and culture change.

Glaze Ware Technology, the Social Lives of Pots, and Communities of Practice in the Late Prehistoric Southwest

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In the last century, southwestern ceramics have been subjected to a staggering amount of research. Southwestern archaeologists have used ceramics to study social boundaries and organizational change, and have devoted extensive attention to understanding variability in stylistic decoration at the community and regional levels (e.g., Graves 1998; Hill 1970; Kintigh 1985b; Longacre 1970; S. Plog 1980). Articles in this volume concentrate on one ceramic technological tradition, glaze-decorated ceramics, which were manufactured and used across a broad swath of the northern Southwest after the mid-thirteenth century AD.

The protohistoric ceramic glaze ware tradition described in this volume is not the first appearance of this technology in the Puebloan Southwest or in the greater region (Eckert, chap. 3). Potters in the Four Corners region began using glaze paints on their white wares in the eighth and ninth centuries AD, and potters in western Mexico manufactured glaze wares by the tenth century AD. The salience of this protohistoric technology lies instead in its widespread adoption, its four-century-long tradition of manufacture, and its co-occurrence with macro-organizational shifts across the precontact North American Southwest.

This volume’s chapters use glaze ware ceramics to examine two such changes: (1) the establishment and growth of large towns, particularly along the Rio Grande; and (2) a series of migrations both within the Western Pueblo region and between the Western Pueblos and commu-

nities within the Rio Grande region. That we see the introduction of a new ceramic technology, and specifically the appearance of glaze-paint-decorated pottery in this region by the late thirteenth century AD, compels researchers to investigate the link between technological and organizational change. This ceramic technological tradition was adopted within a generation in the upper Little Colorado, Zuni, and Acoma regions and spread to the central and southern Rio Grande within a few decades.

A primary goal of this volume is to develop broader frameworks for examining changing roles of ceramic technology during a period of organizational change in the late precontact Southwest. Archaeologists have used ceramics to track episodes of migration during this period into large aggregated settlements in many parts of the Puebloan Southwest (see Schachner, chap. 7, and Laumbach, chap. 8). These shifts correlate with the appearance of a new ceramic technology and specifically the use of copper- and lead-based paints that produce glaze decoration. The volume's contributors explore various articulations between technological and organizational shifts. Monitoring the "social lives of pots" involves considering social and ideological contexts of production, distribution, and consumption in a framework that transcends the confines of a normative "ceramic ecology" approach (following Arnold 1985). Authors in this volume use glaze ware ceramics as a proxy indicator for studying other processes, including the movement of peoples, interregional interaction, the formation of communities, and social and political reorganization.

My objective in this chapter is to contextualize studies of glaze wares into a broader anthropological framework, and to illustrate how studying glaze wares is relevant to areas beyond the precontact Southwest. Conceptual approaches from the anthropology of technology offer useful frameworks for contemplating the nature of glaze ware innovation and adoption, and ideas from practice theory offer alternative perspectives for analyzing examples of ceramic change and for conceptualizing social units that leave archaeological signatures. A new wave of ethnoarchaeological studies, done in concert with laboratory research, strengthens archaeological inferences about the contexts of technological change (see Stark 2003). The fact that recent ceramic ethnoarchaeological research has applied technological and practice frameworks provides intriguing directions for future research on glaze ware ceramics from the precontact Southwest.

Two goals structure this chapter. I first review conceptual frameworks

from the anthropology of technology (Pfaffenberger 1992) and practice theory (Ortner 1984) to provide a framework for thinking about the patterning that the authors of this volume have so deftly identified. Second, I illustrate why these approaches enrich our understanding of social and political changes in the late precontact northern Southwest. My objective here is to encourage southwestern archaeologists to integrate an anthropology of technology framework with practice theory approaches to better understand processes of long-term change.

Anthropology of Technology, Practice Theory and Ceramic Studies

Archaeologists have begun to merge technologically informed conceptual frameworks of artifact variability (embodied in anthropology of technology approaches) within a broader theoretical framework called practice theory. Understanding this trend requires some background in two discrete intellectual traditions: technology studies and practice theory as archaeologists use it. Below I discuss the French techniques and culture school (with the *chaîne opératoire* concept), the concept of technological style, and practice theory.

