MARKING AND MAKING DIFFERENCES: REPRESENTATIONAL DIVERSITY IN THE U.S. SOUTHWEST

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Diversity is generally valued, although it sometimes contributes to difficult social situations, as is recognized in recent social science literature. Archaeology can provide insights into how diverse social situations play out over the long term. There are many kinds of diversities, and we propose representational diversity as a distinct category. Representational diversity specifically concerns how and whether differences are marked or masked materially. We investigate several archaeological sequences in the U.S. Southwest. Each began with the coming together of populations that created situations of unprecedented social diversity; some resulted in conflict, others in long-term stability. We trace how representational diversity changed through these sequences. Specifically, we review the transregional Kayenta migration to the southern Southwest and focus empirical analyses on regional processes in the Cibola region and on painted ceramics. Results show that, initially, representational diversity increased above and beyond that caused by the combination of previously separate traditions as people marked their differences. Subsequently, in some instances, the diversity was replaced by widespread homogeneity as the differences were masked and mitigated. Although the social causes and effects of diversity are many and varied, long-term stability and persistence is associated with tolerance of a range of diversities.

La diversidad es generalmente apreciada, aunque algunas veces contribuye a situaciones sociales difíciles, como se reconoce en recientes publicaciones de las ciencias sociales. La arqueología puede ayudar a entender como las situaciones sociales diversas se manifiestan a largo plazo. Existen muchos tipos de diversidades y proponemos la diversidad figurativa como una categoría distintiva. La diversidad figurativa se refiere específicamente a si esas diferencias están materialmente marcadas o enmascaradas, y de que manera. Investigamos varias secuencias arqueológicas en el Suroeste de los Estados Unidos. Cada una se inicia con la agregación de poblaciones que crearon situaciones de diversidad social sin precedente; algunas resultaron en conflicto, otras en una estabilidad a largo plazo. Rastreamos como cambió la diversidad figurativa a través de esas secuencias. Específicamente, revisamos la migración transregional Kayenta hacia el sur del Suroeste y enfocamos análisis empíricos sobre los procesos regionales en la región Cibola y las cerámicas pintadas. Los resultados muestran que, inicialmente la diversidad figurativa se incrementó mucho más allá que la causada por la combinación de tradiciones separadas previas ya que la gente marcó sus diferencias. Subsecuentemente, en algunas instancias, la diversidad se reemplazó por una homogeneidad extendida ya que las diferencias fueron enmascaradas y mitigadas. Aunque las causas y efectos sociales de la diversidad son muchas y variadas, la estabilidad y persistencia a largo plazo se asocia con la tolerancia de un rango de diversidades.

Readers who follow both policy recommendations and the world news will already have a general understanding of our research subject. On the one hand, diversity is lauded as a desired characteristic in ecosystems and genetics, in interdisciplinary collaborations, in university populations, and in urban environments. On the other hand, diversity is implicated in serious social problems, and people who contribute to diversity by dint of their ethnicity or racial classification often experience discrimination or violence.

Research in the natural and social sciences recognizes that the ways diversity is beneficial or harmful vary widely, depending on the nature of the diversity, its intersection with other factors,

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and the spatial and temporal scales under consideration. Research on the effects of different kinds of diversities focuses on ethnic strife, communication difficulties, and fragmentation, as well as creativity and resilience (e.g., Bassett-Jones 2005; Chapin et al. 1997; Hong et al. 2004; Jehn et al. 1999; Leslie and McCabe 2013; Norberg et al. 2001). There are hints in this work that the benefits of diversity sometimes develop gradually. However, other than implicit consideration of time, this growing body of work on the costs and benefits of diversity is based mostly on a synchronic or short-term perspective; there has been little explicit consideration of diversity over the long term.

The need for a long-term perspective on diversity is made evident by the recent controversy engendered by political scientist Robert Putnam. In 2007, Putnam reported on a study of neighborhoods across the U.S. He found that ethnic diversity (resulting primarily from immigration) was inversely correlated with measures of social capital. Specifically "Inhabitants of diverse communities tend to withdraw from collective life, to distrust their neighbors . . . to expect the worst from their community and its leaders . . . (to) work on community projects less often . . . and to huddle unhappily in front of the television" (Putnam 2007:151). Conservative thinkers have used his findings to argue against race-conscious university admissions, including an affirmative action lawsuit (Fisher v. University of Texas at Austin, No. 11-345). Putnam himself filed a brief in support of the university in which he claimed his work had been "inaccurately and selectively described" (Bartlett 2012). Importantly, Putnam argued that his results spoke mostly to the short-term effects of diversity: "In the short to medium run . . . immigration and ethnic diversity challenge social solidarity and inhibit social capital," and "[i]n the short run there is a tradeoff between diversity and community" (2007:138, 164). However, he also argued that "in the medium to long run . . . *successful* immigrant societies create new forms of social solidarity and dampen the negative effects of diversity by constructing new, more encompassing identities" (2007:138, emphasis ours). Unfortunately, he did not present support of the latter optimistic statement; nor did he elaborate on societies that were not "successful." But Putnam's claim, and its important social implications, can be evaluated with a long-term perspective on diversity provided by archaeology.

We draw on the archaeological record of the U.S. Southwest to provide that missing long-term perspective with research that investigates changes in diversity through multiple cycles of social and settlement transformations and subsequent settling-in periods at multiple spatial scales. We recognize several kinds of diversities and focus specifically on what we call *representational diversity*, that is, the degree to which people mark or mask differences. The transregional case, which we summarize briefly based on extant literature, is a period of migration, cultural mixing, and the subsequent emergence of a new stylistic and religious phenomenon, specifically, the late thirteenth and early fourteenth century Kayenta migrations and subsequent development of Salado in the southern Southwest. We briefly summarize this case, and then focus analysis on the regional scale by examining representational diversity—indicated by painted ceramic wares—through two cycles of aggregation, reorganization, and settling-in from about A.D. 1250–1540 in the Cibola region of the central Southwest.

This research derives from our own transdisciplinary collaboration, known as the Long-Term Vulnerability and Transformation Project (http://ltvtp.shesc.asu.edu/), or LTVTP. Drawing on a series of archaeological cases in the U.S. Southwest and northern Mexico, the LTVTP is interested in configurations of social and ecological diversities and how those contribute to vulnerability, robustness, and transformations (e.g., Anderies et al. 2008; Freeman et al. 2014; Hegmon et al. 2008; Nelson et al. 2011; Torvinen et al. 2015). The research we discuss here focuses on the social component, although we draw concepts and techniques from ecology and other disciplines.

A Diversity of Diversities

When social scientists use the term diversity, they generally mean some kind of instrumental or social diversity (although many labels are used). In addition, students of material culture, including archaeologists, also recognize diversity in material culture or other practices that do not necessarily correlate with instrumental or social diversity (Hodder 1982). Some social or instrumental dif-

ferences may be strongly expressed, while others are masked. We argue here that such expression is usefully conceptualized as another realm of diversity—this is representational diversity, the focus of our analyses.

Instrumental diversity exists when component parts have different properties that work in different ways. This is generally beneficial because a mix of strategies increases the chances of being able to respond in any situation. For example, maize and agave have different tolerances for periods of low moisture, thus a mix of the two increases the chance that a farmer will have enough food during a drought (Anderies et al. 2008). Similarly, access to a diverse range of resources through sharing or exchange reduces the risk of failure in variable environments (e.g., Cashdan 1985; Winterhalder 1990). The same applies to task groups, committees, or interdisciplinary collaborations (Hong et al. 2004). The ecological concepts of "functional redundancy" and "response diversity" (Walker et al. 1999) fit within the general rubric of instrumental diversity, and the utility of these ecological concepts to anthropological analyses is demonstrated by Leslie and McCabe's (2013) discussion of pastoralists' responses to changes in their socio-natural environments.

