




Intermarriage, Technological Diffusion, and Boundary Objects in the U.S. Southwest

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Published online: 25 September 2018

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Abstract

This article draws upon ethnographic accounts of female potters' movement and intermarriage into multi-ethnic Pueblo communities in the U.S. Southwest to illustrate how marriage networks created opportunities for innovation through the production, distribution, and consumption of boundary objects. These objects did not define boundaries but facilitated boundary crossing or bridging by potters. I argue that the concept of boundary objects is more useful than hybridity for understanding the processes of culture contact and material culture diffusion. Archaeological evidence for late twelfth through thirteenth century migrations from the Four Corners to the southern Colorado Plateau is used to make a case for a high degree of intermarriage and post-marital movement of women. Such patrilocality challenges normative views of post-marital residence, including those employed by early ceramic sociologists working in the same area of the Southwest and even at the same sites. The case that I discuss provides a contrast to other Southwest examples in which conformist transmission was more common, and helps to solve a paradox in explanations of the Southwest Pueblo *Sprachbund*. I conclude that the concept of boundary objects complements formal social network approaches in archaeology by bringing out the active role of objects in linking social actors.

Keywords Archaeology · Migration · Intermarriage · Boundary objects · Communities of practice · Social networks · Diffusion · Innovation · *Sprachbund* · U.S. Southwest

The topics of innovation and diffusion are undergoing a resurgence in archaeology. Although diffusion was explicitly rejected by processual archaeologists and rarely studied by post-processual archaeologists, a number of theoretical and methodological approaches are now being applied (e.g., Cameron 2017; Chama 2007; Mills and Peeples 2018; Peeples and Mills 2018; Stark *et al.* 2008; Storey and Jones 2011).

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Some of the rekindling of interest has been through neo-Darwinian approaches (e.g., Bentley and Shennan 2003; O'Brien 2008), while others focus on learning, apprenticeship, and communities of practice (e.g., Bowser and Patton 2008; Cordell and Habicht-Mauche 2012; Lave and Wenger 1991; Minar and Crown 2001; Stark 2006). Less often integrated into archaeological case studies, but important sources for understanding the diffusion of innovations are sociological studies of transmission (e.g., Burt 2005; Rogers 2003; Ryan and Gross 1943; Valente 1998, 2005), and results from the emerging field of network science (e.g., Centola 2010, 2015; Centola and Macy 2007; Cowan 2006; Fritsch and Kauffeld-Monz 2010; Kandler and Caccioli 2016; Watts 2002; Watts and Strogatz 1998).

Models stemming from these varied approaches can be complementary and in this article, I draw upon multiple ways of looking at the diffusion of innovations. I especially draw upon the literature on learning, apprenticeship, and communities of practice (Lave and Wenger 1991). An underappreciated and relatively unexplored concept within the communities of practice literature is that of boundary objects (Star 1989; Star and Griesemer 1989; Wenger 1998, 1999). Boundary objects are things that cross social boundaries, not demarcate them. Wenger makes clear that the concept is not entirely about portable objects, but also about processes and practices. I argue that the concept of boundary objects is more useful than the static concept of "hybridity" that has recently played a part in archaeology, especially in culture contact studies. In the context of migration and intermarriage, I show that potters, as brokers, are engaged with certain forms of material culture as boundary objects that facilitate the transmission process when people with different backgrounds come into contact. The combination of practice and network theories provides a more powerful way of understanding how intermarriage and diffusion worked together to form social and technological bridges.

Coming to Terms: Migration and Intermarriage

An important social context for looking at diffusion or transmission is that of migration and intermarriage. Migration is a classic research area for looking at the movement of ideas and technologies that crosscut disciplines (Anthony 1990). The movement of people brings vast reservoirs of knowledge that can be transferred to new homes. But how this transfer occurs may vary widely. A major variable in how diffusion occurs with migration is the scale of the social group that moves. At one end of the continuum is a single individual and at the other, the movement of large numbers of people from their homeland. Even this continuum holds enormous potential for variation depending on the distances moved; the presence and scale of the host community; and the social, political, and religious organization of both hosts and guests (Mills 2011; Ortman and Cameron 2011). In archaeology, long distance migrations and movement of large numbers of people are usually easier to identify demographically and technologically than are shorter distance migration and/or the migration of individuals or small family groups. Yet, the smaller social scale fits better with many network models produced through agent-based modeling and other experimental methods.

Intermarriage is one example of migration at the individual side of the continuum. It is defined by the movement of one member of the couple into a community outside of

the group in which marriage partners are typically recruited. Proximity is usually a major determinant in where marriage partners come from; if not endogamous, or from their same settlement, they tend to come from local or adjacent groups (DeBoer 2008: Table 11.2 of his work; Harrison and Boyd 1972). I refer to marriage at this latter scale as local exogamy and contrast it with migration and intermarriage, which is outside of the local group's more regular marriage patterns. Using the definition of intermarriage as outside of normative exogamous marriage patterns, it encompasses both spatial and social dimensions. It may entail movement into communities in which different languages are spoken and where cultural practices are contrastive with those in the home community. This definition may include those who leave of their own free will as well as those in captive and refugee statuses (DeBoer 2008:234–236).

Individuals who move for marriage outside of their own communities are subject to many of the same advantages and disadvantages as other migrants. Disadvantages may be marked by inequalities between first comers and newcomers. These inequalities may be especially pronounced when intermarriage is forced and highly asymmetrical in power relationships, as with captives (Cameron 2010, 2016) or refugees. But in cases of noncaptives, the movement of marriage partners into new families may lend stability if not higher status to an individual's life history, especially if they bring with them skills and connections to individuals with high status (Mills *et al.* 2016).

Intermarriage is often cited as one of many causes for similarities in material culture but, with a few exceptions, archaeologists have not explicitly addressed it as a vector of technological transmission. Yet, it is widely recognized that intermarriage is most likely to occur at the edges of societies and/or in situations of colonialism where there are gender imbalances between colonists and colonized (Feuer 2016). As an example of the former, Coldstream (1993) points to several cases at the edges of the Greek state in which intermarriage was likely responsible for heterogeneous assemblages and possibly the spread of literacy. Examples of the latter include historical archaeologists studying colonialism, who also point to the importance of intermarriage—both forced and consensual—as vectors for social change, including technology (*e.g.*, Deagan 1985; Voss 2008).

Within Americanist archaeology, and especially in pre-colonial situations, the hesitancy to explicitly discuss intermarriage may be attributed to the impact of critiques of the New Archaeology's ceramic sociology of the 1960s and 1970 (Deetz 1965; Hill 1970; Longacre 1970). These studies emphasized decorative style over other attributes, and normative patterns of transmission, descent, and post-marital residence. In these cases, female potters were thought to have learned within matrilineal households and assumed to remain in or nearby these households after marriage. In addition to methodological issues such as formation processes (Skibo *et al.* 1989), one critique of ceramic sociology came from ethnographic examples, such as Hopi potters who acquired knowledge within multiple learning scenarios, some of which were from potters in other villages rather than close kin (*e.g.*, Stanislawski and Stanislawski 1978).

Notable among the original work of ceramic sociologists and their critics was the absence of extensive discussion of migration and its implications for transmission of pottery practices through intermarriage. Even Allen and Richardson's critique of kinship studies used by the New Archaeologists only mentions in passing the potentially confounding factor of "an influx of distantly related relatives" (1971, p. 50). This

is not surprising since the ceramic sociologists of the 1960s and their critics were working in a period in which migration was largely sidelined.

Most archaeologists working in the Southwest today now recognize migration was—and still is—a persistent process, but with vast differences in origins, scale, destinations, and impacts (e.g., Bernardini 2005; Cameron 1995; Clark 2001; Clark *et al.* 2013; Hill *et al.* 2004; Mills 1998, 2011; Mills *et al.* 2013, 2016; Neuzil 2008; Ortman 2012; Ortman and Cameron 2011; Woodson 1999). Nonetheless, the implications of migration and intermarriage of potters into host communities is still underdeveloped, particularly with respect to the innovation and diffusion process. For example, an overview of Southwest kinship by an archaeologist treats exogamy as a normative societal rule relating to clans, moieties, and villages (Ware 2014). While exogamy in this local sense is one characteristic of Southwest societies, exogamy is also an outcome of the movement and relocation of people across the region at very different social and spatial scales. Recent discussions of the spread of Rio Grande Glaze Ware from Western to Eastern Pueblos are one area in which migration and intermarriage has been recognized to be important vectors of ceramic change (e.g., Eckert 2007; Herhahn and Huntley 2017).

Another approach to intermarriage in the Southwest is Kohler's (2013) identification of the importance of exogamous marriage as a vector of cultural transmission in the context of the Pueblo *Sprachbund* (see also Bereznak 1995; Hill 2017; Whiteley and Snow 2015). In its original usage, *Sprachbund* refers to a language community, in which multiple language families may be spoken but that share many commonalities and convergences—more so than they share with surrounding groups. Bereznak (1995) was the first to argue for its application to the Pueblo Southwest based on several lines of linguistic evidence. Besides the U.S. Southwest, examples include the Northwest Coast of North America, the Balkans, Southern Africa, and Australia. Kohler (2013) argues that exchange, migration, and convergent evolution were “powerful blending forces” contributing to the strong similarities that characterize the Pueblo *Sprachbund* over nearly a millennium. One of these forces was “local exogamy...on the borders of linguistic groups” (p. 229). While I take issue with his use of “blending” rather than a more specific discussion of the practices of transmission, and his limitation of exogamy to the local or to borders of language groups, the concept of a *Sprachbund* is an important one for understanding how people, ideas, and technologies moved and still move across the Pueblo area. It emphasizes how shared practices connect distinctive languages and cultures of the Southwest. To use a network metaphor, the *Sprachbund* concept provides a way of thinking about how brokers provide lines of communication and learning that cross boundaries. Because *Sprachbunds* are not unique to the Southwest, investigation of how intermarriage produces ties across this larger community is important to understand.