Anthropology of Technology Framework

Increased attention to an "anthropology of technology" framework has emerged in the last decade (e.g., Dietler and Herbich 1998; Hegmon 1998; Lemonnier 1986, 1992; Loney 2000; Pfaffenberger 1992; Rice 1996a:186–87; Stark 1998:5–7). This approach has both an eclectic following and a varied intellectual history in both European and Anglo-American archaeology (Loney 2000; Schiffer et al. 2001). Much recent research, however, derives from a European scholarly tradition whose lineage originated in work by Marcel Mauss (Schlanger 1998), and which Andre Leroi-Gourhan operationalized using the *chaîne opératoire* concept (Audouze 2002:286–88; Pelegrin, Karlin, and Bodu 1989). More archaeologists working in Europe than in North America have adopted the *chaîne opératoire* as an analytical research methodology (Dobres 2000:167–70); it bears some resemblance to the behavioral chain or life-history approaches used in behavioral archaeology (e.g., Schiffer and Skibo 1997). While the ceramic ethnoarchaeological literature using this approach has burgeoned recently (Stark 2003:211–13), more archaeological applications have fo-

cused on lithics until recently (e.g., Knecht 1993; Pelegrin 1990; Sellet 1993). Their publication in French (rather than English) may also explain why such work remains poorly known among Americanist archaeologists.

At the same time the French developed their *techniques et culture* approach, some Americanist specialists have fused art, technology, and structuralist theory to examine the articulation between technological aspects of manufacture and symbolic systems (e.g., Hegmon 1998:266–68; Lechtman 1984; Lechtman and Steinberg 1979). Integral to this approach is the concept of technological style (following Lechtman 1977), which represents the aggregate of multiple choices during the manufacturing sequence and challenges the conventional style-function dichotomy that characterizes much Americanist research (see Stark 1998). Ethnoarchaeological studies indicate that technological styles are expressed through a wide variety of manufactured objects, including iron-smelting furnaces (Childs 1991; Childs and Killick 1993:330–33), social uses of space (Hitchcock and Bartram 1998), and earthenware ceramics (Hosler 1996; see also Stark 2003 for review). The use of technological approaches provides a methodology for studying technical choices in the archaeological record. By tracking differences and similarities in the production sequence across geographic regions, archaeologists can identify discrete technological traditions, technological innovations, and even some migration events in the archaeological record (Frankel 2000; Stark, Clark, and Elson 1995). A technological approach that combines practice theory with a chaîne opératoire framework, and that draws from comparative ethnoarchaeological studies, can help us understand the social contexts of glaze ware ceramic manufacture, circulation, and use in the precontact North American Southwest.

Practice Theory in Archaeology

Archaeologists' increased attention to practice theory is one significant outgrowth of the recent tumult in North American archaeology over critiques of processual archaeology. Practice theory, as archaeologists envision it (Dobres and Robb 2000:4–9; Dornan 2002; Roscoe 1993:111–14), originated in ideas of Pierre Bourdieu (1977) and Anthony Giddens (1979) and were mainstreamed into anthropology by Sherry Ortner (1984). In this conception, practice theory focuses on the routinized activity of individuals as they undertake their daily activities: these practices are thus cultural constructions. Practice theory emphasizes indi-

vidual action, rather than a society's institutions, as the driving force of behavior. This perspective views society as the aggregate of practices of its individuals and asserts that cultural and technological transformations unfold through practice (Dobres 2000:127).

While practice theory overlaps with agency theory (Dobres and Robb 2000), the two are not synonymous, since agency theory views people as mindful participants and practice theory does not focus as closely on individual intent as it does on outcomes. Yet individual action and choice matters in both frameworks, and practice consists of a series of choices that reflect what James Watson (1990:22) calls “cultural diacritics” (see also S. Jones 1997:87–92). These acts may be conscious, subconscious, or unconscious (e.g., Wobst 1999), but their implementation leaves material manifestations that reflect multiple levels of group identity.