Social diversity involves differences in backgrounds or perspectives, including everything from ethnicity and language to academic disciplines. Such diversity is potentially problematic because it may be divisive, resulting in problems ranging from communication difficulties (see Jehn et al. 1999) to ethnic violence. However, social differences can also contribute to instrumental diversity and thus facilitate a wide range of responses (Page 2007).

Network analysis draws these concepts together in considerations of network diversity, which concerns similarities or differences—in instrumental or social realms—among connected actors (e.g., Borck et al. 2015; Peeples and Haas 2013). A well-known property of social networks is a tendency toward homophily, the development of strong connections among actors who share some key characteristic, such as ethnicity (McPherson et al. 2001). A heterophilous network, on the other hand, refers to a situation in which connections span different characteristics—for example, connecting actors of different ethnicities. Like instrumental diversity, network diversity may be advantageous in that it provides a diversity of options. However, like social diversity, network diversity may create liabilities when diverse connections contribute to mistrust.

Representational diversity concerns the ways instrumental or social differences are marked or masked in media ranging from material culture to dialects. The passive voice ("are marked or masked") connotes that, while the representation may be intentional, it also may result from subconsciously reproduced traditions. Recognizing representational diversity as a separate realm allows archaeologists to deal with the inconvenient truth that material culture is not a direct reflection of cultural groups or social interaction (Dongoske et al. 1997; Hodder 1982; Plog 1978). Instead, our conceptualization recognizes that, in some situations, material differences may create or emphasize social or instrumental differences, while in other situations material similarities may mask, mediate, or reduce those differences (Hodder 1979). It is also possible that an absence of material differences represents true homogeneity in the other realms, and detailed analysis of multiple lines of evidence—such as technological traditions, architectural configurations, and migration histories together with representational diversity—should make it possible to distinguish these possibilities.

The concept of representational diversity synthesizes and gives analytical salience to a number of observations and perspectives that are important to archaeology. For example, in his studies of migration, Clark (2004) tracked cultural groups through analyses of low visibility attributes, such as nuances of technology and foodways, and asked whether and how social differences were expressed stylistically in more visible attributes (an approach developed more generally by Carr [1995]). In our terms, Clark asked if and how social diversity was represented. Conversely, Duff (2002) found evidence of substantial interaction—indicated by a shared utility ware tradition and regular local exchange—among a series of proximate villages, although those same villages had different styles of painted pottery and participated in different regional exchange networks. In this case, social homogeneity at one level was overlain by representational diversity. In their study of aggregation, Kohler et al. (2004) found lower than expected

levels of diversity in ceramic style, leading them to conclude that the cultural transmission process was biased towards conformity, which might have enhanced within-group cooperation. In this case, representational homogeneity overlay newly created social diversity. Finally, the Southwest Social Networks Project (SWSN; Mills et al. 2015) amassed data on the distribution of ceramic types and wares in the western Southwest. SWSN researchers treat ceramic similarities—representational homogeneity, in our terms—as indicative of the potential for interaction, and they use other kinds of data, including the distribution of obsidian from known sources, to understand the social processes associated with that similarity. Borck et al. (2015) recently used these data to compare more and less diverse networks. They found that regions characterized by diverse (heterophilous) connections had greater persistence through times of environmental and social upheaval than did those with less diverse and internally focused (homophilous) connections. The Cibola region, the focus of our analysis, was a notable exception to these trends, as we discuss below.

Our research considers two archaeological sequences that began when aggregation and/or immigration created situations of heightened social diversity. Some of these situations resulted in violence or defensive posturing; others developed into new forms of social integration and sometimes long-term stability. We trace how representational diversity changed through these sequences, considering both transregional and interregional scales (see Mills et al. 2015).

Three final points set the stage for our analyses. First, what we see as representational diversity may result from a variety of mechanisms, including exchange, local production, and immigration. Conceptually, it is not necessary to separate these mechanisms—a point that is methodologically very convenient. Rather, we simply focus on the diversity of what was present, adding nuance when we are able to identify specific processes, particularly immigration or exchange. Second, depending on the situation, either representational diversity or homogeneity may be beneficial, as archaeologists have long recognized. Representational diversity might mark identity differences that make interactions more predictable, and homogeneity might mask differences; both usages could contribute to integration (Plog 1990; Wiessner 1983). Thus, we do not predict *a priori* how representational diversity will change, but instead trace how it changes through several sequences, noting, in particular, how it relates to both discord and social stability. Third, we do not suggest that low or high representational diversity somehow caused societies to be more or less stable. Rather, it is likely that the underlying social processes created a situation that resulted in both the degree of stability and representational diversity that we observe, although the representational diversity might in turn have reinforced those social processes. Our goal is to observe the associations of these processes over time and at two spatial scales and to use these observations to develop ideas about why such associations might exist.

Putnam (2007) describes the challenges that diverse communities face when immigration mixes people of different identities and backgrounds, and he offers the optimistic prediction that the diversity becomes beneficial over time. In the sections that follow, we examine Putnam's ideas about the long-term effects of diversity at multiple spatial scales and through multiple cycles of immigration and social change. We draw on our concept of representational diversity to offer insights regarding how and why some diverse communities find long-term stability and others have more problematic trajectories.

The Big Picture: Transregional Migration and Diversity

In the late thirteenth century, much of the northern Southwest was depopulated. Many people moved from the Kayenta-Tusayan region in northeast Arizona to the southern Southwest (Figure 1), and the migrants interacted with indigenous residents in a variety of ways. Here we review these processes, focusing on the sequence of social changes and how they are represented materially.

At Point of Pines Pueblo, there was clearly a Kayenta enclave, one of three roomblocks in a village built around A.D. 1265 (Stone 2015). It had distinctive architecture, including a D-shaped kiva, pottery made in the Kayenta region, and a locally made version of Kayenta-style pottery known as the Maverick Mountain series. Stone and Lipe (20011:286) argue that the "Kayenta mi-