But if we are to analyze more specifically how those ties are created—ties that reach both within and across linguistic boundaries—then it is paramount to look at what practices are shared and how people with different backgrounds and learning traditions become incorporated into new social situations. This is part of current critiques of the terms “hybridity” and “blending” by archaeologists studying culture contact in that they do not provide the social contexts of practice, performance, and meaning that is entailed in the transmission process (Liebmann 2013; Silliman 2013, 2015; VanValkenburgh 2013).

The study of intermarriage in the context of communities of practice is key to understanding the process of transmission, along with the contexts in which knowledge and practice have been transferred. For example, how do women who marry into a new community alter their craft production practices after marriage? What aspects of their learning are most conservative and which subject to innovation? Are there specific contexts in which innovation is encouraged and those where it is not? And, finally what enhances transmission within and across social boundaries?

Ethnoarchaeological and ethnohistoric studies provide some sources of models for understanding transmission of pottery practices after intermarriage. In the African Luo case, for example, female potters do not learn how to pot until after they have married and move into their husband's households within a patrilocal residence system (Herbich and Dietler 2008). Cross-culturally, however, most potters learn as children or adolescents (Crown 2014)—well before marriage, including in the U.S. Southwest. Nonetheless, intermarriage across language and/or tribal boundaries has the potential for altering practices of production both by the migrant potter and by those in the host society. In these situations, certain aspects of pottery production may be more resistant to change. Forming techniques (*e.g.*, David and Hennig 1972; Gosselain 2000, 2008) have been especially cited as more conservative attributes in the ethnoarchaeological literature. And as recently articulated by Whitney (2017), certain functional classes of vessels, such as water-carrying vessels, may be more resistant to change because their manufacture entails learned motor habits that are more complex than, for example, a hemispherical bowl. However, Gosselain cautions from African case studies that while shaping techniques are important for understanding different kinds of transmission, they are not closed systems and are often modified and combined (2008:170).

Decorative styles, on the other hand, are more likely to shift and multiple styles may be practiced by the same individual. Style shifting has been demonstrated in ethnoarchaeological case studies (Friedrich 1970), analogous to language switching in different social contexts. Potters may be influenced by other potters in their age cohort as much as by those in older generations (Graves 1981). Such examples of diverse sources for transmission, and the varied material outcomes produced by the same individual, are important to incorporate into any models of intermarriage and its consequences for technological exchanges. This diversity is consistent with more recent attention to the process of transmission in a broad range of ethnographic situations from hunter-gatherers to more sedentary societies (*e.g.*, Jordan 2014).

Intermarriage poses an important structural implication for the process of technological transmission in pottery production. If wives have already learned to pot before marriage, as might be expected in the Southwest, then we might expect that forming and finishing techniques may be more conservative than other ceramic attributes. This may be especially true of certain forms that require more potting expertise, such as canteens and large jars. Yet, shared decoration may be one way that potters in the host community influenced those marrying in and *vice versa*. Such examples are often referred to as “hybrids” but instead may be more usefully considered through the concept of boundary objects, which play an important role in heterogeneous societies.

Boundary Objects, Bridges, and Constellations of Practice

Leigh Star's (1989) concept of "boundary objects" is a significant part of the ideas about communities of practice that Étienne Wenger formulated with Jean Lave (Lave 2011; Lave and Wenger 1991; Wenger 1998, 1999). In fact, Wenger devotes a large section of his (1998) book to an elaboration upon Star's concept. As he outlines in a later publication, boundary objects are "bridges across practices" (Wenger 1999) and may be people, objects, activities and practices, or technologies. He uses the term "knowledge brokers" to refer to people who participated in multiple networks, much as brokerage has been defined in network science.

Central to Wenger's (1998) identification of people as boundary objects is their multimembership in a number of different knowledge communities. Objects may also be brokers in the sense that they may be used by people with different backgrounds and/or are understandable by people with different perspectives. Wenger's examples include clearly worded contracts and proposals, but in societies where oral communication is more important, his other example, "technological platforms that make communication across boundaries easier," is more apt. Finally, Wenger cites practices that place people with different experiences and perspectives together as a key to successful bridging.

Star and Griesemer (1989) provide an extended example of the concept of boundary objects in the context of museums, which host people from different backgrounds and with varied training and experience. Despite these differences, objects, catalog cards, maps, and other products span differences among users within the ecology of the museum. Using a natural history museum as an example—Berkeley's Museum of Vertebrate Zoology—they show how scientific specimens and other curated items are boundary objects, which may be used by people from multiple social groups. More specifically, these objects acknowledge the heterogeneity implicit in scientific work, and translate across different audiences.

Star and Griesemer further suggest that their conceptual approach is broader than other approaches to technology. They specifically critique Actor Network Theory (ANT), which also uses the term translations (*e.g.*, Callon 1986; Latour 2005), because of ANT's emphasis on managers and how they use or funnel interactions, usually for their own benefit. Instead, they advocate for an ecological approach toward social interactions that does not emphasize a specific individual and his/her place in a hierarchy, but rather individuals as representative of different social groups or "many-to-many mapping" (Star and Griesemer 1989:390).

Wenger (1998:107) elaborates on this by pointing out several key characteristics of artifacts that become boundary objects: (1) modularity, (2) abstraction, (3) accommodation, and (4) standardization. Modularity refers to the ability of things to be viewed in terms of its parts, such as sections of a paper. In terms of things, this need not literally be different portions or parts but each person who views or uses an object may focus on a different aspect such as decoration, contents, and size. Abstraction refers to the idea that the object may summarize more complex ideas, or some ideas may not be represented. The example Wenger provides is a map that is a representation of the terrain but does not, and indeed can not, represent the terrain in its entirety. Many objects are abstractions of other objects, whether as skeuomorphs—objects made in a form that imitates the form of objects made of other materials—or in terms of the use of

metaphor in form or decoration (Knappett *et al.* 2010). Accommodation refers to the ability of objects and spaces, such as offices, to be used by multiple audiences. In terms of objects, these may be shared forms or categories, as well as those that might move among people. In terms of spaces, Gosselain (2016) has argued that the concept of boundary object can be applied to plazas—spaces which are used by different people for different practices. And finally, standardization in this context refers to how objects are understood to include information contexts that are similar or regular enough for people to immediately understand what they are even if that understanding differs among individuals. What is important is that “the creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds” (Star and Griesemer 1989:393).

Using learning theory, Akkerman and Bakker (2011:140–141) discuss how boundary objects as artifacts work:

Not only people but also objects can play an essential role in crossing boundaries. In studies of boundary objects we also find...ambiguity. On one hand, boundary objects are artifacts that articulate meaning and address multiple perspectives. As already indicated by the definition by Star and Griesemer (1989), boundary objects have different meanings in different social worlds but at the same time have a structure that is common enough to make them recognizable across these worlds. However, it is not only interpretative flexibility that turns objects into boundary objects; boundary objects are organic arrangements that allow different groups to work together, based on a back-and-forth movement between ill-structured use in cross-site work and well-structured use in local work (Star 2010). Hence, they are “a means of translation” (Star and Griesemer 1989, p. 393) within a situation of multisite work relations and requirements” (pp. 140–141).

Pottery-serving vessels, especially bowls, are an artifact class that was especially important as a boundary object in Puebloan societies (Mills 2016). There is modularity in terms of how different people may focus on various aspects of their form, decoration, and use. They are abstractions in that their designs often refer to other aspects of Pueblo life, including weaving, ritual practice, identities, and other referents through metaphor (Hays-Gilpin and Schaafsma 2010; Ortman 2000; Sekaquaptewa and Washburn 2004). Physically, they moved among different contexts, from everyday lives to marked situations of consumption or feasts (Mills 2007a; Van Keuren and Cameron 2015)—a feature of Wenger’s accommodation. And they are standardized in terms of overall shapes and functional classes. Pueblo people moving into a community in which they were not raised would be very likely to recognize the use of these vessels based on their forms even if they did not know all the rules of etiquette, recipes, and performance details.

One aspect influencing the acceptance of an innovation is the visibility of the technology or its performativity (Rogers 2003). These may be private or public, but public performances may enhance acceptance. When the technology is deployed within practices that are highly visible and/or enhance status, they may work to promote the acceptance of new technologies or other ways of doing. In the Southwest, serving bowls are one category of objects that enhanced consumption in multiple contexts (Van

Keuren and Cameron 2015). These serving bowls operated as boundary objects—bridging potters and the people who used those pots especially in shared consumption practices (Mills 2016). These acts of consumption ranged from the daily to more marked contexts such as feasting. Such linkages form constellations of practice (Wenger 1998; see also Joyce 2012; Roddick and Stahl 2016a, b) that served to link communities over large geographical spaces.

Ceramic bowls were probably not the only category of vessels that operated as boundary objects, however. There are several other forms that also fit the above criteria, especially water jars, canteens, and cooking vessels, which were consistent parts of Pueblo household assemblages and widely recognized categories that crosscut Pueblo societies (and many non-Pueblo ones as well). My proposal is that formal/functional categories that are shared by different groups enable boundary objects to work. Support for this comes from current work in museums that engages Pueblo people in discussions of materials. A recent project bringing together Zuni tribal members to talk about museum objects, for example, found that there were two major ways in which Zuni objects were spoken about: (1) “stories and narratives about objects,” including their biographies and histories; and (2) “uses and practices around objects” (Srinivasan *et al.* 2010:750). As they pointed out, the function of each object was an essential part of what Zuni participants focused on—and the first response to open-ended questions such as “How would you describe this object.”