Previous authors have summarized Pierre Bourdieu's work authoritatively (e.g., Calhoun, LiPuma, and Postone 1993; Harker, Wilkes, and Mahar 1990; Jenkins 1992; J. F. Lane 2000; van der Leeuw 1993:238–42), and readers are urged to consult these sources (see also Habicht-Mauche, chap. 1, this vol.). Bourdieu's practice theory was founded in ethnographic experience, and he focused on the constitution and reproduction of unequal power relations among people. His approach combined notions of structure and practice in the concept of *habitus*. *Habitus* describes the cultural embodiment of structures during socialization that reflect wider symbolic systems (Lemonnier 1993). *Habitus* is constituted and manifested in practice. Techniques used to manufacture goods like the ceramics discussed in this volume are often unconscious (Dietler and Herbich 1998:244–48). These techniques—motor habits, gestures, and behaviors—are social productions that are transmitted within and across generations. Ethnoarchaeologists and archaeologists can observe the practices that *habitus* produces. Increasing numbers of archaeologists, particularly those who study technology and culture, have adopted aspects of practice theory as a conceptual tool for studying the archaeological record (e.g., Dobres 2000; Dobres and Hoffman 1994; Dobres and Robb 2000).

There may be several explanations for the increase in archaeologists turning to practice theory. First, as a sort of middle-level theory (following Schiffer 1988), practice theory has the potential to transcend otherwise disparate theoretical programs (see also Dobres and Robb 2000:6–8). Archaeological applications of practice theory have thus far been dominated by postprocessual and postmodernist approaches and lumped under the

“agency” rubric (Pauketat 2001a:79), but this approach is not restricted to such a narrow group of practitioners. Archaeologists with interests as divergent as meaning and evolutionary ecology are now concerned with aspects of social and cultural reproduction, individual action, and historical contingency. Their interest takes different forms and involves different analytical units, but practice theory and the closely related agency theory are beginning to penetrate the recesses of Anglo-American archaeology.

A second reason that archaeologists have recently embraced practice theory lies in the appeal of its conceptual framework, which is both familiar and accessible to Americanist archaeologists. Notions like *habitus* arguably have parallels deep in the culture historians’ debate over typology. Most notably, Rouse’s (1939) concept of mode, which emphasized techniques “analogous to habits” (1939:19), closely resembles the techniques that Lemonnier and his colleagues describe. Even some New Archaeology formulations of classification emphasized the importance of “measuring what people actually do, rather than what they think (the latter being difficult at best)” (Hill and Evans 1972:266). James Sackett’s camp in the style debates of the 1980s and 1990s (Sackett 1977, 1982, 1985, 1986, 1990) emphasized “isochrestic variation,” which bears some relationship to *habitus*. Finally, the use of practice theory enables us to conceptualize social boundaries as “something people do” (following Hegmon 1998:272) rather than simply as a set of cognized categories that many archaeologists believe is inaccessible in the ancient past.

A third reason why archaeologists like practice theory lies in its methodological approach, which lends itself to archaeological data. Practice theory stipulates that people reproduce their culture and social positions through daily practice, that daily practice is structured by basic organizational principles, and that daily practice is expressed through *habitus*. Daily practice leaves patterned traces in the archaeological record (Shennan 1993:55); the challenge lies in developing appropriate interpretations of material culture patterning. Examples from historical archaeology (e.g., L. Ferguson 1992; Lightfoot, Martinez, and Schiff 1998) and from ethnoarchaeological research (e.g., Dietler and Herbich 1998; Gosselain 1998, 1999, 2000; Hitchcock and Bartram 1998) provide controlled case studies that link particular social units to discrete material signatures and demonstrate the potential of a practice theory framework for archaeological research.

Some archaeologists using practice theory focus on learning frameworks (e.g., Crown 2001; Minar and Crown 2001) and blend earlier cogni-

tive theory research by Jean Lave and Etienne Wenger (Lave and Wenger 1991; Wenger 1998) with practice theory (e.g., Sassaman and Rudolph 2001:408). Others use practice theory to study historical process insofar as this reflects a process of tradition building, or cultural construction through practice (Pauketat 2001b:4). Finally, archaeologists have begun to use practice theory as a conceptual framework for studying social groups in the archaeological record: as “ethnic groups” (S. Jones 1997:87–92), “ethnic cores” (Emerson and McElrath 2001), or “communities of practice” (Lightfoot, Martinez, and Schiff 1998; Minar 2001).