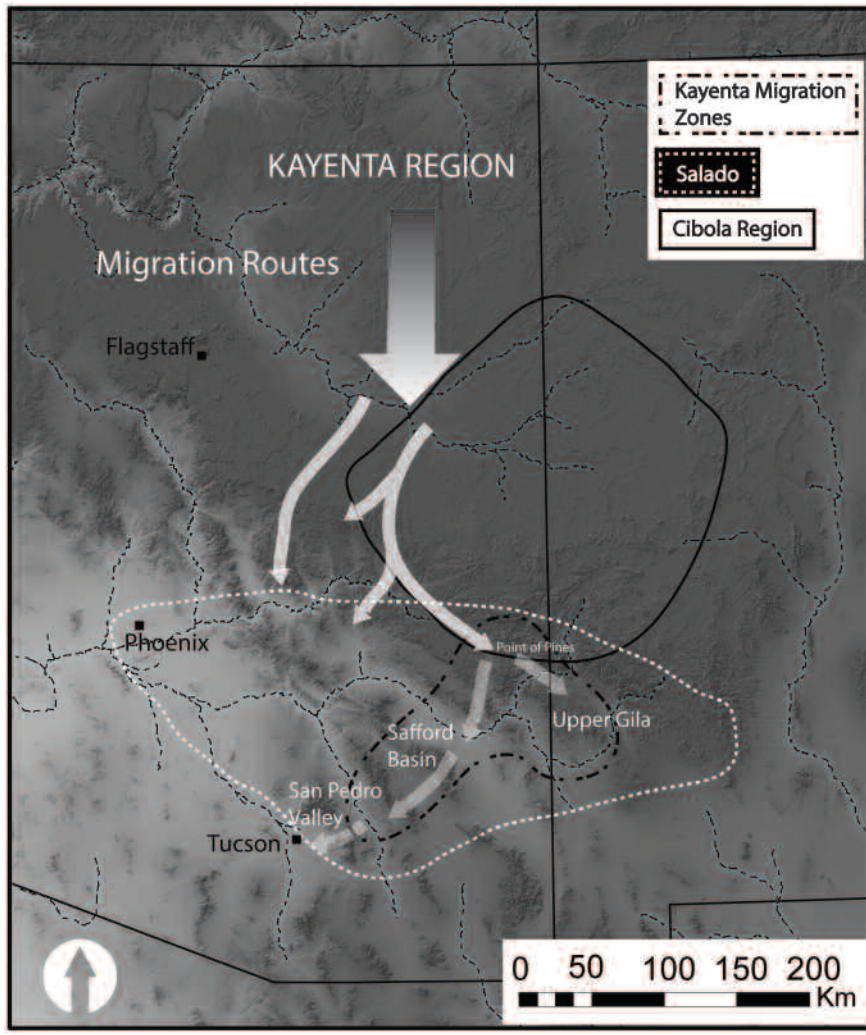

Figure 1. The western Southwest, showing the regions and sites discussed in the consideration of transregional migration.

grants felt secure enough to signal their 'otherness' actively for at least a generation," that is, they used representational diversity to mark social differences. Around A.D. 1300, a fire destroyed the roomblock and killed at least two people. Subsequently, the D-shaped kiva was filled with trash, and a large defensive wall was built around the entire site. The migrants either left or ceased to represent their differences; it is also possible that the migrants became so integrated into the community that they no longer had differences to represent. Although specific interpretations vary,[1] Point of Pines is a case in which diversity was associated with conflict.

Some Kayenta migrants moved into the San Pedro River Valley, an area extensively studied by Archaeology Southwest (Clark et al. 2014) and the focus of detailed network analyses (Mills et al. 2015). The migrants brought distinctive styles of pottery (Maverick Mountain series vessels and perforated plates used as ceramic base molds [Lyons 2003; Lyons and Lindsay 2006]) and architecture (kivas with benches, footdrums, and loom anchor holes [Di Peso 1958]). There is evidence of competition and defensive posturing, with immigrant sites such as Reeve Ruin and local sites such as High Mesa built on defensive locations (Clark et al. 2014; Di Peso 1958). Perhaps in reaction to the incursion, locals revived their production of Hohokam-style red-on-brown pot-

tery and began to build platform mounds. Migrants and locals made different kinds of pottery, and while small amounts of migrant-made Maverick Mountain pottery are found on local sites, local decorated pottery is virtually absent at migrant sites. Thus, in the immediate aftermath of the migration, there is evidence of some degree of conflict, and representational diversity is used to mark social diversity. Distinctions between the two cultural traditions lasted for several decades. Then, in the early 1300s, immigrants and their descendants began making Salado style pottery (*aka* Roosevelt Red Ware), which was rapidly adopted by local groups. In contrast to developments a few decades earlier, the new style is an instance of representational homogeneity overlying and possibly masking social diversity. Later sites are more aggregated, in contrast to the earlier dispersed villages (Clark and Laumbach 2011:304), and were probably occupied by descendants of both immigrants and indigenous groups. Overall, the San Pedro case shows that the cultural mixing may have been problematic initially, indicated by the signs of conflict, though over time differences were de-emphasized, as indicated by the low representational diversity.

The Kayenta migration into the Safford and Aravaipa Valleys in southeast Arizona was substantial. Every post-A.D. 1275 site has some Kayenta-style ceramics or architecture (Neuzil 2008:92), and Neuzil suggests that migrants arrived in the area in both small household-scale and larger groups. Three sites in defensive locations, including Goat Hill (Woodson 1999), are separate enclaves of newly arrived Kayenta migrants. More than a dozen other sites (dating from 1275–1400) exhibit mixes of migrant and indigenous styles in various configurations of mixing and separation (Neuzil 2008:Figure 6.1). Diversity increased immediately following the migrations: "It appears that each group maintained some differences, seen in a continuation of distinct decorated ceramic traditions side-by-side . . . Migrant and indigenous groups renegotiated their identity and redefined their social space in order to facilitate coresidence, but likely would not have characterized themselves as a single cohesive social group at this time" (Neuzil 2008:94). Subsequently, in the fourteenth century, people across the area made and used Salado Style Roosevelt Red Ware and built more spatially integrated sites (assessed in terms of Neuzil's [2008] space syntax analysis), although there were still some architectural and network differences between social groups.

This overview demonstrates the importance of scale in understanding processes associated with diversity. At the local scale and over the short term there are instances of segregation (e.g., the Goat Hill Site) and possibly violence (e.g., Point of Pines) associated with contexts in which representational diversity marked differences. A broader view provides a different perspective. A few decades after the migration, the representational diversity was replaced by the relatively homogeneous Salado style (though see Plog and Solometo 1997), associated with a new pan-regional religion (Crown 1994). The low representational diversity of the Salado style can be seen as both resulting from and contributing to the new relatively stable social situation; the similarities would mask remaining social differences and mark newly discovered similarities, thus contributing to integration. Although Salado lasted only a few generations, the overall scenario provides support for Putnam's optimistic predictions. In order to examine these processes in more detail, we focus on data from one region.

Zooming in on the Cibola Region: Background

Our overview of transregional migration demonstrates the importance of understanding diversity in many cases and at multiple scales. When considered in the short term, diversity is associated with isolation or violence in some areas of the Southwest. At larger temporal and spatial scales, the diversity eventually gave way to some degree of integration and stability. In the analyses that follow, we use detailed data from the Cibola region (Figure 2) to provide a multi-scalar perspective on these processes. In this section, we summarize two sequences; each began with an increase in social diversity that was followed, variously, by situations of factionalism, reorganization, and long-term stability. Then, we trace how representational diversity changed through these sequences, drawing on various lines of data, including demography, architecture, and skeletal analyses. Finally, we use data on decorated ce-

