

## ARTICLE

LINES OF COMMUNICATION: MIMBRES HACHURE  
AND CONCEPTS OF COLOR

Will G. Russell, Sarah Klassen, and Katherine Salazar

*Turquoise has played an important role in the Southwest, both today and in the distant past. Increasingly, archaeologists are coming to appreciate that the mineral was likely valued for its symbolism, rather than its chemical properties or economic worth. Thus, the color blue-green and a variety of blue-green things may have been conceptually analogous, together referencing and petitioning moisture. J. J. Brody recognized that additional symbols, while not themselves blue-green, may have likewise belonged to this blue-green complex. Over a decade ago, and while testing Brody's hypothesis, Stephen Plog convincingly argued that black-on-white hachure in Gallup-Dogoszhi pottery served as a proxy for blue-green. Here, we ask whether Mimbres artists incorporated the same symbolism. Findings suggest that Mimbres hachure was likely representative of color but not necessarily blue-green. In fact, it may have referenced yellow. Yellow and blue are often paired among the Pueblos, and interregional differences in the meaning of hachure may relate to interregional complementarity.*

*La turquesa juega un papel importante en el Suroeste, tanto en la actualidad como en el pasado remoto. Cada vez más, los arqueólogos reconocen que el mineral fue valorado no tanto por sus propiedades químicas o su valor económico sino probablemente por su simbolismo. Por lo tanto, es posible que el color verde-azul y una variedad de objetos de color verde-azul hayan sido conceptualmente análogos, conjuntamente haciendo referencia a la humedad y solicitando la misma. J. J. Brody reconoció que varios símbolos adicionales, aunque no de color verde-azul, también pudieron haber pertenecido a este complejo verde-azul. Hace más de una década, en un intento de comprobar la hipótesis de Brody, Stephen Plog argumentó de forma convincente que el hachurado en negro sobre blanco en la cerámica Gallup-Dogoszhi sirvió como sustituto del verde-azul. Aquí nos preguntamos si los artistas Mimbres incorporaron el mismo simbolismo. Los resultados sugieren que el hachurado Mimbres probablemente fuera representativo de un color, pero no necesariamente del verde-azul. De hecho, es posible que hiciera referencia al color amarillo. A menudo el amarillo y el azul forman un par entre la gente Pueblo, y es posible que las diferencias interregionales en el significado del hachurado se relacionen con la complementariedad interregional.*

As anyone who has visited Taos, Tuba City, or Tucson knows, turquoise and its many hues are inextricably linked to concepts of the US Southwest. This connection is hardly new; archaeologists have long recognized that turquoise was valued among many of the region's prehispanic societies. Many consider the valuation and distribution of turquoise within an economic framework (e.g., Di Peso 1968; Frisbie 1980; Lummis 1920:219; Riley 1980:15), and focus on questions of procurement and exchange (e.g., Harbottle and Weigand 1992; Hull et al.,

2008; Judge et al. 1981; Mathien 1981, 1986, 1993; Reyman 1995; Snow 1973; Weigand 1992, 1994; Weigand and Harbottle 1993; Weigand et al. 1977; Windes 1987, 1992; Young et al. 1994).

Noneconomic explanations for the widespread, prehispanic use of turquoise are gaining traction, drawing from indigenous insight and expanding discussion to include the mineral's subtler symbolic associations (Hedquist 2016, 2017; Mathien 2001; Mills 2008; Plog 2003; Shepard et al. 2017; Weiner

**Will G. Russell** ■ Arizona State Parks & Trails, 1100 W. Washington St., Phoenix, AZ 85007, USA  
([WRussell@AZStateParks.gov](mailto:WRussell@AZStateParks.gov), corresponding author)

**Sarah Klassen** ■ Arizona State University, 900 Cady Mall, Tempe, AZ 85287, USA ([Sarah.Klassen@ASU.edu](mailto:Sarah.Klassen@ASU.edu))

**Katherine Salazar** ■ Arizona State University, 751 E. Lemon St., Tempe, AZ 85281, USA ([KSalaz1@ASU.edu](mailto:KSalaz1@ASU.edu))

*American Antiquity*, page 1 of 19

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2015; Whiteley 2012). Turquoise, it seems, was but one of several components within a *blue-green complex*, referencing and petitioning the cyclic movement of life-sustaining moisture. The multifaceted use of blue-green is, we suggest, interwoven with the Uto-Aztecan *Flower World*, as described by Hays-Gilpin and Hill (2000; see also Hill 1992; Stephen 1936:165).