The Anthropology of Southwestern Glaze Ware Technology

The southwestern glaze ware ceramic tradition has a long and hallowed history of research (chap. 3, this vol.) and is well suited for studying the social life of pots. Several chapters in this volume (e.g., Fenn, Mills, and Hopkins; Huntley; Nelson and Habicht-Mauche) summarize the development of glaze ware technologies in particular regions of the northern Southwest. Other chapters (e.g., Schachner, Capone) focus on contexts of technological change. Several other chapters (Fenn, Mills, and Hopkins; Herhahn; Laumbach; Van Keuren) examine the existence and movement of glaze ware manufacturing artisans and their communities. I first discuss the social lives of pots and then turn to ideas related to practice theory. The formation and maintenance of artisan communities, and their movement across space, provides a central theme for the volume’s chapters.

The Social Lives of Pots

This volume’s editors emphasize the social lives of pots, and it is this social lens through which contributors have been encouraged to view their data. As the dust now clears from the processual-postprocessual debates of the 1990s, most of us now agree that ceramics are not simply passive reflectors of style or even simply of ideological movements (see review in Rice 1996a, 1996b). Many among us still feel uncomfortable with the kinds of interpretive leaps that characterized symbolic-structural studies of ceramics in the 1980s (Stark 1993), precisely because of their nonempirical methodologies. Most ceramicists now agree, nonetheless, that potters do not make their goods in a cultural void, nor do consumers use pots in a social vacuum. We still face methodological challenges in studying these issues in an archaeological context.

The context-laden nature of ceramic technology is particularly evi-

dent in ethnographic settings; ceramic ethnoarchaeology provides guidance in constructing methodologies for studying archaeological ceramics. Ceramics, like other manufactured objects, reflect technical choices that leave material traces for archaeologists to study (Sillar 1997; Sillar and Tite 2000). Ethnoarchaeological research strategies enable archaeologists to observe potters making technical choices throughout the manufacturing process, from the processing of raw materials (e.g., Gosselain 1999; Livingstone Smith 2000) and particular shaping techniques (e.g., Mahias 1993; Pétrequin and Pétrequin 1999; Stark 1999; van der Leeuw 1993) to preferences in fuel for firing pottery (Sillar 2000). Some of these steps in the manufacturing process, such as shaping, are remarkably resistant to change, while others (such as stylistic decoration) vary. Subsequent laboratory testing permits the identification of material correlates of some of these technical choices in raw materials selection (Aronson, Skibo, and Stark 1994; Stark, Bishop, and Miksa 2000).

Several contributors to this volume focus on technological choices in the operational sequence that inform on the social lives of glaze ware pots. For example, Scott Van Keuren (chap. 5) focuses on brushstroke sequence to contemplate learning frameworks and emulation among potters who made White Mountain Red Ware. Deborah Huntley (chap. 6) argues that change to lead-based glazes was a conscious choice by fourteenth-century Zuni potters to produce meaningful color combinations. Looking somewhat later in time, Patricia Capone (chap. 12) tracks temporal changes in raw materials processing and shaping techniques in Salinas area ceramic technologies that reflect expediently produced and less standardized ceramics from the pre-Mission to Mission period.

That some of pottery's social life lies in the creation of social relationships is revealed through ceramic ethnoarchaeological research. For example, ceramic circulation forms certain types of communities that are predicated on potter-consumer relationships (e.g., Kramer and Douglas 1992; Longacre and Stark 1992). Moreover, the social relations of producer-consumer relationships may override geographic distance in determining the directionality of ceramic circulation and the shape of the distributional network. Few ceramic studies focus specifically on the relationship between producers and consumers, in part because such interactions are difficult to discern in regions where multiple communities are involved in ceramic production.