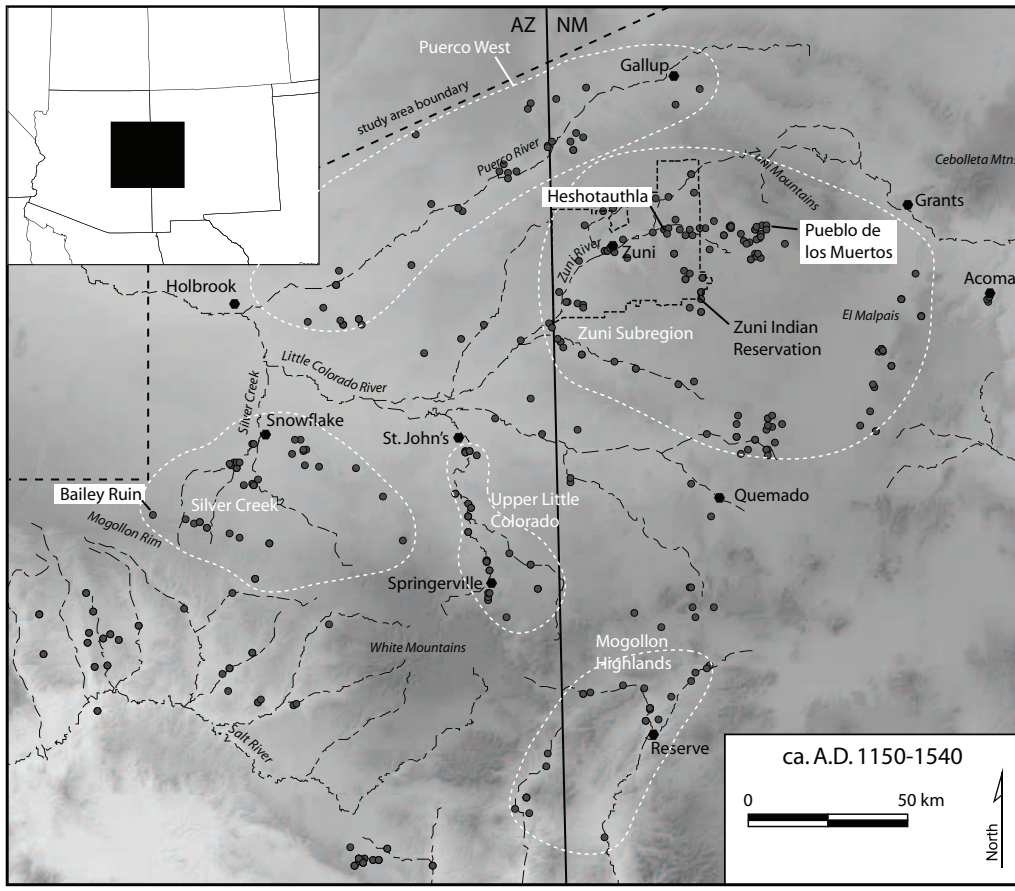

Figure 2. The Cibola region, showing the subregions and sites included in the analysis. Circles are archaeological sites, hexagons are contemporary places.

ramics to investigate representational diversity through time and across space.

The analyses consider five subregions,[2] defined by site clustering (see Adams and Duff 2004) and archaeological tradition; these are the Zuni, Upper Little Colorado, Puerco West, Silver Creek, and Mogollon Highlands subregions.

The First Cycle: Pueblo III (1150–1275 C.E.) to Pueblo IV (A.D. 1275–1400)

The Pueblo III period in the Cibola region was a time of aggregation as populations began to concentrate in a few locales in clusters of closely spaced room blocks. The end of the period, the late thirteenth century, was a time of migration across much of the Southwest. Around A.D. 1275, people across the Cibola region and eventually across much of the Southwest moved out of the numerous small room blocks and site clusters and constructed large nucleated towns, often built around one or more formal plazas. This transition marks the beginning of the Pueblo IV period, which is divided into early (A.D. 1275–1325) and late phases (A.D. 1325–1400). These sweeping changes played out differently across the region. In the Zuni subregion, there is little evidence of long-distance migration but, rather, reorganization through collective action that rapidly built large towns, some with more than 1,000 rooms (Kintigh et al. 2004; Peeples 2011). Although these new large sites were highly integrated architecturally (Potter 1998), they appear to have been socially unstable (Kintigh 1985:115–117). Some were occupied for less than a generation, after which people moved to similar, but somewhat smaller, towns in the same area. In most other subregions, new

arrivals likely did join local populations, and the nucleation process was slower. In the Silver Creek subregion, nucleated pueblos were built accretionally over the course of a generation by a mix of local populations and immigrants; Bailey Ruin, one of the largest, has about 250 rooms (Kaldahl et al. 2004; Mills et al. 1999). Although they lasted longer than the first towns in the Zuni subregion, the Early Pueblo IV sites in the Silver Creek subregion have evidence of factionalism (Kaldahl et al. 2004).

By the Early Pueblo IV period, nearly everyone in the Cibola region lived in one of about 40 large towns, most with enclosed plazas. Settlement in towns continued, with the population increasingly clustering in the northern part of the region and a general decline in overall population in the Late Pueblo IV period (Kintigh 1985; Peeples 2011:81). There was little or no occupation in the Mogollon Highlands subregion after the mid-fourteenth century. Other southern subregions, including Silver Creek and Upper Little Colorado, saw some new construction in the early part of this period, but, by 1400, nearly the entire region had been depopulated, with the important exception of the Zuni subregion (Huntley and Kintigh 2004).

In our analyses, we use data from Pueblo III, Early Pueblo IV, and Late Pueblo IV periods to examine the first cycle of change. That is, the transformation itself is the shift from small residential sites to large nucleated towns that marks the transition between Pueblo III and Early Pueblo IV, and the Late Pueblo IV period is the time of settling in. We view Late Pueblo IV as the pretransformation period for the second cycle of change.

The Second Cycle: Pueblo IV to Protohistoric (A.D. 1400–1540)

Around the beginning of the fifteenth century, most of the region was depopulated and nine large pueblos were established or greatly expanded along the Zuni River valley and major side drainages. This area (part of the Zuni subregion) had previously seen relatively little settlement; the shift was probably associated with an increased reliance on irrigation (Kintigh 1985). Unlike some early Pueblo IV sites, these new towns were not planned constructions but instead are clustered roomblocks, suggesting accretional growth. Various lines of evidence, including new practices such as cremation, changes in architecture and material culture, and biological data, indicate substantial migration from other subregions in the Cibola region and beyond (Peeples 2014).

Most of the Protohistoric towns are large, complex, and long-lived sites that have seen little excavation with modern techniques; best known is Hawikku, which was excavated by Hodge in the early twentieth century but not reported until much later (Smith et al. 1966). Little has been published on how architecture or settlement changed over the course of the Protohistoric period, although the apportioning technique discussed below (Roberts et al. 2012) makes it possible to separate ceramic assemblages associated with the Early and Late Protohistoric periods (A.D. 1400–1450 and A.D. 1450–1540). In our analyses, we consider the shift from Late Pueblo IV to Early Protohistoric to be the second transformation, and the Late Protohistoric to be the period of posttransformation settling in.

Zooming in on the Cibola Region: Database and Methods

The two cycles of change—nucleation followed by periods of settling in—provide an ideal setting for tracing representational diversity through time and understanding how it is part of processes such as residential instability or long-term persistence. In order to develop comparisons across time and space, we focus our analyses on painted ceramic wares, which have been collected and analyzed from a large number of sites. A ware is defined by a set of technological attributes such as paste and paint and may include several types distinguished by different styles. The Cibola wares are especially well suited for these analyses because they are defined by the various uses of paint and thus are easily recognizable even on relatively small sherds (Carlson 1970). For example, Cibola White Ware was made with light-firing clays and has designs painted in black mineral paint. Early White Mountain Red Ware was also made with light-firing clays but slipped with a well-polished layer of red to orange clay and painted with black mineral paint and sometimes with white paint on the exterior of bowls (Carlson 1970). Zuni Glaze Ware similarly has a red-slip on a light-firing clay

Figure 3. Examples of pottery wares considered in the analysis, including only those found in abundance in the Zuni subregion. Cibola White Ware, White Mountain Red Ware, and Roosevelt Red Ware reproduced with permission of the Archaeological Research Institute, School of Human Evolution & Social Change, College of Liberal Arts & Sciences, Arizona State University, Tempe. Zuni Glaze Ware is vessel 2006.60.310 in the Reidhead collections at Brigham Young University, used with permission. Matsaki photograph by Kintigh, courtesy Museum of Archaeology and Anthropology, Cambridge, UK. Accession no. Z 42586.

but is distinguished by the use of dense glaze paint made with distinct recipes, complex black or polychrome designs on the interior of bowls, and a different suite of complex designs painted in white or white and black on the exterior of bowls (Figure 3). Most wares are well dated (Mills 2007; Peeples and Schachner 2012), and large analytical projects provide detailed knowledge of ceramic production and movement (Peeples 2011; Schachner et al. 2011).