Zuni classifications of pottery underscore that emic categories are based on shape and then size distinctions within each shape class, both of which reflect overall use. Two main terms are used with modifiers: *sa’le* for open or bowl-shaped forms and *de’le* for restricted or jar forms (Hardin 1983:19–25; Walker 1979). These were originally recorded by Cushing and added to the catalog of collections made by James Stevenson for the Smithsonian Institution in the late nineteenth century (Stevenson 1883). In her assessment of Walker’s (1979) Zuni semantic categories for pottery, Hardin (1983:19) notes that actual use can often trump the open/closed distinction, so that a bowl that is used for bulk storage may be called by the same term as a storage jar. In general, however, Zuni terms reflect intended function rather than the re-purposing of vessels. These general forms used at Zuni in the nineteenth century have long histories of use and include water jars, serving bowls, cooking jars, storage jars, canteens, and a number of other special forms, some of which were used in serving (*e.g.*, ladles or spoons) and religious practice (*e.g.*, prayer meal bowls).

Similarly, Hopi and Tewa terms for different pottery categories emphasize open vs. closed forms, size, and function (Schaaf 1998:175–177, Appendix 3 of their work). In what appears to be a rank order, ethnoarchaeologists working at Hopi stated that potters see “ware, size, utilitarian form, use of Hopi rather than foreign designs, and choice of school of design...[as] the most vital matters,” and vessels made for their own use are in “traditional shapes such as the Piki bowl, mutton stew bowl and canteen” (Stanislawski and Stanislawski 1978:65). Most of these forms have been in use for over a millennium and by all Pueblo groups, although the specific ways in which they were shaped and decorated differed, as they still do today. As Bunzel (1929:86) noted, for Pueblo potters, “it is the utilitarian aspect of objects and activities that holds the center of interest.”

I argue that treating these general formal categories as boundary objects is more useful than the concept of hybridity for understanding the processes of culture contact,

community formation, and material culture diffusion. For Pueblo societies of the last millennium, ceramic vessels were recognizable in their forms and functions. Even neighboring groups, especially the Navajo, had adopted several of these forms by the eighteenth century (Brugge 1981; Carlson 1965).¹ While hybridity emphasizes the comingling of attributes, the concept of boundary objects emphasizes the more dynamic practices that produce large-scale regional similarities at one level, but still allowing for individual variation and even multiple expressions (*i.e.*, style “switching”) by the same individual depending on context, skill, and imagination. I illustrate how this might have occurred in the past by focusing on intermarriage and subsequent technological diffusion that has been documented through various sources including autobiographies, biographies, and ethnographies of Pueblo potters.

Inter-Pueblo Diffusion of Sacred and Secular Technologies

Despite language diversity, Pueblo people in the northern Southwest share many commonalities. As noted above, this has contributed to the formulation of the area as a “*sprachbund*,” which is defined as a region that encompasses linguistic variation but convergences of other aspects of social and cultural life (Jakobson 1931; Trubetzkoy 1931). One might even equate it, as one southeastern archaeologist recently has done, with an interaction sphere or “an area of shared understanding of the universe and what to talk about” (Seeman 1995:135).

Based on shared linguistic traits, Bereznak (1995) was the first to argue that the Pueblo region of the U.S. Southwest was an example of a *sprachbund*. Jane Hill points out that historical linguistics in the Pueblo Southwest reveals “a history of complex cosmopolitan interactions” and multi-lingualism (Hill 2017:128). Her evidence includes similarities across Pueblos for personages such as kachinas and clowns (Hill 2007), as well as songs and ritual vocabulary incorporating lines and stanzas from other Pueblo languages (Parsons 1925; Sekaquaptewa *et al.* 2015), and linguistic code-switching (White 1944). Religious sodalities, such as kachina and medicine societies, were widely shared across the Pueblo world, with documented transmission from one Pueblo group to another through migration and population loss (Blinman and Ware 2000; Ford 1972). Whiteley and Snow (2015) discuss the distribution of the gendered suffix “-*tiva*” added to personal names across the Pueblo area as additional evidence for widespread cultural interchange within the Pueblo *sprachbund*. Along with Kohler (2013), they argue that the basis for this lies in the extensive movement of materials and people that reaches deep into pre-colonial Pueblo history and which created “multiplex relationships” (Whiteley and Snow 2015:529) and even multi-ethnic communities.

Intermarriage in the Southwest would have created opportunities for transmission of a diversity of technologies across local community boundaries. Men’s involvement in religious sodalities that were shared across Pueblos and the widespread presence of common technologies is related to the ease with which different linguistic groups in the

¹ Although I focus on intermarriage between Pueblo groups in this paper, the concept of boundary objects and technological diffusion also applies to intermarriage between nomadic groups, such as the Navajo and Pueblo peoples. By the eighteenth century, Navajo potters made decorated pottery, including polychrome bowls and jars.

Southwest were already adapted to learning from each other because of their histories of migration (Kohler 2013). Materially, it is expressed in the ways in which pottery vessels were, and still are, “boundary objects”—linking diverse communities together.

Historical and ethnographic documentation of potters’ movement into different Southwest villages illustrates how production technologies changed after marriage. In some cases, they did this to conform to local stylistic traditions, especially when female potters moved in with their husbands’ families and their mother-in-laws were active potters. This kind of movement results in the reinforcement of stylistic boundaries and has been documented for contemporary Rio Grande Pueblos (Wallaert 2013). But in other cases, intermarriage of potters resulted in the innovation of new technological styles in their adopted homes. And in still other cases, these new production techniques were added to potters’ repertoires and throughout their lives they engaged in style “switching.” This process is analogous to linguistic switching in that the use of different styles is dependent on context, in this case the use, distribution, and consumption of vessels.

One example of migration, intermarriage, and technological transfer in the Southwest is the migration of Tewa speakers from the Rio Grande region to the Hopi Mesas, soon after the end of the Pueblo Revolt of 1680–1696. This was one of many migrations caused by Spanish conquest and colonization of the Pueblo area, which resulted in multi-ethnic/multi-lingual communities. Members of Tiwa, Tewa, and Keresan communities are known to have moved to the Hopi area in the historic period (Adams 1981; Capone and Preucel 2002:99; Hays-Gilpin and Gilpin 2018; Herr and Clark 1997), which likely followed earlier migrations in the late prehispanic period. Keresan speakers were present on Second Mesa (Hays-Gilpin and Gilpin 2018), while Tewa speakers established the village of Hano on First Mesa, near the two Hopi (Moqui) villages of Sichomovi and Walpi (Dozier 1966:24). Many of the migrants in the historic period returned to their home communities but the spatially and socially distinct Tewa village of Hano still persists.

Identification of specific cases of intermarriage and pottery production between Hano residents and other Hopi (Moqui) villages is difficult for the seventeenth and eighteenth century because of the lack of detailed historic documentation. However, the Pueblo Revolt period and its immediate aftermath saw changes in ceramic technology across the Pueblo world, some of which may have been in shared resistance to the Spanish and the forms and designs that had been adopted in the early colonial period culture contact (Adams 1981:Table 1 of their work; Capone and Preucel 2002; Mills 2002). The dominant pottery ware at Hopi in the fourteenth through sixteenth centuries was a highly polished, unslipped yellow ware (called Jeddito Yellow Ware) decorated with one to multiple colors of matte paints and coal-fired to high temperatures. One style within this, called Sikyatki Polychrome, was often painted with complex asymmetrical designs. But even before the Pueblo Revolt, seventeenth century pottery made at Hopi had attributes of Eastern Pueblo pottery including kick-up bases, taller necks, and new design layouts that are different from earlier Sikyatki Polychrome (called San Bernardo Polychrome), yet still made in the yellow ware tradition. Following the Pueblo Revolt, Hopi ceramic technology changed dramatically, with little in common with earlier ceramics. What archaeologists define as Payupki Polychrome was made, which some Hopi specialists consider to be a direct introduction of ceramic technology from Keresan migrants, with significant differences in vessel forms (Adams 1979).

While some of the designs are attributed to Keresans at Hopi, the situation may have been more complex and Tewa potters may also have contributed to the change. In either case, the post-Revolt period was one of intensive movement, interaction, and pottery innovation and diffusion. Pottery forms and building techniques were among the strongest attributes that were introduced by migrant potters.

Still another important change in ceramic production at Hopi occurred with the advent of the nineteenth century, when new slip combinations and designs were introduced. At least some of the changes in form and slip combinations were inspired by Zuni pottery. Hopis resided at Zuni during the smallpox epidemic of 1853 and again between 1864 and 1868 when there was another drought (Adams 1981; Cameron 1999:35–36).² When potters returned to Hopi, the vessels they produced were covered with white slips, like those produced at Zuni, and incorporated Zuni design layouts and motifs. Despite similarity in slips and designs, there were still differences in raw materials, proportions of shapes of bowl and jar forms, and associated differences in design fields. Hopi vessels tend to be more globular, with a lower center of gravity, shorter necks (and hence no separate neck design field), and less pronounced shoulders than Zuni vessels of the same period.

Such conformity to shape is what might be expected based on cross-cultural comparisons showing which pottery attributes tend to be conservative even in situations of culture contact. General forming and finishing techniques, such as use of the potter's wheel, coiling, or use of paddle-and-anvil, are the least likely to change (Crown 2014:76; Gosselain 2000, 2008; Roux 2010). This is because specific shaping methods are more embodied than decoration techniques and thus more resistant to change. As noted earlier, however, these different forming techniques should not be seen as monolithic categories, but rather ways in which different techniques might be variably incorporated, and are closely tied to potters' identities (Gosselain 2008:170). All Pueblo pottery was built by coiling and finished by scraping and polishing, but there were differences based on the use of turning plates or pukis, the sizes of the clay coils, and vessel proportions that were also less resistant to change because they, too, would have entailed embodied practices. Based on ethnoarchaeological comparisons, other differences in vessel forming, such as rim or handle finishing, in addition to surface finish and decoration (if any), may have been more likely to be the result of cultural choice (David and Kramer 2001:149). Hopi potters' incorporation of Zuni designs during the nineteenth century, but not their exact shaping techniques, fits this pattern. In profile, one could still distinguish a Hopi form from a Zuni form because of differences in the height of the neck, and proportions of shoulder to height, among other variables.