Three examples from this volume exemplify how pottery can cre-

ate social relationships. First, Kathryn Leonard's study of fifteenth- to eighteenth-century Plains-Pueblo relations provides a fine case study (chap. 13). Limitations of the archaeological record, however, make it exceedingly difficult to know whether the Pueblo groups who formed trade partnerships with Plains groups manufactured their own pots, or whether they imported ceramics to use in exchange transactions. Second, compositional analyses of central Rio Grande ceramics (Nelson and Habicht-Mauche, chap. 11) demarcate different geographic clusters formed through the circulation of finished vessels and raw materials. Analysis of ceramic distributional data suggest that, during the Pueblo IV period, people were more likely to interact with others in their local settlement cluster than with populations beyond it (see also Creamer 2002: 101-7). Finally, Schachner's chapter (chap. 7) suggests that the appearance of Matsaki Buff ceramics may have heralded the beginning of a newly formed and heterogeneous social unit that integrated long-term residents and relative newcomers into more unified Zuni communities.

Archaeological Units and Communities of Practice

In some respects, the chapters contribute more directly and substantively to archaeological understandings of communities of practice. Such communities are visible ethnographically as potter communities, in which artisans share a set of manufacturing techniques that are guided by local tradition and that reflect a shared habitus (e.g., Gosselain 1998; Stark 1999). Archaeological ceramicists who study communities of practice combine ideas of habitus and technological style to study stability in particular motor skills and identify bounded social units (e.g., Crown 2001; Minar 2001; Sassaman and Rudolphi 2001). With respect to glaze ware ceramics, Scott Van Keuren draws from the ceramic sociology tradition of the New Archaeology (following S. Plog 1983) to discuss shared learning and cognitive frameworks among potters who made White Mountain Red Ware vessels. Also in the Mogollon Rim region, Fenn and his colleagues explicitly link particular glaze paint compositions to localized technical traditions that they call "pottery production groups."

What, exactly, is the scale of a community of practice? It is becoming increasingly evident that we cannot directly move from this identification to certain types of social units like villages or communities, "cultures," or ethnic groups. These communities may not be isomorphic with villages, since artisans' technological traditions may appear in several settle-

ments. Ceramic ethnoarchaeological research suggests that scalar variability exists in communities of practice (e.g., Gosselain 1998, 1999, 2000). Most communities of practice that have been documented ethnoarchaeologically are found at the local level (Graves 1994a,b; Stark 1999), and compositional studies suggest that these units leave tangible evidence (e.g., Arnold, Neff, and Bishop 1991; Arnold et al. 1999; Stark, Bishop, and Miksa 2000).

The fact that ethnographically documented communities of practice may not be isomorphic with villages or communities has archaeological implications for understanding southwestern glaze wares and their makers. Using archaeological research from elsewhere in the precontact North American Southwest (Elson, Stark, and Gregory 2000), we have offered the term *local system* as a more suitable alternative to village or community, since this term can encompass multiple residential clusters whose occupants share some practices (and presumably some social links) with others across the clusters. In the Tonto Basin (east-central Arizona), archaeological correlates for local systems include shared raw material sources for temper and perhaps even for clays (e.g., Miksa and Heidke 2001; Stark and Heidke 1998). Nelson and Habicht-Mauche (chap. 11, this vol.) use the term *local settlement cluster* to demarcate a similar social unit and source pottery to a particular district, a cluster of sites, or (in some cases) a specific manufacturing settlement.

Beyond the local system lie larger and meaningful social units that are not self-ascribed ethnic groups (contra Emerson and McElrath 2001; S. Jones 1997), since shared technological traditions, rather than language or other emblematic indicators of group affiliation, unite these producers into a social unit. The notion of the regional system, linked through kinship, alliances, and ideology, provides a more useful conceptual alternative to that of ethnic group (also see Neitzel 2000). Using an example from the Sepik Coast of New Guinea, Welsch and Terrell (1998) describe such a system as a social field or a “community of culture.”