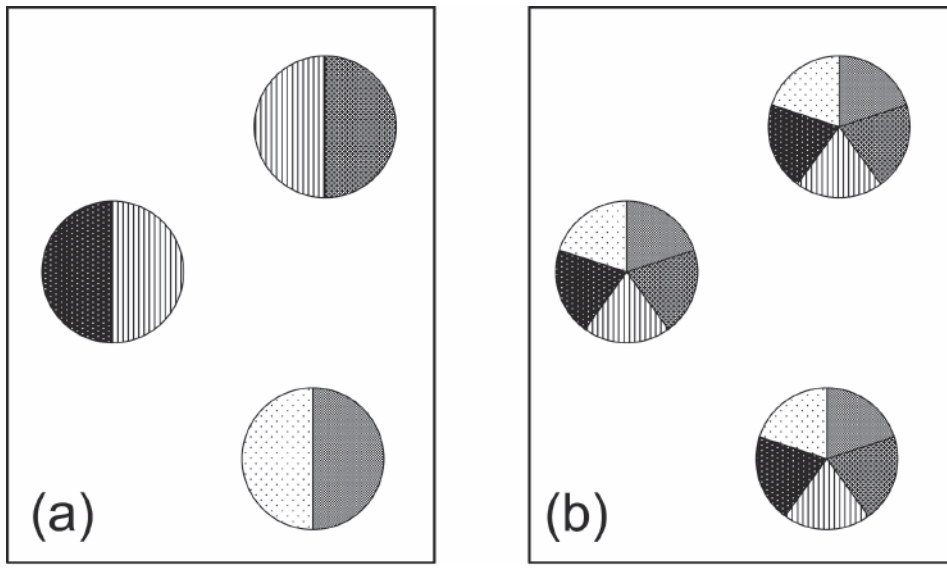

Figure 4. Schematic illustrating different combinations of intrasite and regional diversities.

Database

The data used in our analyses are counts of ceramic wares found at sites across the region, divided by time period. Most of these data were compiled by Peeples as part of the first part of the LTVTP (see Peeples 2011), and they have subsequently been incorporated into the SWSN database (Mills et al. 2015).

Many of the sites had short, single-component occupations resulting in ceramic assemblages associated with discrete time periods. In order to establish good separation of the time periods on all sites, including those with multi-component occupations, we used Roberts et al.'s (2012) technique to apportion the ceramic counts to the five time periods of varying lengths (Pueblo III, Early Pueblo IV, Late Pueblo IV, Early Protohistoric, and Late Protohistoric periods). We leave the technical details to other publications (Peeples and Haas 2013:238; Roberts et al. 2012), but, in short, this method takes the occupation spans of sites, the dated production ranges of types, estimates of population and deposition rates through time, and certain assumptions regarding popularity curves of types and wares through time to estimate the relative proportions of each type deposited in each period in which a site was occupied. The detailed data are available in Appendices A–E (see Data Availability Statement). Based on calculations shown in Appendix A, only sites with counts of 40 or more painted ceramics for a given period were included in the analysis.

Analytical Methods

Our research requires that diversity be considered at multiple scales. The importance of this perspective is illustrated with the simple schematic shown in Figure 4 in which each pie chart represents the assemblage found at a site. (Here we equate diversity with richness; below we develop a more comprehensive measure.) In Region A (left), the diversity at each site is two and diversity at the regional level is five. In Region B (right) site and regional diversities are both five. In social terms, people in Region A would encounter difference as they moved from site to site, whereas people in Region B would encounter a familiar degree of diversity.

Diversity at these scales can be quantified by using Simpson's C, a measure of concentration often used in ecology. Like the H-statistic often used in archaeology, it is sensitive to both richness and evenness; we use C rather than H because it can more easily be compared to ecologists' analyses and because it is more intuitive and easier to calculate. If an assemblage has i categories and

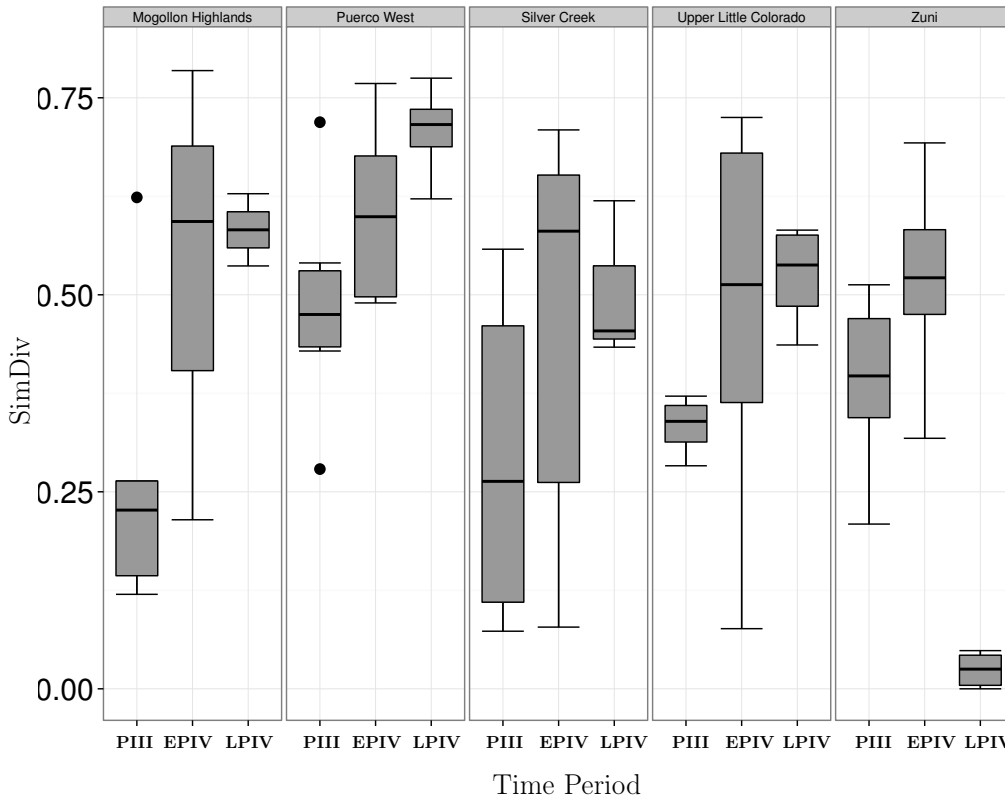

Figure 5. Box-plots of intrasite diversity (SimDiv) in the different subregions through the first cycle of change.

p_1, p_2 , . . .p_i are the proportions (expressed as fractions of 1.0) in categories 1, 2, . . . i, C is calculated as the sum of the proportions squared:

$$C = p_1^2 + p_2^2 + \ldots + p_i^2$$

C is at a maximum (1) if the entire collection is concentrated in a single category, and at a minimum if the collection is equally distributed across a number of categories; other things being equal, the larger the number of categories, the smaller the concentration. For cosmetic reasons, since we are concerned with diversity, we use 1-C so that larger numbers correspond to greater diversity; we refer to this as the *Simpson's Diversity measure (SimDiv)*.