By the twentieth century, intermarriage of Tewa and Hopi speakers became common, especially between First Mesa villages (Dozier 1966). Most Tewa spoke both Hopi and Tewa, while most Hopi only knew a little Tewa (Kroskirty 1993:8). Kroskirty refers to the Hopi-Tewa as "culture brokers" for the way that they interacted with Hopi and Euro-American societies, including their participation in new or revived economic activities such as pottery production in the late nineteenth century (Kroskirty 1993:24;

² At least, one earlier such migration from Hopi to Zuni is documented for the period 1777–1780. Hopis temporarily migrated to Zuni during a long drought (Clemmer 1995:32). Spicer notes that in 1780, many Hopis were also taken to the Rio Grande Pueblos by Father Andrés Garcia, who "distributed them in various villages," and that the population at Hopi declined in a period of 5 years from 7494 to 798 persons (1962:195).

see also Dozier 1966:26–28). The most famous of these potters was Nampeyo, a Tewa woman married to a Hopi man. She inspired many other potters and was responsible for expanding the Hopi decorative tradition of both Hopi-Tewa and Hopi potters (Blair and Blair 1999; Kramer 1996).³ By the late nineteenth and early twentieth centuries, both Hopi and Hopi-Tewa potters made pottery in what is called Sikyatki revival style—a revival of decorative styles and vessel forms of earlier Jeddito Yellow Ware—despite many other ways in which the two societies remained distinct including language, ceremonies, and hairstyles (Dozier 1966:63). However, some potters (including Nampeyo herself) made pottery in both the new Sikyatki revival style as well as the older Zuni-inspired white-slipped ware (Bunzel 1929:64).

The ethnoarchaeological studies of Barbara and Michael Stanislawski at Hopi in the late 1960s to early 1970s document how innovations by Hopi and Tewa potters moved between the two speech communities. At that time, there were about 75 Hopi and 50 Hopi-Tewa active potters. In a very specific example of innovation and diffusion between Tewa and Hopi potters, they point to the use of a new, polished white slip technology with black or black and red designs that was begun *ca.* 1920–1925, and originated with a group of Hopi-Tewa potters from three different clans. It was later adopted by Hopi potters and produced by at least 49 potters across several villages, 41 of whom were still working in the 1970s when the Stanislawskis did their work. A specific bowl variant with a highly polished white-slipped interior and red exterior slip was an innovation by a Hopi woman who married into a Hopi-Tewa family in the 1950s and the practice was subsequently adopted by potters of both linguistic groups (Stanislawski and Stanislawski 1978:66–67). They use this as one of several examples to illustrate that decoration styles were regarded as personal choices that crosscut tribes, villages, clans, and lineages—one of the original critiques of the Deetz/Longacre/Hill hypothesis for transmission. It is also an example of how pottery at Hopi has served as a boundary object, linking members of both speech communities together.

There are several other ethnographic examples of migration and movement of potters in the Southwest that affected pottery production in their new communities. Parsons (1928) noted that potters who migrated from Laguna in 1880 taught their hosts at Isleta pottery making. As with the Hopi-Tewa migration, the migrants and hosts spoke different languages—Keresan at Laguna and Tiwa (a Tanoan language) at Isleta. Isleta potters only made plain ware before the Lagunas migrated, like their fellow Tiwa speakers at Taos and Picuris. The Laguna potters made both plain and decorated wares and were, according to Parsons, more skilled. An Isleta woman named Maria Chiwiwi, who was married to a Laguna man, learned how to make pottery from her female Laguna neighbor after her husband passed on. Interestingly, Isleta women who made Laguna style pottery were not those who already made the plain ware but women who

³ There are many fallacies about Nampeyo that have been perpetuated in the literature (Kramer 1996:189–192). One of these is that she learned how to make pottery when her husband worked for Jesse Walter Fewkes of the Smithsonian Institution, while he was excavating at Hopi sites in the area including Sikyatki. Her husband did not work for Fewkes and Nampeyo already knew how to make pottery. She and many other potters were inspired by the diversity of decorated pottery that came out of the excavations. Another fallacy is that she started to pot because of the influence of Thomas Keams, a prominent Hopi trader. He commissioned some pieces, but again, pottery making was already an important craft. Also false is the idea that Sikyatki-revival designs replaced the white-slipped Polacca Polychrome, inspired by Zuni designs. A 1900 Edward Curtis photograph of a group of Nampeyo's pottery at the time of firing shows that she was making both. (Wade and Cook 2012:152; Braun Research Library Collection, Autry National Center; P.37632).

had never potted. They only made painted wares once they learned how to make pottery (Parsons 1928:604–605), creating two different communities of practice within Isleta, one shared by two different linguistic groups, the other only by the original Isleta potters. Paints for the decorated vessels were acquired from the Laguna migrants, who continued to procure white and red pigments from their traditional areas near Old Laguna and black paints from along the Rio Puerco (p. 605), but clays were sourced locally.

While the above cases are examples of multiple families moving in with other Pueblo groups, there are also cases of individual movement through intermarriage that has resulted in diffusion of pottery practices, counter to the conformist transmission model discussed by Wallaert (2013). For example, Mary Ester Archuleta learned pottery making from her mother, Margaret Tafoya of Santa Clara. She married a man from San Juan and subsequently made pottery in the style of both Pueblos (Barsook *et al.* 1974:52).

In another example, one of the prominent potters at Zuni in the twentieth century was Daisy Hooee Nampeyo, a granddaughter of Nampeyo (Blair and Blair 1999; Chappell 2015; Fowler 1977; Lanmon and Harlow 2008). Pottery making at Zuni decreased significantly in the early to middle twentieth century followed by a revival in the late twentieth century that continues to the present day. While some Zuni families continued to make pottery in the early to mid-twentieth century and aided in this revitalization (Chappell 2015), expert potters from other Pueblos, including Daisy Hooee Nampeyo, also helped with the revitalization. She moved to Zuni in 1939 and taught pottery to many women in the pueblo out of her home as well as teaching pottery in the Zuni High School from the 1960s to 1974 (Lanmon and Harlow 2008:504; Rodee and Ostler 1986). Some of the vessels were made for the tourist and art markets, but others for Zuni household use (especially large stew bowls) and ceremonial purposes. Several of her students were members of the Zuni Olla Maidens, who performed at festivals such as the Gallup Inter-Tribal Ceremonial. Daisy's own pots were mostly made in Hopi Sikyatki revival style, using clay from Hopi's First Mesa (Fowler 1977:60), but she also practiced style switching and made Zuni Polychrome (Fowler 1977:64). Her forms were more consistently Hopi, however, including the wide-shouldered vessels that were part of the Sikyatki revival. These vessels take a lot of skill to make because the upper vessel walls need to be thinner to ensure that the form does not collapse of its own weight. Such embodied skill would have been more difficult to unlearn and in Daisy's case, she was not pressured by in-laws to alter her building techniques.⁴

Another potter who married into Zuni was Jennie Laate (1933–1994), who was from Acoma and married Noel Laate. She replaced Daisy Hooee Nampeyo as the high school teacher of pottery making in 1974 and continued to teach there until 1990. Many of Zuni's most active potters in the late twentieth century were her students (Hardin 1983). Jennie's designs were consistently in the Zuni style, but Rodee and Ostler (1986:71) point out that her deer designs were not outlined in the typical white paint and her forms veered from the traditional Zuni Polychrome

⁴ Daisy Hooee Nampeyo's biography is remarkable involving almost losing her eyesight, adoption by a wealthy Anglo woman from California who arranged medical treatment, and living outside the SW to attend L'Ecole de Beaux Arts in Paris before she moved to Zuni.

in that they were much higher shouldered with narrow bases, like Acoma pots. They also point out that many of her students' vessels also have higher shoulders and narrow bases, illustrating how subtle differences in shape were learned and diffused into the community.

As these examples show, intermarriage of Pueblo potters created opportunities for cross-Pueblo crafts learning, innovation, and diffusion. While some potters adopted the technology and decorative styles of the village that they moved into, especially in the Rio Grande, others retained many if not all of their original learned technologies and even styles of decoration. Still others, especially those more skilled, switched between different styles of decoration and these individuals often affected the direction of adoption. This style switching accounts for overlapping production of older and newer styles in the corpus produced by a single potter. Styles of decoration and even forming techniques crosscut villages and language communities in the case of Hopi, where intermarriage was relatively close. With increasing spatial distance, even within hand-built coiled-and-scraped pottery, differences in shape between Pueblos were present that were often retained by potters who intermarried into new communities. Members of different Pueblos and even of language communities shared overall pottery vessel categories, design elements, and often slip combinations. In this way, Pueblo pottery vessels were boundary objects that linked people together, just as did the intermarriage of women into new communities, positioning both pots and people as brokers in networks of interaction.

Boundary Objects Archaeologically: Prehispanic Pueblo Water Jars in the Mogollon Rim Region

An archaeological case study of Pueblo water jars of the late prehispanic period provides an example of how boundary objects worked in a case study of migration and intermarriage. In the semi-arid Southwest, water procurement and storage in necked jars was an important practice across the area.⁵ However, there is a great deal of variation in water jar pottery production attributes including clays, tempers, shape proportions, handle/lug types (if any), neck heights, rim flare, volume, slips, polishing, paint types, design field placement, design motifs, individual design elements, fuel choices, and firing regimes. Archaeologists in the Southwest generally use the ware concept to refer to configurations of technological attributes that co-occur. Decoration is used to identify types that are more temporally sensitive categories within wares.