Archaeological research using a suite of compositional techniques provides a valuable approach for identifying regional systems in the northern Southwest. Broad-scale ethnoarchaeological research has identified macrogroups through systematic documentation of manufacturing techniques that crosscut communities and link them in a broader entity (e.g., Gosselain 1998, 2000). Work by Nelson and Habicht-Mauche provides a first step in this direction, as they identify geographic clusters in the

Rio Grande in which social links are established and reaffirmed through the circulation of raw materials and finished goods involved in ceramic production. And Leonard’s analysis of Plains-Pueblo relationships also identifies larger social units than the local system, bound together by the circulation of ceramics (and likely other materials), and perhaps intergenerational in depth, between culturally discrete groups. Because ceramics constituted one small part of a much broader material culture inventory, it is imperative to cast a wider net that includes other material categories in such research.

The Timing and Nature of Change

Linda Cordell (chap. 14) reminds us that identifying the origins of southwestern glaze wares is interesting, but exploring processes behind their widespread adoption is of paramount importance. Research presented in this volume suggests, first, that potters adopted the glaze ware tradition within a single generation across most of what was to become the Western Pueblo region. Secondly, Eckert’s synthesis (chap. 3) indicates that glaze ware technology peaked in popularity (where popularity is measured by the diversity of types produced at one point in time) between ca. AD 1424 and 1450. Within the next generation, this technological tradition waned in some areas (i.e., Little Colorado, Zuni, Acoma) and intensified in areas along the Rio Grande.

Chapters in this volume discuss the coevolution of glaze ware traditions among upper Little Colorado groups and the Zuni and Acoma potters’ manufacture of Zuni Glaze Ware types indistinguishable from those made at Zuni, and sixteenth-century Zuni potters’ emulation of Rio Grande Glaze Ware vessel forms. Understanding the “social lives” of these pots requires additional study of their changing social and political contexts, and of the development of intraregional and interregional relationships through time.

A technological approach provides an appropriate methodological framework for interpreting some aspects of innovation in southwestern glaze ware ceramics; it also offers a set of theoretical tools. Envisioning southwestern glaze wares as the outcome of discrete manufacturing steps (of a particular *chaîne opératoire*) provides a finer-grained perspective on technological innovation, persistence, and change over a four-hundred-year span. Along the Mogollon Rim, glaze ware technology was adopted relatively rapidly in the late thirteenth century (Fenn, Mills, and Hop-

kins, chap. 4); in the fifteenth-century Zuni region, the glaze ware tradition disappeared rather abruptly and was replaced by a buff ware tradition (Schachner, chap. 7). Potters adopted technological innovations associated with glaze ware manufacturing at different rates; in areas like Zuni, some potters may have decided not to adopt high-lead glaze recipes while neighboring artisans did (Huntley, chap. 6).

Studies in this volume also describe the nature of technological changes in glaze ware ceramics through time. Habicht-Mauche's introduction and Eckert's synthesis of glaze ware traditions suggest that Pueblo IV technological changes involved primarily decorative techniques (e.g., introduction of polychromatic color schemes, the use of new painting techniques, and changes in design structure/symmetry) and surface treatments (i.e., adoption of copper and lead-based pigments that formed glaze paints upon firing). Potters' experimentation with glaze paint recipes along the Mogollon Rim (Fenn, Mills, and Hopkins, chap. 4) required them to also modify their firing regimes. Potters made similar changes across the northern Southwest to accommodate their new glaze paint technology. Whereas previous generations of potters used a reducing (or neutral) firing atmosphere to manufacture their white ware ceramics, potters making glaze ware ceramics fired their vessels in an oxidizing atmosphere to produce yellow wares, red wares, and polychromes. These technological innovations required modifications to their firing technologies, the use of different fuels, and perhaps even the introduction of new firing features.

From an anthropology of technology framework, such changes involved both modifications to an extant ceramic manufacturing tradition and also technological transformations; the latter often reflects the influx of new producers. As such, our focus should be on factors that encouraged potters to modify their traditions as much as on documenting particular migration events. Several of this volume's chapters provide empirical evidence for the influx of immigrants into the region, from the thirteenth-century Mogollon Rim (Fenn, Mills, and Hopkins, chap. 4) to the fifteenth-century Zuni region (Schachner, chap. 7) and beyond to the Rio Grande Valley (Eckert, chap. 9). But, as Cynthia Herhahn (chap. 10) also points out, we cannot explain technological change simply or exclusively through processes of migration.