SimDiv can be used to calculate diversity at various scales. Intrasite diversity is calculated based on the assemblage at each site: in Figure 4 all sites in Region A have SimDiv scores of .5, and all those in Region B have scores of .8. In contrast, if the assemblages are pooled at the regional level, the regions have similar degrees of diversity, because all five patterns are fairly evenly distributed in both.

The calculations at multiple scales make clear the need to consider the effect of sample size. The intrasite calculations depend only on the distribution of the assemblage across categories regardless of the assemblage size (i.e., if two sites in Region A have counts of 50, 50, 0, 0, 0 and 500, 0, 500, 0, 0, both have the same proportions and thus the same SimDiv). However, if the data are pooled across a region based on counts, the sites with larger assemblages would swamp the others (i.e., 550, 50, 500, 0, 0). In our Cibola case, differences in assemblage sizes are primarily a result of differences in the extent of excavation or surface investigation. Thus, to ensure that all sites are equally represented in the larger scale calculations, we generate regional assemblage profiles by averaging proportions rather than by pooling counts.

Table 1. Summary Diversity Measures at Intrasite and Subregional Scales.

	Measure	Pueblo III	Early Pueblo IV	Late Pueblo IV	Early Protohistoric	Late Protohistoric
Mogollon Highlands	Intrasite[a]	.23	.66	.63		
	Subregion[b]	.33	.68	.63		
	N[c]	5	4	1	0	0
Puerco West	Intrasite	.49	.60	.72		
	Subregion	.54	.75	.76		
	N	6	5	4	0	0
Silver Creek	Intrasite	.26	.58	.45		
	Subregion	.34	.57	.53		
	N	8	6	3	0	0
Upper Little Colorado	Intrasite	.33	.51	.54		
	Subregion	.5	.69	.62		
	N	4	5	4	0	0
Zuni	Intrasite	.40	.52	.03	.37	.02
	Subregion	.49	.63	.02	.43	.04
	N	43	21	6	7	7

[a]Intrasite diversity (SimDiv) was calculated for each site, the figures given here are the median across a given subregion.
[b]Subregion diversity (SimDiv) was calculated for the ceramic assemblage pooled across the subregion.
[c]N = number of sites (with relevant sherd count ≥ 39) included in the analysis.

Zooming in on the Cibola Region: Empirical Analysis of Diversity over Time and Across Space

The cycles of transformation brought people in the Cibola region together in unprecedented ways, creating contexts with various forms and degrees of social diversity that played out in numerous ways in subsequent generations. In this section, we trace the degree of representational diversity through these processes by assessing the diversity of painted ceramics over time and across the region. The analyses are organized in terms of the scale of diversity, considered first at the intrasite and then at the subregional levels. For the first cycle of change (Pueblo III through Pueblo IV), which was seen across the region, we compare the various subregions. The second cycle (Late Pueblo IV through Protohistoric) is seen only in the Zuni subregion. Summary measures for both the intrasite and subregional scales are provided in Table 1; more detailed data are available in the Appendices.

Intrasite Diversity

Measures of intrasite diversity provide insight into what people experienced in their daily lives, including the extent to which they represented similarities or differences with their immediate neighbors. This is calculated for each site with our SimDiv measure, and those intrasite measures are grouped by subregion. The changes in diversity through the first cycle of change in the different subregions are shown in Figure 5. Intrasite diversity increased in all subregions between the Pueblo III and Early Pueblo IV periods, a time of rapid aggregation and some immigration. During the settling-in period (Early to Late Pueblo IV) diversity remained at close to the same level in four of the subregions but dropped to almost zero in the Zuni subregion.

The entire sequence in the Zuni subregion is shown in Figure 6. The trends in intrasite diversity are comparable through the two transformations. In both cases, nucleation (in the Early Pueblo IV and Early Protohistoric) is associated with increases in diversity, which drops precipitously in the subsequent settling-in periods.

Overall, there is an increase in diversity at times of nucleation (between Pueblo III and Early Pueblo IV, and again between Late Pueblo IV and Early Protohistoric). The extent to which this is simply a product of mixing materials brought by different peoples can be explored by comparing three Early Pueblo IV sites. Heshotauthla, in the Zuni subregion, was formed when residents of a previously dispersed and long-lived community came together; there was likely little or no demo-

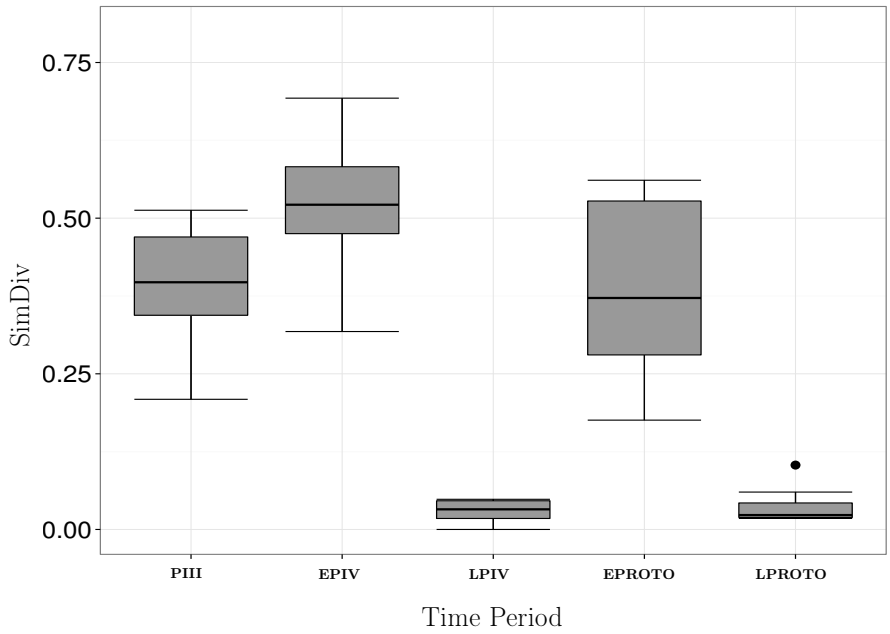

Figure 6. Box-plot of intrasite diversity (SimDiv) in the Zuni subregion through the two cycles of change.

graphic change (Kintigh et al. 2004). Pueblo de los Muertos, also in the Zuni subregion, was formed in part through intra-regional migration, when people who had recently moved into the previously unoccupied El Morro Valley, perhaps a generation earlier, nucleated into the large pueblo (Schachner 2012; Watson et al. 1980). In contrast, Bailey Ruin in the Silver Creek subregion was formed by a mix of local residents and migrants who probably came from outside the region (Kaldahl et al. 2004; Mills et al. 1999). Bailey has a somewhat higher diversity score than the other two (Table 2), as would be expected, given that migrants probably brought new ideas about ceramic production with them. However, its diversity is not much greater than that of the other two sites. Surprisingly, Heshotauthla, which had almost no immigration, has a higher score than Pueblo de los Muertos. These results indicate that increases in diversity scores in the post-nucleation period are not simply a result of new material being moved into the area; rather, it appears that people were increasingly representing their differences in all three different contexts. These processes can be understood from a different perspective by comparing intrasite processes with regional processes.