In the Pueblo Southwest of the eleventh through fourteenth centuries, water jars were nearly always slipped and painted. They were used to collect water from wells, springs, and rivers and would have been carried through public spaces and clearly in view. Edward Curtis' iconic photographs show women and girls in different Pueblos carrying these vessels for water collection (Fig. 1).⁶ By analogy with historic and ethnographically documented use, this collection would have

⁵ Another closed form for carrying water was the canteen, usually with two handles for tying a strap.

⁶ While many of his subjects were dressed up in fancy clothing, not thought to be typical work clothes, the use of the vessels in these contexts is not disputed.



Fig. 1 Acoma women walking with water jars to collect water. Curtis Mo. 1168. Forms part of Edward S. Curtis Collection (Library of Congress). Published in *The North American Indian/Edward S. Curtis*. [Seattle, WA.]: Edward S. Curtis, 1907–1930, Suppl., v. 16, pl. 570. Downloaded from the U.S. National Archives; copyright held by the National Museum of the American Indian (nmaiarchives@si.org)

been done most often by women and young girls and their volumes related to age (Hardin 1983). Like decorated serving bowls, they would have been particularly active as boundary objects because of common understanding of their use and their public visibility—and hence performativity—even across linguistic and other social boundaries.

The thirteenth century Southwest was one of increasing aggregation, environmental challenges, and extensive movement and migration (e.g., Cameron 1995; Glowacki 2015; Mills 1998, 2011; Ortman 2012; Ortman and Cameron 2011). By the end of the thirteenth century, migration resulted in the depopulation of the Four Corners—most notably the Kayenta and Mesa Verde areas. Commensurately, population densities increased in other areas, including the Rio Grande and still-occupied Western Pueblo areas, and even parts of the southern Southwest that were part of the Hohokam World (Clark 2001; Clark and Lyons 2012; Hill *et al.* 2004; Mills *et al.* 2013; Neuzil 2008; Woodson 1999). These migrations followed smaller-scale interactions that likely included exchange and intermarriage in the generations before. For the purposes of this example, I focus on the Mogollon Rim region, which divides drainages flowing north into the Upper Little Colorado from those flowing south into the Salt River. It is an area that has been variously called Mogollon Pueblo (south of the Mogollon Rim), and the southwest Cibola area (north of the Rim) (Peoples 2018).⁷

One innovation in ceramic technology that was most certainly brought by migrant potters was the use of the turning plate. This was a specialized pottery form that was first made in the Kayenta area of northeastern Arizona. Its occurrence in a female burial, along with other potting tools, is one of the main lines of evidence for attributing prehispanic pottery production to women (Beals *et al.*

⁷ This is also the area where Broken K and Carter Ranch are located, the sites that Longacre (1970) and Hill (1970) used to develop their ceramic sociology arguments.

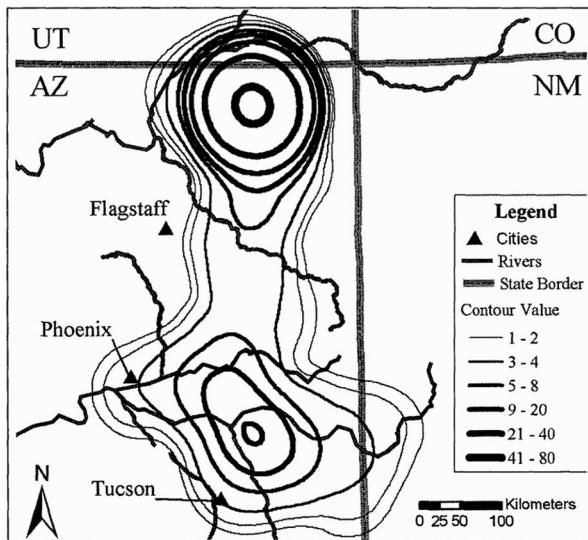


Fig. 2 Density distribution of perforated plates (all periods). After Lyons and Lindsay 2006:Figure 2 of their work. Reprinted by permission of the publisher (Taylor & Francis Ltd, <https://www.tandfonline.com>)

1945:138; Crotty 1983:30)—a pattern that continued with few exceptions until the historic period (Crown 2014). The distribution of these turning plates is time-transgressive from the Kayenta area, where they appear earliest, to what is present-day southern Arizona, a maximal distance of 600 km (Fig. 2; after Lyons and Lindsay 2006: Fig. 2). While plates with single or multiple rows of perforations below the rim have been recorded, there are also many that are unperforated. In both cases, they are interpreted as pottery making turning plates. Many have the high degree of exterior basal wear that is expected from use in this way, have been recovered in association with other pottery tools, and at least one with clay still adhering to the surface (Haury and Hargrave 1931; Mills *et al.* 2016).

Turning plates were made with local clays and tempers (*e.g.*, Stinson 1996) and so it was the diffusion of the practice rather than exchange that accounts for their distribution. Moreover, coiled-and-scraped technology was used by these potters, which is distinctive from the paddle-and-anvil technology used to build vessel walls in the southernmost areas where they moved. Potters made both serving bowls and water jars among other specialized forms. The distribution of plates is a lynchpin to arguments about not only widespread Pueblo movement at the scale of a diaspora, but also for several other innovations in pottery technology including a new ware called Salado polychromes beginning in the late thirteenth century (Clark *et al.* 2013; Clark and Lyons 2012; Crown 1994).

In the southern, Southwest northern potters and their families initially lived in enclaves, separately from their hosts, but within a couple of generations, these migrant families' children most likely intermarried with local families. By contrast, sites in the Mogollon Rim region do not have distinctive enclaves of migrant households (Mills 1998). Instead, this upland region was one in which aggregated villages incorporated people without distinctive differences between households in the late A.D. 1200s and

early 1300s. At the same time, there was an increase in and diversification of religious architecture, ceramic technology, and multi-craft specialization that has been attributed to smaller-scale migrations. Who exactly were the migrants has been a point of debate. Some archaeologists have argued that migrant Kayenta potters using plate technology for forming and northern design layouts intermarried into these communities (e.g., Lyons 2015). Others reject any Kayenta migration and attribute changes as coming from more localized movements within the general Mogollon Rim region (Whittlesey and Reid 2015). No one disputes that there was migration and intermarriage at some scale.

One of the problems with this debate about which sites were occupied by Kayenta migrants is in trying to assign entire sites or spatial divisions of settlements to a single group from northeast Arizona. Instead, I argue that the above facts should be viewed in light of intermarriage of men and women from the northern Southwest into the Mogollon Rim area, especially the upper tributaries of the Little Colorado River. These included but were not exclusively from the Kayenta area, who had already established connections as early as the 1100s. Other areas that likely contributed to population movement are those who were living in the Hopi Mesas/Tusayan area, as well as to the south close to the Middle Colorado River, such as the Hopi Buttes area. These earlier examples of intermarriage created pathways for later migrations of the A.D. 1250–1280 period when the Kayenta area was depopulated. In none of the periods are there separate sites or room blocks occupied by migrants but the use of turning plates, local production of early Salado polychromes, white ware bowls and jars decorated with northern designs, and water jars with northern forms all converge toward the movement of potters into the area during the A.D. 1200s. In addition, although I focus here on women's crafting, this is also the period in which we see a diversification in religious architecture, including kivas with loom holes. These kivas were used by men for weaving and come in a variety of shapes (D-shaped and rectangular being the most prominent), and have clear parallels with kivas in the Kayenta-Tusayan areas.

White ware ceramics throughout the greater Mogollon Rim region, which encompasses the upper drainages of the Little Colorado River in present-day Arizona (Fig. 3), exhibit diversity in a number of different attributes including form, temper type, paint type, and design layouts and content. The variation in the assemblages from some areas, such as the Hay Hollow Valley, is high in the AD 1200s, as are contemporary assemblage just below the Mogollon Rim in the Grasshopper area (Zedeño 1994). Carter Ranch and Broken K Pueblos are two sites that were excavated by Paul Martin and his colleagues and became the quintessential Southwest examples of ceramic sociology promoted by the New Archaeologists (Hill 1970; Longacre 1970; Martin *et al.* 1967). They argued that similar ceramic designs on potsherds from different rooms were because of shared learning and transmission from mother to daughter and could be used to identify a matrilocal/uxorilocal residence pattern.