Contexts of Change

Another theme in the volume's chapters concerns the social contexts of technological change. Technological change does not simply correlate

with, or serve as proxy indicator of, broader organizational changes. It instead operates at different rates, responds to multiple stimuli, and results from a complex mixture of internal and external pressures. Technological change is not ideologically determined, although we may detect relationships between certain types of change and the emergence of ideological movements. Instead, technological change reflects individual and aggregate decisions to innovate and adopt new strategies. Technological change thus represents a delicate interplay of agency and constraints; some aspects of technology are remarkably resistant to change (Aronson and Fournier 1993; Nicklin 1971; Stark 1991).

Documenting the nature of shifts through time is a necessary prerequisite for understanding the contexts of technological change. Extensive work across the northern Southwest, summarized ably by Suzanne Eckert (chap. 3), has helped bracket an approximate start date for the introduction of this new technological tradition. Research along the Mogollon Rim by Fenn, Mills, and Hopkins provides intriguing evidence of the inception of innovation, replete with compositional evidence for a trial-and-error period of experimentation. So, too, does Cynthia Herhahn's study of the earliest Rio Grande potters' efforts to use glaze paint recipes. Work by Mills (1995) and Schachner (chap. 7) illustrates the "life cycle" of the Zuni Glaze Ware technological tradition, which underwent significant technological shifts through time.

Some of the volume's chapters also identify shifts in glaze ware technology, including a shift from mineral to carbon to glaze paint during the twelfth through fourteenth centuries in the middle and northern Rio Grande region (Eckert, chap. 9), to a shift from relatively low-lead and high-copper to relatively high-lead and low-copper glaze paints in the fourteenth-century Zuni region (Huntley, chap. 6), and in the transition from more intensive to less intensive temper processing from the fifteenth to seventeenth century in the Salinas area (Capone, chap. 12). In the Rio Grande area, at least, potters pursued multiple strategies of production (possibly including household-based specialization) and engaged in trade throughout the region from the fourteenth to early sixteenth century AD.

The adoption of glaze ware technology across much of the northern precontact Southwest did not entirely overwhelm local ceramic technological practices. Fenn and his colleagues provide convincing evidence for the replacement of Cibola White Ware with red ware along the Mogollon Rim by ca. AD 1300. On the other hand, Suzanne Eckert's study suggests that white ware production continued in the thirteenth and fourteenth

centuries at some communities in the central Rio Grande, while other settlements witnessed a replacement of white ware with glaze ware manufacture.

These sorts of empirical findings make valuable contributions, and help us consider whether, why, when, and which potters adopted new technological traditions (and abandoned old ones) at different rates. Questions remain concerning the origins of southwestern glaze wares and the differential adoption of this technology across the region. Why did potters during the Protohistoric period opt to modify certain production steps but not others? Perhaps some potters made deliberate choices to distinguish their wares from those of others in their regions (e.g., Huntley, chap. 6), while others made less conscious technological accommodations to changing raw material availability (for review, see also Hensler and Blinman 2002:377–79). To what extent did social and demographic factors (including immigration) stimulate this shift? Understanding these processes requires us to think about cultural transmission, or how information and techniques are transferred from one person to the next.

Cultural Transmission

The study of cultural transmission—and in this case, how technological knowledge passes from one artisan to another—is critical for understanding the development, spread, and disappearance of the glaze ware ceramic series. Herhahn's chapter views glaze ware as a technological style, and tracks its movement from west to east and then throughout the Rio Grande. Cultural transmission can take many forms, including vertical transmission through intergenerational learning frameworks (Van Keuren), horizontal transmission through emulation and exchange (Herhahn, Huntley), and through population movement (Schachner). Migrant potters' adoption of new technologies and their experimentation with unfamiliar raw materials across the late precontact Puebloan Southwest stimulated changes in local technological traditions (see also Schachner, chap. 7). The fact that migration and diffusion are complementary rather than contradictory processes is essential; Herhahn suggests that intergroup interaction might have occurred more frequently than physical migration in parts of the Rio Grande.