Subregional Diversity

People in the prehispanic Southwest interacted with others well beyond the local site or village level, and it is possible that they might have represented social differences differently at these two levels. They might have marked local similarities that distinguished them from others in the region (as in Figure 4a), or they might have marked social differences at home but maintained broader similarities (Figure 4b). In order to examine these possibilities, we calculated the SimDiv measure for assemblages pooled at the subregional scale (Figure 7; Table 1). Note that while Figures 5 and 6 show ranges across the sites in each subregion, Figure 7 displays only a single figure for each pooled subregion.

Diversity at this scale follows the same general

Table 2. Intrasite Diversity (Simdiv) for Three Sites Formed by Different Processes.

Site	Process	Early Pueblo IV Diversity
Heshotauthla	Local aggregation	.58
Pueblo de los Muertos	Intra-regional migration	.48
Bailey	Migration from outside	.67

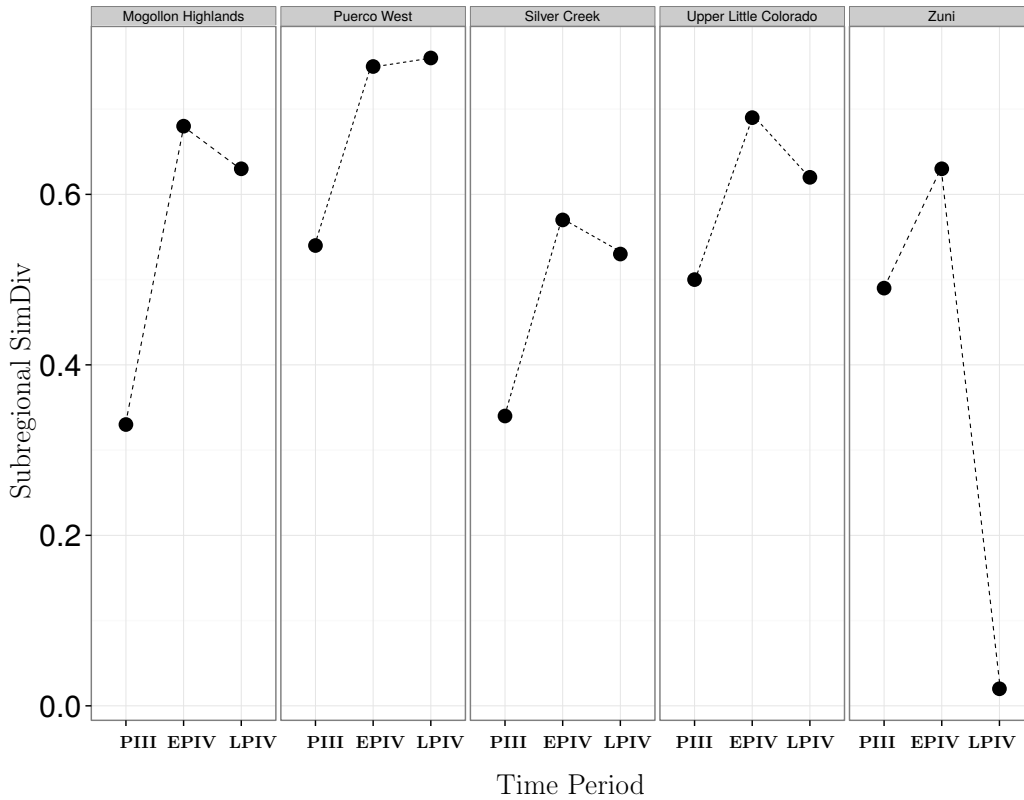

Figure 7. Diversity at the subregional level (SimDiv calculated for pooled assemblages) through the first cycle of change.

trends as intrasite diversity. Through the first transformation, diversity increases when people aggregate in the early Pueblo IV period. Then, in most of the subregions there is relatively little change between the Early and Late Pueblo IV periods. Again, Zuni stands out; diversity in that subregion drops to almost zero in the Late Pueblo IV period. The second transformation, seen only at Zuni, follows an almost identical trend, as diversity (.03 in Late Pueblo IV) increases (to .43) immediately following the Early Protohistoric nucleation and then once again drops to nearly zero (.03) in the Late Protohistoric.

Ceramic Details

Analyses at both the intrasite and subregional scales reveal strong and consistent patterning. The times of nucleation at the beginning of both cycles are associated with an increase in diversity. In the subsequent settling-in periods there is relatively little change in diversity in most of the subregions, with the important exception of Zuni. In the Zuni subregion, in both cycles, diversity drops to almost zero during the settling-in period. To conclude this section, we discuss the proximate causes of diversity in terms of changes in the named wares (data available in the Appendices). In the Pueblo III period, assemblages across the region were dominated by Cibola White Ware (probably made in all subregions) and Early White Mountain Red Ware (made primarily in the Zuni and Upper Little Colorado subregions and distributed widely). These wares continued to be made and used in the Early Pueblo IV period, when a number of other wares were added to the repertoire. Specifically, people in the Zuni subregion began to make Zuni Glaze Ware and perhaps small amounts of Late White Mountain Red Ware, and (like their predecessor White Mountain Red Ware), both wares were distributed to other subregions. In addition, people in the other subregions began to make other wares (Kintiel-Klagetoh Ware, Roosevelt Red Ware, and Orange Ware), although none of these were moved into the Zuni subre-

gion[3]. Production of the longer-lived types (Cibola White Ware and Early White Mountain Red Ware) ceased by the Late Pueblo IV period, resulting in the lower diversity scores. In the Zuni subregion, 99 percent of the Late Pueblo IV assemblage consists of Zuni Glaze Ware, producing the near-zero diversity score. In summary, through the first part of the transformation (Early Pueblo IV aggregation), diversity increases because new wares were added to the existing assemblage. By the Late Pueblo IV period, the repertoire is narrowed as the earlier wares drop out of use.

A very similar process is seen through the second transformation in the Zuni subregion, nucleation into the Early Protohistoric towns. The homogeneous Late Pueblo IV assemblages (dominated by Zuni Glaze Ware) were made more diverse by the addition of small quantities of Roosevelt Red Ware and Jeddito Yellow Wares (made in the Hopi region to the west), as well as larger quantities of a new ware known as Matsaki Buff Ware. Then production of Zuni Glaze Ware ceased and flows of other non-local wares slowed, and the assemblages became dominated by the new Matsaki Buff Ware, resulting in near-zero diversity scores.

Conclusions

Diversity is a complex, multidimensional, and scalar concept. Diversity may be beneficial or problematic depending on the nature of the diversity and its context. For example, heightened diversity in post-migration contexts may help people to sort out their differing identities, but if the diversity persists it may contribute to factionalism. Previous research on diversity has considered how its effects develop as situations change, although time is mostly implicit in this work. Here we explicitly focus on the temporal perspective, using the long time-depth of the archaeological record. We develop the concept of representational diversity to focus on understanding how people do, or do not, represent social differences.

In this article, we described and analyzed changes in diversity through three periods of transformation in the U.S. Southwest: (1) the Kayenta migration and emergence of Salado in southern Arizona in the late thirteenth and early fourteenth centuries; and (2, 3) cycles of change in the Cibola region. The Cibola cycles are, first, the shift from small residential sites to massive nucleated settlements between the Pueblo III and Early Pueblo IV periods (ca. A.D. 1275) and the subsequent settling in during the Late Pueblo IV period (A.D. 1325–1400); and, second, the shift into large towns in the Zuni subregion (part of the larger Cibola region) at the beginning of the Protohistoric period (A.D. 1400) and settling in during the Late Protohistoric (A.D. 1450–1540).

In all three cases and at the transregional, regional, and local scales, people came together as a result of migration and nucleation into newly diverse social contexts. Representational diversity increased because people with different traditions brought with them different material cultures, a result that is, in itself, not surprising.