While some of the variation present in the ceramic assemblage is because these sites were occupied for several generations, it is also clear that potters with different learning frameworks were responsible for generating diversity. However, because the possibility of migration and intermarriage was not considered as part of their models, the variation was primarily interpreted as stemming from different

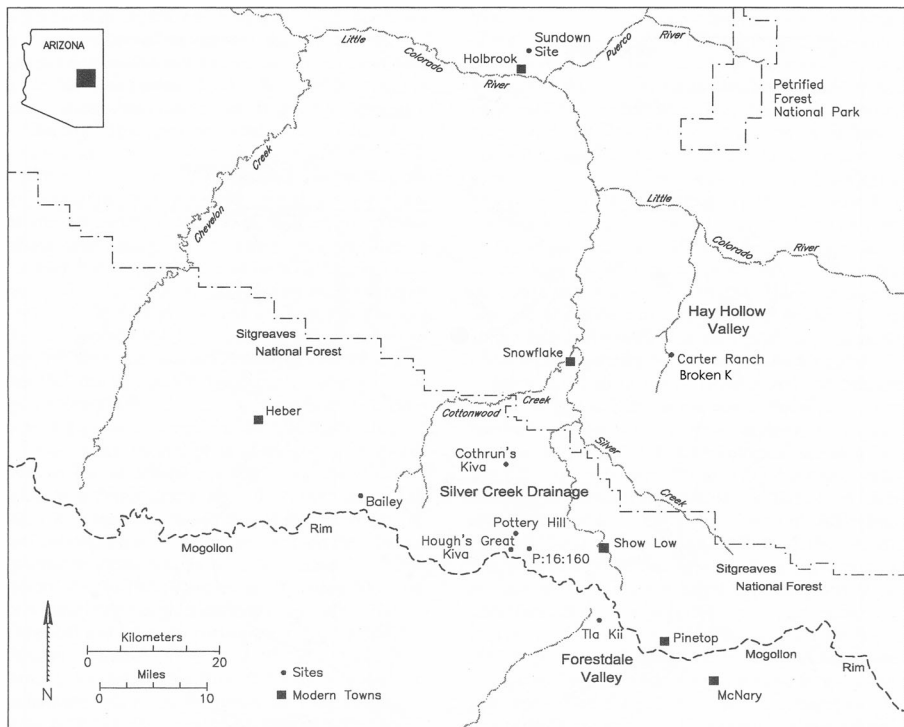


Fig. 3 Map of East-Central Arizona, showing locations of sites mentioned in the text. Modified from Herr 2001:Figure 1.1 of their work courtesy of the University of Arizona Press

local family traditions. Broken K Pueblo, consisting of about 95 rooms, and was occupied the latest, from about A.D. 1150 to the A.D. 1280s (Hill 1970). Based on the examples presented earlier in this article, vessel forms, including overall proportions, neck heights, and rim eversion suggest that there were multiple learning frameworks or communities of practice. I focus on water jars here because of the complexity of their forming and decoration and their potential roles as boundary objects.

Several different white ware traditions are known from northern and east-central Arizona. These wares, especially after A.D. 1000, are distinguished on the basis of paint type and temper and include Cibola White Ware (sherd temper, mineral paint), Tusayan White Ware (sand temper, carbon paint), and Little Colorado White Ware (sherd temper, carbon paint) (Hays-Gilpin and van Hartesveldt 1998). Paint and temper attributes co-occur with a number of other differences including firing regimes, clay types, forms, and design styles although some of the latter crosscut wares to form “analogous types” (Colton 1943). These crosscutting styles may be the result of emulation, but when reproduced on vessels that are also morphologically distinct from vessels that were made in the local

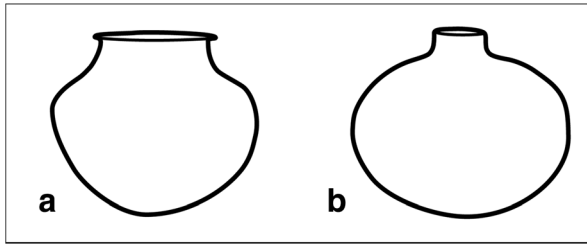


Fig. 4 **a** Tusayan White Ware jar form (Flagstaff Black-on-white). **b** Cibola White Ware jar form (Tularosa Black-on-white) showing contrasting thirteenth century shapes. Original vessels are type examples from the SW virtual Museum (<http://swvirtualmuseum.nau.edu/wp/>). Figure drawn by Kelsey Hanson

tradition (*i.e.*, Cibola White Ware), there is a greater confidence in attributing their production to the movement of potters.

Kayenta area potters making Tusayan White Ware in northeastern Arizona formed jars with a high shoulder, a short neck, an everted rim, and no handles (Fig. 4a). By contrast, other potters adhered to contemporaneous Cibola White Ware forms, which were more globular and with a short stove pipe neck (Fig. 4b). Thirteenth century sites in the Mogollon Rim region did not adhere strictly to any of these. Rather than seeing these as hybrids, however, they should instead be seen as ways that potters engaged with these jars as boundary objects and brought with them different learning traditions at the same time as they created new products within a nonconformist mode of pottery production.

As an example, Fig. 5 shows a jar from Broken K—a late Cibola White Ware with sherd temper in a light gray paste that indicates it was made in the southern Colorado Plateau. The relatively short, slightly flared rim, and dense decoration in Kayenta style using a Y-frame layout is more typical of Tusayan White Ware. Figure 6 is an almost identical design, but a Tusayan White Ware that was collected from the Batwomen Site in northern Arizona. The vessel shown in Fig. 5 was most likely made by a northern potter moving into the Broken K area who switched to local clays and tempering materials, as well as to mineral paint.

The vessel in Fig. 7, from Broken K, has a similar overall design layout with its use of diagonal sections incorporating many northern design motifs, but was also executed in Cibola White Ware technology. Vessels such as these have been found on thirteenth century vessels throughout the Mogollon Rim area in the mid- to late thirteenth century, with attributes that are both northern and local (Zedeño 1994). While having a more direct rim and stove pipe neck of the Cibola White Ware, the massing and selection of the elements is again in a northern style. Figure 8 is another Cibola White Ware with the characteristic stove pipe neck and with its main design field framed both top and bottom by circular bands around the body. The motifs on the body of the vessel are made up of series of small squares that are characteristic of more northern styles, often called Betatakin style. These small squares have been interpreted as representing cotton textiles, specifically using a



Fig. 5 Cibola White Ware (Kayenta style) from Broken K Pueblo, Room 69, East Wall Trench. Courtesy of the Field Museum, Image No. A99842, Catalog No. 282970, after Martin *et al.* 1967:Figure 99 of their work

technique called weft-wrapped openwork. In fact, all of the northern styles, whether Tusayan, Kayenta, or Betatakin, are widely recognized as coming from textile patterns. A similar argument has been made by Ortman (2000) for thirteenth century Mesa Verde White Ware.⁸

The above vessels are quite distinct from some other thirteenth century Cibola White Ware from the Mogollon Rim region, including Broken K. Tularosa Black-on-white was produced over a large swath of the southern Colorado Plateau and widely exchanged to below the Mogollon Rim (Wilson 1999; Zedeño 1994). One vessel from Broken K shows how different the interlocking solid and hatched curvilinear design layouts of Tularosa style are from the Tusayan/Kayenta/Betatakin designs (Fig. 9).⁹ This is probably a late version since the design incorporates parallel rather than cross hachure, more like Pinedale style. The Pinedale style incorporates aspects of both Tularosa and Kayenta designs (Crown 1994; Zedeño 1994). Figure 10 shows another Cibola White Ware vessel from Broken K that uses a Y-frame layout, but with parrots, and is more typical of Pinedale style.

Contrasting with the above examples, but also executed in Cibola White Ware technology, is the vessel shown in Fig. 11. Here, all over, solid designs are used within a banded layout. The neck and globular jar form is more Cibolan but if it were executed in carbon paint and with clays characteristic of Little Colorado White Ware made to the north of Broken K, it would be called Walnut (B) Black-on-white. However, it is clearly made in Cibola White Ware technology. This style, with multiple solid framing lines

⁸ The densest designs (Figs. 5, 6, and 7) are those found on painted cotton textiles while the design painted on Fig. 8 depicts a weft-wrapped openwork textile.

⁹ Late examples of Tularosa black-on-white closer to the Continental Divide near Zuni (the Quemado/Fence Lake area) also incorporated denser and more geometric designs from Kayenta/Tusayan repertoires and may also be where Kayenta/Tusayan migration occurred (Mills 2007b).



Fig. 6 Tusayan White Ware (Kayenta Black-on-white) from Batwoman House. Courtesy of Northern Arizona University, on loan from the University of Utah to Navajo National Monument (Catalog No. 436)

and opposed step-frets on Cibola White Ware vessels, became common in the Hay Hollow Valley suggesting closer affinities to the Middle Colorado River/Hopi Buttes area than the Kayenta area indicating that there was not a single source for potters moving into the area.

The diversity of styles evident at Broken K Pueblo—all made with local, Cibola White Ware technology—parallels the findings of others working on collections below the Mogollon Rim (Zedeño 1994). While some of the incorporation of northern styles might be a product of emulation, the degree to which overall design layouts and neck treatment also conformed to northern production canons suggests otherwise. The most



Fig. 7 Cibola White Ware (Tusayan style) from Broken K Pueblo, Room 39, Level B. Courtesy of the Field Museum, Image No. A99845, Catalog No. 284076, after Martin *et al.* 1967:Figure 101 of their work



Fig. 8 Cibola White Ware (Betatakin style) from Broken K Pueblo, Room 33, Floor, Pit O. Courtesy of the Field Museum, Image No. A99846, Catalog No. 283245, after Martin *et al.* 1967:Figure 102 of their work

parsimonious explanation is that these vessels were formed and decorated by northern women who moved into Broken K through intermarriage. Just how far north may have varied since there are design layouts and motifs that are found from a large area north of the Little Colorado River, from the Kayenta region to the Hopi Buttes.

The degree of creativity and skill in the building and execution suggests that these potters were not subject to the “long arm of the mother in law” (Herbich and Dietler 2008), which would have required re-learning and building vessels that were more like those already made in the area. As Waellart documented, when there is re-learning of pottery, it tends to follow all steps, not partial adoption of different shape and design attributes. The conclusion that some patrilocality was present at Broken K must be considered, similar to the ways that ethnographically documented boundary crossing occurred in the historic and ethnographic Pueblo Southwest. The diversity of religious



Fig. 9 Cibola White Ware (Tularosa style) from Broken K Pueblo, Room 69, Levels B, C, and Floor #1; also Room 4, Level B. Courtesy of the Field Museum, Catalog number 283475, after Martin *et al.* 1967:Figure 98 of their work



Fig. 10 Cibola White Ware (Pinedale style) from Broken K Pueblo, Room 41, Floor 1, Pit A. Courtesy of the Field Museum, Image No. A99843, Catalog No. 282868, after Martin *et al.* 1967:Figure 100 of their work

architecture at Broken K, especially the presence of D- and rectangular-shaped kivas that are new to the area and that appear earlier in the Kayenta/Tusayan area, argues for a great deal of interaction, possibly also including northern men. Both of these may be the case in areas with permeable boundaries. In the case of Broken K, there is no evidence that the entire site is a Kayenta/Tusayan enclave, so women and men must have been moving on a more individual, rather than group, scale. It is likely that once they moved, potters shared designs and vessel building traditions across their age cohorts, as has been documented ethnoarchaeologically (Bowser and Patton 2008; Graves 1981), further complicating the picture.