The Rio Grande, however, remains an ideal setting in the precontact North American Southwest for studying the movement of populations and migration-stimulated changes in local manufacturing traditions. Yet

the response varied, and artisans adopted new technologies differentially: the influx of immigrants in the fourteenth-century Rio Grande led to some settlements adopting glaze wares, while other settlements remained committed to white ware manufacture (Eckert, chap. 9). Eckert also illustrates that some indigenous potters adopted the glaze ware technology from Western Pueblo potters (at least at Hummingbird Pueblo), and that potters sometimes used the same clays for local glaze ware and white ware production. Along the thirteenth-century Mogollon Rim (Fenn, Mills, and Hopkins, chap. 4) and in fifteenth-century Zuni (Schachner, chap. 7), the addition of nonlocal populations is clear from the archaeological record, which contains not only divergent burial traditions but discrete ceramic traditions that reflect distinctive technological styles. In each case, migration may have stimulated the emergence of new identities in the immediate postmigration period, the intensification and diversification of ritual life, and ultimately changes in the local ceramic technological tradition.

The Direction of Future Research

This volume's chapters contain a truly impressive amount of primary data using different analytical techniques. We now know more about southwestern glaze ware ceramic traditions than we do about any other ceramic technological tradition from precontact North America. Yet the contributors themselves suggest directions for future research; I leave substantive questions aside for regional specialists to consider.

On a methodological level, work remains to be done to integrate divergent data sources. Despite myriad compositional studies, more work is needed to merge technical and stylistic approaches into more holistic studies. Exploring communities of practice requires more integrated research that includes the entire range of steps in the operational sequence rather than focusing predominantly on decorative steps (Van Keuren, chap. 5). Stylistic and compositional studies must be combined to provide a proper baseline for studying the nature of change over the four-century period when southwestern glaze wares were manufactured.

Linda Cordell (chap. 14) bemoans the lack of theoretical guidance that a technology-and-agency approach provides, since it focuses primarily on issues surrounding ceramic production. Her point is well taken: we clearly need more theoretical work on ceramic distribution and consumption.

A growing corpus of ethnoarchaeological literature on ceramic distributional networks (for references, see Kramer 1985:82–83, Stark 2003:208–9) provides a starting point for understanding the range of factors that affect how ceramics circulate. So, too, does recent ceramic ethnoarchaeological research on ceramic use or consumption (see Stark 2003:209–13).

On a conceptual level, using a technological approach raises the bar for archaeological ceramicists, even in a region like the North American Southwest where the analytical caliber of such work is already outstanding. Concepts like technological style and habitus are useful to archaeologists, but require refinement and incorporation into a dynamic framework. Likewise, work to define, identify, and track communities of practice in the archaeological record has just begun. Bridging the source fields of these concepts and the archaeological correlates we study requires hard work by archaeologists. Southwestern archaeological ceramicists are well situated to undertake such work, particularly those working on glaze wares, as work in this volume illustrates.

On a theoretical level, archaeological ceramic studies can and should contribute to our understanding of the social life of things in general (following Appadurai 1986) and of pots in particular. Thus far, regrettably, the exchange has been largely unidirectional: archaeologists are generally consumers of external theory more than we are producers (Yoffee and Sherratt 1993). The bold questions of this volume's chapters concerning glaze paint ceramics in the Pueblo IV period test the limits of our conventional interpretive analysis. The precontact North American Southwest is deservedly famous for its archaeological research tradition, particularly in the realm of methodology. Southwestern archaeology contains some of the world's finest-grained chronologies, most precisely dated ceramics, and best-documented sites. This region is particularly well suited to pushing conceptual and theoretical boundaries.

In her chapter, Suzanne Eckert (chap. 3) calls for models that map complex relationships between material culture and social practices, models that archaeologists must build. Southwestern archaeologists working with glaze wares have an excellent opportunity to use fine-grained data sets to tack between the archaeological record and comparative ethnoarchaeological approaches. Doing so not only refines methodologies and encourages ethnoarchaeologists to undertake more relevant research; it contributes to our understanding of the social lives of pots across the precontact North American Southwest, and of the artisans who made them.

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The Social Life of Pots

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the Southwest, AD 1250–1680

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