What happened after the initial coming together is more interesting, and can only be understood with a long-term perspective. *Representational diversity increased above and beyond the mixing of previously separate populations*. This is indicated by three lines of evidence: (1) In their analyses of the Kayenta migration, several authors (Clark and Laumbach 2011; Stone and Lipe 2011; cf. Clark 2004) suggest that people deliberately emphasized their differences in the post-migration contexts. (2) In the Cibola region, the increase in the diversity of ceramics in the (post-nucleation) Early Pueblo IV period was almost entirely a result of local production of new wares. (3) Also in the Cibola region, similar increases in diversity are seen at Heshotauthla (which was formed through the nucleation of a previously dispersed community) and Bailey Ruin (formed through the mixing of local populations and migrants from outside the region).

The social effects of these changes and increases in diversity were many and varied. The big picture result of the Kayenta migration was the eventual—after a generation or so—development of the relatively homogeneous Salado style (i.e., low representational diversity) and possibly of a new religion (Crown 1994). However, there are also places—such as Point of Pines and Goat Hill—where there is evidence of violence, isolation, or disunity (Stone 2015; Woodson 1999). In these cases, the increase in social diversity was part of, or perhaps a cause of, difficult social circumstances.

The aftermath of the Pueblo III to Pueblo IV nucleation and increase in social diversity was similarly varied across the five Cibola subregions. The Zuni subregion had the least evidence of population mixing, and the construction there of large, spatially integrated Early Pueblo IV towns is evidence of large-scale cooperation characterized as collective action. However, representational diversity increased considerably once people moved into those towns, most of which did not last for even a generation. In the Silver Creek subregion, the new (smaller and less formal) Pueblo IV towns were inhabited by a mix of migrants and locals. Although they lasted longer than the early towns in the Zuni subregion, the Silver Creek towns were pulled apart by factionalism (Kaldahl et al. 2004) and the subregion was depopulated. The role of representational diversity in the Silver Creek case is particularly interesting. On the one hand, people there produced several distinct wares, representative of social and possibly instrumental differences. On the other hand, the distinct wares have very similar designs (the Pinedale Style) applied in similar ways (Van Keuren 2000), suggesting some effort to represent homogeneity.

Our results show a *strong association between low representational diversity and persistence*. This is seen most clearly in the Cibola region sequence through the two cycles of change. Briefly, the Pueblo III to Early Pueblo IV nucleation is associated with an increase in diversity in all subregions. In the Late Pueblo IV period of settling in, diversity remains fairly high in all of the subregions except Zuni, where it drops to almost zero. Zuni is the only subregion where settlement continues, with a very similar sequence in the second transformation. The Late Pueblo IV to Protohistoric nucleation is associated with an increase in diversity, and in the Late Protohistoric settling-in period diversity again drops to almost zero. A similar conclusion was reached by Peeples and Haas (2013), who found that sites with high ceramic diversity had relatively low degrees of persistence. Similarly, Nelson et al. (2011) found an association between low diversity and high population density.

Zuni is one of a very few places in the Southwest with a remarkably long and persistent history of settlement (Gregory and Wilcox 2007; Nelson et al. 2010), and our analyses may shed light on that persistence. We found that people in the Zuni subregion repeatedly, through two cycles of change, decreased representational diversity so that almost everyone in the region was making and using only a single ware. The causality that underlies this association of persistence and low representational diversity is likely complex. We do not suggest that persistence somehow caused—or will always result in—low representational diversity, or vice versa. Other parts of the Cibola region where settlement persisted at least into the Late Pueblo IV period did not see this decrease in diversity. Rather, we suggest that social contexts able to lessen representational diversity after an initial increase in diversity associated with migration and nucleation were also able to persist, and that there was probably a feedback between these processes. Kohler et al. (2004) suggest that conformity—we would add, conformity in the representational realm—may be an important component of social systems that emphasize within-group cooperation.

Our emphatically long-term perspective adds important insights to these findings, illustrated by the up-down-up-down pattern in Figure 6. That is, the persistence of settlement at Zuni is not simply associated with low diversity. Rather, it is associated with quite dramatic changes in representational diversity over time and through social change. In other words, diversity may be beneficial (or not) depending on the context. Thus, rather than concluding that persistence in the long term is associated with low representational diversity, we suggest that it is associated with a situation that can tolerate or is open to various degrees of diversity.

These findings might be relevant to a puzzling issue in the history of the Southwest. On the one hand, developments across the Cibola region, including in the Zuni subregion, were in many ways connected to pan-regional trends. The Chaco phenomenon is well represented in the region, and the region was connected to other parts of the Southwest through trade relations (Ferguson and Hart 1985:53). On the other hand, the Zuni language is a linguistic isolate, unlike most other languages in the Southwest or beyond. New research also suggests that Zuni was isolated in terms of visual landmarks like mountain peaks (Bernardini and Peeples 2015) and social networks

(Borck et al. 2015). This suggests that in some ways people at Zuni maintained a strong degree of homogeneity, while in other ways and at other times they maintained considerable diversity.

We close with three suggestions for future research. First, our empirical work focused on one kind of material, painted ceramics. More work is clearly needed to systematically investigate the interplay among many different kinds of diversities including instrumental, social, and representational (cf. Torvinen et al. 2015). Second, our case would benefit from comparison with other explicitly long-term perspectives that consider diversity over time through complete cycles of change. Finally, and perhaps most importantly, our survey of the literature makes clear that diversity is *sometimes* beneficial. We expect that this is also true regarding the ethnically diverse communities studied by Putnam (2007); some are successful and over time create new forms of solidarity; others probably do not. That is certainly the case in the archaeological cases discussed here; sometimes situations of social or culture mixing and heightened diversity result in new, stable, and apparently positive developments; other times they do not. More research is needed to understand how and why it works in some cases. Archaeologists can play a special role in studying how these processes play out over time.

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Data Availability Statement. The detailed data are available in Appendices A-E, which are archived in the Digital Archaeological Record (tDAR ID 399125, http://core.tdar.org/ project/399125/. Appendices A-E are assigned DOIs: 10.6067/XCV8PC33R5, 10.6067/XCV8VQ3409, 10.6067/XCV8JM2C0K, 10.6067/XCV8XW4M4D, 10.6067/XCV8T43VFR, respectively. The ware categories are those compiled by the SWSN project (Mills et al. 2015), and a list of all wares is available at http://www.archaeologysouthwest.org/swsn.

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Notes

1. Following Haury (1958, see also Stone 2015; Stone and Lipe 2011), many researchers assume that the immigrants were burned out. However, Rodrigues's (2008) skeletal analysis found that violence was not specifically directed towards

the migrants, and Lyons infers continuity of migrant material styles after the fire, possibly suggesting that the migrants were not all forced to leave or that their material traditions were incorporated into local practices (Patrick Lyons, personal communication, 2015).

2. What we (and the SWSN Project) call the "Zuni subregion" is equivalent to what is called the "Zuni region" by Huntley and Kintigh (2004). Our "Zuni subregion" incorporates three smaller subregions ("West Zuni," "Pescado Basin," and "El Morro Valley") used in Peeples (2011).

3. NAA results indicate that Roosevelt Red Ware was made in various parts of the Cibola region (but not the Zuni subregion) during the Pueblo IV period (Duff 2002; Peeples 2011). The Roosevelt Red Ware found at the Zuni subregion Protohistoric sites is thought to have been imported, perhaps brought by migrants.

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