Rather than wholesale adoption of local ceramic forming and decorating, potters making the local Cibola White Ware in the late thirteenth century seem to have retained many of the Tusayan White Ware and Little Colorado White Ware shape and decorative attributes but tweaked them. They kept the dense black designs, but began to execute them in mineral paints. Higher necks were used, closer to Cibola White Ware forms. To call these vessels simply hybrids, however, does not bring out the way that these vessels



Fig. 11 Cibola White Ware (Walnut B style) from Broken K Pueblo, Room 33, Floor, Pit O. Courtesy of the Field Museum, Image No. A99841, Catalog No. 283244, after Martin *et al.* 1967:Figure 103 of their work

operated as bridges or boundary objects. By adopting some but not all of the aspects of Cibola White Ware, there was a maintenance of ties to their original areas. The incorporation of visual cues referencing highly valued textiles but rendered in paint on ceramics also speaks to cross-Pueblo interactions. Rather than conforming, these vessels were the product of highly skilled potters who added to the design repertoire of the local potting community ratcheting up the production and skill by local potters, as has been argued for the later migrations into the area (Mills *et al.* 2016). By the end of the occupation of Broken K, and other sites in the area dating to the late thirteenth century, a new style emerged (Pinedale style) that drew on both Cibola and Tusayan designs. This style was made on both white and red wares for the next two to three generations, even after the lower elevation areas of the Mogollon Rim region were depopulated and settlements closer to the Rim were occupied.¹⁰

An important factor in the production of both white and red ware vessels was that the products of the potters in the Mogollon Rim area, whether northern or local, or both, were producing many more vessels than for their own household needs. Virtually, all white ware distributed below (south) of the Mogollon Rim was imported, especially in the thirteenth century (Wilson 1999; Zedeño 1994). Over the next century, community-scale specialization of both white and red ware became more common above the Rim, with commensurate differences in consumption between producer and consumer villages, yet linked by shared contexts and cuisines (Mills 2016). The movement and intermarriage of skilled potters was an important part in the intensification of specialized production in some villages, especially those living above the Mogollon Rim (Mills *et al.* 2016). But these products were distributed differentially to other communities below the Mogollon Rim.

Discussion

The Pueblo IV period (A.D. 1275–1550) of the northern Southwest has been recognized as not just a period of aggregation, but one of social coalescence stemming from widespread migration and regional reorganization (Adams and Duff 2004; Hill *et al.* 2004). The communities that formed in the late thirteenth century were multi-ethnic and likely multi-lingual, drawing in migrants from multiple locations (Clark *et al.* 2018). In most cases, research on the Pueblo IV period migrations has looked at the social groups moving at the scale of households, sodalities, and less on the movement of individuals through intermarriage. The transfer of technologies in pottery production has been discussed in many of these works on Pueblo IV period communities, including Rio Grande Glaze Ware (*e.g.*, Herhahn and Huntley 2017), Hopi Yellow Ware (*e.g.*, Eckert 2007), and Salado polychromes made in southern Arizona (*e.g.*, Clark *et al.* 2013; Clark and Lyons 2012).

These migrations did not take place solely in the late thirteenth century—migration was a way of life for Pueblo people in the Southwest (Cameron 1995). The process of

¹⁰ One of these sites is Bailey Ruin (*ca.* A.D. 1275–1325), where NAA data have shown that both white and red ware with Pinedale style designs were made with the exact same clays, which also compositionally matched prepared (sherd-tempered) clay found in a subfloor vessel (Herr *et al.* 1999). There is also ample evidence of turning plates and production of Salado polychromes.

aggregation began in the early A.D. 1200s, although not at the scale seen in the post-1275 period. Aggregated pueblos were spaces where people from disparate locations came together, including those along the southern drainages of the Colorado Plateau. However, because of the absence of enclaves for many of these sites, such as the Bailey Ruin (Kaldahl *et al.* 2004; Mills 1998), there have been debates about the source(s) of migrants into the area (*cf.* Lyons 2015; Whittlesey and Reid 2015). I suggest that the reason for this ambiguity is because of a high degree of more individual movement from a broad geographical area into these Pueblo spaces.

Broken K Pueblo was one of the earlier settlements, where people moved with different backgrounds, and which was then depopulated when nearby Pueblo IV villages in the Upper Little Colorado, Silver Creek, and Homo'lovi areas received an influx of migrants at the end of the thirteenth century (Adams and Duff 2004). Unlike the Pueblo IV villages, residents of Broken K and other nearby thirteenth century sites produced and used many vessels decorated in black-on-white and very few of the polychromes found elsewhere or later in the region.¹¹ It is the communities of practice surrounding black-on-white vessels, rather than polychromes, which are the focus of this paper and which form the basis for comparisons to later communities (especially those in Cordell and Habicht-Mauche 2012).

This article has argued that the innovation and diffusion of technologies used in the production of black-on-white vessels was at least partially inspired by potters moving into the southern reaches of the Colorado Plateau through intermarriage. Vessel forms (especially those incorporating shorter and flared necks), design layouts such as the Y-frame, and design motifs composed of dense black designs inspired by textile weaving all point to potters moving into the area from the Kayenta/Tusayan/Hopi Buttes areas. The incorporation of women into these communities was facilitated by their participation in pottery production, and especially in the production of water jars that would have required a great deal of skill. I have argued that these served as boundary objects within communities of practice that encouraged creativity rather than conformity.

For the Southwest, Spielmann (2004) pointed out that during the aggregations of the Pueblo IV period, ceramic diversity differed widely across the Southwest. Some areas, such as the Mogollon Rim or Silver Creek area, evidence very high diversity while others, such as the Rio Grande Pueblos, relatively low diversity. Kohler *et al.* (2004) identify conformist transmission in the Rio Grande Pueblos and argue that it was part of a wider cooperative basis for village integration. However, such an argument does not seem to apply to the same extent in the Mogollon Rim/Silver Creek area, including the Pueblo III village of Broken K in the Hay Hollow Valley nor to other contemporary villages, such as Chodistaas, just below the Rim in the Grasshopper area (see Zedeño 1994).

What made these Western Pueblo villages more innovative and more diverse in terms of technology over their Eastern Pueblo counterparts? I have argued that the high degree of intermarriage as a result of migration, coupled with the skill of potters who

¹¹ Broken K has a late occupation that is characterized by early Roosevelt Red Ware (Pinto Polychrome) as well as late White Mountain Red Ware of the Zuni series (St. Johns Polychrome and Springerville Polychrome) (Martin *et al.* 1967). The latter two types may have been made in the Hay Hollow Valley but the frequencies are low, like those in the Mogollon Rim region where White Mountain Red Ware was not produced until the late A.D. 1200s with glaze paints and which has been separated out as the White Mountain series.

moved into the area (Mills *et al.* 2016), created the conditions for innovation and diversity. Highly skilled potters from northern Arizona brought with them new technologies and design repertoires and instigated a fluorescence of ceramic production. Artistic skill in Pueblo societies is a form of social status; the richest female burial in the Kayenta area was a potter (Mills 2000). Thus, when the high-status individuals were the ones marrying in at the same time as aggregation was occurring, they helped to promote creativity and diversity.

In known examples of migration and intermarriage, potters who were highly skilled have influenced local pottery production in terms of forming methods, color combinations, and choices of designs. In Pueblo society today, skilled potters are highly regarded within their communities and this would have been likely in the past as well. This would have elevated their status and the transfer of knowledge in different ways—horizontal, oblique, and vertical. Even short-term co-residence in multi-lingual, multi-ethnic situations such as Hopi movement to Zuni to escape drought and diseases resulted in adoption of new slip colors and design styles by Hopi potters that visually point to Zuni. These ethnographic studies also show how easily it is for style switching so that an individual potter may use different layouts and slip colors albeit with subtle shape differences that tend to mark different potting communities.

The concept of “boundary objects” helps to link different communities of practice creating constellations of practice (Roddick 2009; Roddick and Stahl 2016a, b) that apply well to the Southwest. Derived from Star and Griesemer (1989; see also Star 2005, 2010) and elaborated on by Wenger (1998), boundary objects are touchstones for different groups, each of which may have different interpretations or assign different meanings to the objects. *Importantly, they do not create boundaries but rather bridge groups.* Ann Stahl (2016:207) discusses how vessels with certain visual properties, such as mica slips, were popular across a range of different groups but each group viewed them slightly differently. They connected people and practices across regions. Olivier Gosselain (2016) suggested that markets may also represent boundary objects—places on the landscape that people flow through but regard and experience quite differently depending on which group they come from. He also points to pottery vessels as boundary objects and shows how many of the Niger River examples were decorated with designs that originated with textiles. Similar kinds of cross-media associations have been discussed in the Southwest for pottery and textiles (*e.g.*, Hays-Gilpin and Schaafsma 2010; Ortman 2000). As boundary objects, pottery decorated with textile designs had the ability to link different communities of practice, each of which would have had different knowledge bases and skills. And as many of the contributors to the recent volume on “Knowledge in Motion” point out (Roddick and Stahl 2016a, b), boundary objects entail power relationships and agency for both producers and consumers.

Potters moving on an individual basis into the southern Colorado Plateau communities actively used water jars as boundary objects. These potters were in a network and when they moved to new locations, they became brokers in a structural sense. The innovation and diffusion of ideas and technologies is a prominent part of network science approaches, including those addressing brokerage, that are complementary to a communities of practice approach. Network theory suggests that there are several aspects of network topology or structure that enhance the adoption of an innovation that I briefly summarize here to provide a way to help explain why boundary objects

operated differently between the Eastern and Western Pueblos during the thirteenth century.

First, networks with greater heterogeneity, or multiple components or subgroups, are able to spread innovations further than are those that are highly homogeneous—given certain conditions. Ugander *et al.* (2012) tested this with a large-scale network and found that the number of connected components (the number of subgroups or “communities”) predicted the adoption of behaviors but that the absolute size of each component did not. The explanation for this is that for innovations to spread, they must reach across local social boundaries, which are usually made up of people who are more similar to each other, called homophily (McPherson *et al.* 2001), than they are across those boundaries. Intermarriage is one way that innovations would spread across these boundaries, linking different areas that would otherwise be highly inward focused and less connected. In the Western Pueblo area in the A.D. 1200s, social networks consisted of a heterogeneous group of components (Borck *et al.* 2015; Mills *et al.* 2013, 2015).

In another study looking at innovation, Derex and Boyd (2016) found that “networks of partially isolated groups connected by occasional migration events can outperform fully connected networks of the same size” (p. 2985). Outperformance in this case is the presence of innovation diversity. Their results have interesting implications for archaeological sequences since changes in spatial aggregation/dispersal are commonly seen in different historical trajectories. All other things being equal, more spatial aggregation should result in *decreases* in technological diversity—probably through the combined effects of homophily and propinquity. Therefore, those cases where diversity *increases* with aggregation should be of great interest because they do not fit the expectation. This is exactly the situation in the Mogollon Rim region in general, where diversity increased with aggregation and which were linked by occasional migration events.

But how, then, does someone in the group become the vector for innovations from outside the group? The concepts of structural holes, brokers, and weak ties (Burt 1992, 2004; Gould and Fernandez 1989; Granovetter 1973, 1983; Peeples and Haas Jr. 2013; Stovel and Shaw 2012) help to understand how diffusion occurs across subgroups. Structural holes or gaps in the network, such as the presence of multiple components or subgroups producing heterogeneity, create opportunities for actors or nodes to form bridges. Bridging or weak ties connect nodes in components that are more closely tied to each other. Weak ties are important because they entail socially (and often spatially) long ties, *i.e.*, they bridge different parts of the network and shorten the distance between nodes. Granovetter (1973, 1983) framed this in terms of “the strength of weak ties” because although weak ties are by definition less central to the network, they have the advantage of gaining information or resources from multiple components within the network.

Research by the Southwest Social Networks Project has shown that for the thirteenth through fifteenth century, weak ties are highly correlated with migration—whether that migration was over short or long distances. Peeples and Haas Jr. (2013) explicitly discussed the role of brokers in connecting different components within the late prehispanic Southwest (A.D. 1200–1500), where these weak ties were more prevalent. Weak ties were also correlated with physiographically transitional areas in many cases,

such as the Mogollon Rim area, as well as with lower population sizes than areas that were dominated by strong ties (Peeples and Mills 2016).

Brokers and brokerage are key concepts associated with weak ties (Burt 1992, 2004, 2005; Peeples and Haas Jr. 2013; Obstfeld 2005; Obstfeld *et al.* 2014). Obstfeld *et al.* (2014:141) have recently advocated a definition of brokerage as “behavior by which an actor influences, manages, or facilitates interactions between other actors.” Importantly, they underscore that brokerage as a process should be separated from the structure of the network. Thus, while brokers may be defined by their location in the network—as a position within a triadic structure—the motivations, opportunities, and therefore outcomes may be highly varied.

Obstfeld and colleagues argue that social network structure does not define how brokers do their brokering, however, and discuss three different “strategic orientations to brokerage action”: (1) conduit brokerage, (2) *tertius gaudens* brokerage, and (3) *tertius iungens* brokerage. In conduit brokerage, there is transmission of information through a mediator that may include technological knowledge but with low potential for altering the relationship between the two individuals or nodes that are being brokered by the third. *Tertius gaudens* brokerage involves the exploitation or conflict between two individuals or nodes and is more akin to Burt’s (1992) conception of how people may benefit by bridging structural holes and strategically gaining access to information from both of the alters. Such an approach may also entail conflict, rather than cooperation, since the broker is explicitly exploiting the relationship between the other two nodes. Gould and Fernandez’s (1989) original typology of brokerage describes many outcomes but they assume a *tertius gaudens* connection (Shi *et al.* 2009). *Tertius iungens* brokerage entails the facilitation of ties between the two alters resulting in cooperation rather than conflict. One result of a sustained relationship of this kind may result in the emergence of social movements (Obstfeld *et al.* 2014:146).

In their archaeological application, Peeples and Haas Jr. (2013) also noted that there may be multiple ways that brokers operate within social networks. They found that a collectivist rather than an individualist strategy better characterized brokerage interactions for the prehispanic U.S. Southwest at the regional scale. This work re-positions brokerage as more cooperative than competitive in some social settings but especially for the late prehispanic Southwest. A collectivist strategy is closer to the *tertius iungens* form of brokerage, which better describes situations of intermarriage—*iungens* literally means union. Stovel and Shaw (2012:146) describe this form of brokerage as forming a new connection across social groups that results in catalysis. They also point out that “any weakly connected social setting containing persons with different resources, skills, knowledge, or backgrounds creates opportunities for brokerage. The migration of persons from one place to another certainly meets these conditions” (2014:156). The ethnographic cases discussed earlier in this article, including Nampeyo, Daisy Hooee Nampeyo, and Jennie Laate, are all examples of women who intermarried, were skilled potters, and who taught others how to pot while in positions as brokers.

There is one additional network concept that helps to understand the differences between the Eastern and Western Pueblos in terms of conformity. Centola (2015) and Centola and Macy (2007) argue that depending on the content of what is being transmitted, different network structures may be required for successful adoptions and their diffusion. Simple contagions, like diseases, may be spread by contact. Simple contagions may not apply to technological knowledge, however. More complex

contagions, where technologies must be learned over a period of time, may need other kinds of network structures. Pottery is an example requiring more complex technological knowledge and therefore not as subject to simple contagions. Centola's (2015) simulations further showed that there is a U-shaped relationship between group cohesion and probability of adopting new ideas. Moderately cohesive groups have the highest probabilities of diffusion, while low and high group cohesion showed lower rates of adoption. Adoption is enhanced by the presence of "wide bridges" in which memberships in different social groups overlap (*e.g.*, work settings, kinship, and other social networks). The latter is referred to as the degree of consolidation.

There are many situations, especially in small-scale societies, in which membership in different social networks overlaps creating wide bridges. For the thirteenth century sites considered in this article, the presence of multiple social ties is architecturally expressed through multiple sodalities and scales of interaction. Broken K and other Pueblo III/early Pueblo IV communities in east-central Arizona had a diversity of ceremonial spaces including multiple forms of kivas. When status positions in the social networks of these small-scale societies frequently overlapped, they set up the conditions for the creation of wide bridges that extended across local communities and enhanced the acceptance of new innovations. This may also apply to the innovation and diffusion of pottery technology within the same communities as female potter's ties reached across local communities through marriage and descent.

Archaeologists considering ceramic vessels in the Mogollon Rim region might refer to them as hybrids, but boundary objects are a better way of looking at bridges and the diffusion of innovations than hybridity and the two should not be conflated. Several archaeologists have recently summarized problems with the concept of hybridity, including the fact that anything can be called a hybrid. Hybridity has largely been used in terms of labels rather than processes, and when used as a label, it is absent from some of the original usages of the term that were adamantly political (Hitchcock and Maier 2013; Liebmann 2013; Silliman 2013, 2015; VanValkenburgh 2013). When we instead focus on consumption and the role of different vessel forms in Pueblo societies as boundary objects, it helps to understand the processes by which different community members became connected—migrants and hosts, potters and weavers, men and women—in what must have been intensely negotiated co-residence during times of population movement. The relationship of pottery to water and to cuisines—especially the preparation and serving of food—must also have been key to how pottery in the Southwest became so important to the creation of social networks and the diffusion of specific production details.

In sum, the movement and intermarriage of female potters into multi-ethnic Pueblo communities in both ethnographic and archaeological cases show how marriage networks created opportunities for innovation. The ability to incorporate new innovations is highly related to the Pueblo *Sprachbund* as a cosmopolitan, multi-lingual construction. This was accomplished through the production, distribution, and consumption of "boundary objects." These objects did not define boundaries but facilitated boundary crossing or bridging. Boundary objects provide touchstones for different communities of practice in that they are mutually understood categories of use, yet subject to individual modification and variation. Within the ecology of a village, potters with different backgrounds understood how these vessels were used and who produced

them. They also gained status and power when these vessels were appreciated and consumed by others within a larger network of distribution.

Acknowledgments I thank Valentine Roux, Gianluca Manzo, and Blandine Brill for the invitation to present an earlier version of this paper at the Université de Paris and for organizing this special journal issue. My thanks to the Field Museum and their staff for facilitating research with the Broken K collection, especially Jamie Kelly and Jamie Lewis. I also thank the editors of *JAMT* as well as the four anonymous reviewers for their comments, which greatly improved the manuscript.

Funding Information Research on this topic was conducted as part of NSF Grants #9507660, #0827007, and #0211034 for the Silver Creek Archaeological Research Project and the Southwest Social Networks Project.

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