Others have argued that, within the prehispanic blue-green complex, turquoise was valued as a vector of meaning and power, rather than because of its specific mineralogy (Hedquist 2016, 2017; Shepard et al. 2017; Weiner 2015), a conclusion based on both archaeological and ethnographic evidence (e.g., Parsons 1939:555; Plog and Heitman 2010; Stephen 1936:165). Turquoise was not the only blue-green mineral to have garnered such veneration. Others include azurite, malachite, serpentine, and chrysocolla,<sup>1</sup> suggesting that the manifestation of the blue-green *color* (and perhaps other shared properties) was more important than mineralogical particulars.

Given the longstanding importance of the blue-green complex, one would expect to encounter overlapping and redundant means of preserving and sharing it. Our fundamental research objective, then, is to explore the more subtle and nuanced ways in which the blue-green complex was embedded and reified in everyday life and practice.

Archaeological and ethnographic data indicate that the use of blue-green was one of many strategies to reference the blue-green complex. Others involved the depiction of flowers, clouds, rainbows, and riverine insects (see Hays-Gilpin and Hill 2000), lyrical description (e.g., Hill 1992), and metaphor in dress (e.g., Roediger 1941:132). J. J. Brody suspected that hachure on Chacoan pottery—*shu'k'ish-pa-tsi-nan* in Zuni (Cushing 1886:488)—might have represented the color blue-green (Plog 2003:670). To test Brody's hypothesis, Plog (2003:673) first identified instances where Pueblo potters suggested that hachure was, in fact, conceptualized as a color (Bunzel 1929:35, 42). He then examined nonceramic Chacoan artifacts that include blue-green, focusing on the color's incorporation into overall designs. He documented a pattern of similarly rendered, similarly incorporated motifs

on Gallup-Dogoszhi pottery, albeit rendered in hachure. Thus, Plog argued that Chacoan hachure served as a proxy for blue-green at a time when blue-green paint could not survive the firing process (see Rice 1987:333; Shepard 1961:32).

Over a decade has passed since Plog's (2003) analysis, yet there has been little effort to see whether the use of hachure as a substitute for blue-green extended beyond the Chacoan horizon. One place to look is within Mimbres society. In this paper, we test the hypothesis that Mimbres hachure, like Chacoan hachure, served as a visual proxy for the color blue-green.

Although the Chaco and Mimbres phenomena were largely contemporaneous and relatively close (but not adjacent or overlapping; see Figure 1), they developed in remarkably different ways. Whereas Bonito phase (AD 920–1130) Chacoan culture emphasized expansion, ostentation, and nonlocal interaction (e.g., Judge 1989; Kantner 1999; Lekson 1999, 2007; Reed 2004; Swentzell 2004:50), Classic period (AD 1000–1130) Mimbres society developed as a small-scale, insular network with little evident connection to what was going on in the north. Given these differences, the few things held in common stand out, including the early introduction of large masonry pueblos, interest in Mesoamerican materials, noteworthy turquoise consumption, and the early use of black hachure on white-slipped pottery (see Anyon and LeBlanc 1984:306–307; Brody 2004; Crown and Hurst 2009; Lekson 1992:116, 1999:52–53; Plog 2003).

In comparing the meaning(s) of Chacoan and Mimbres hachure, we acknowledge some significant differences, such as the relationship between hachured and solid elements. Some of the best-known examples of Chacoan hachure involve the Gallup-Dogoszhi style, with geometric designs not unlike those of contemporaneous local types (Plog 2003:667). The primary difference is that, while Gallup-Dogoszhi patterns are constructed almost exclusively from hachured elements (Hays-Gilpin and van Hartesveldt 1998:118), patterns on other Northern San Juan pottery are executed almost entirely in solid black (Colton and Hargrave 1937; see Figures 2a and 2b). On rare occasions, Chacoan vessels combine

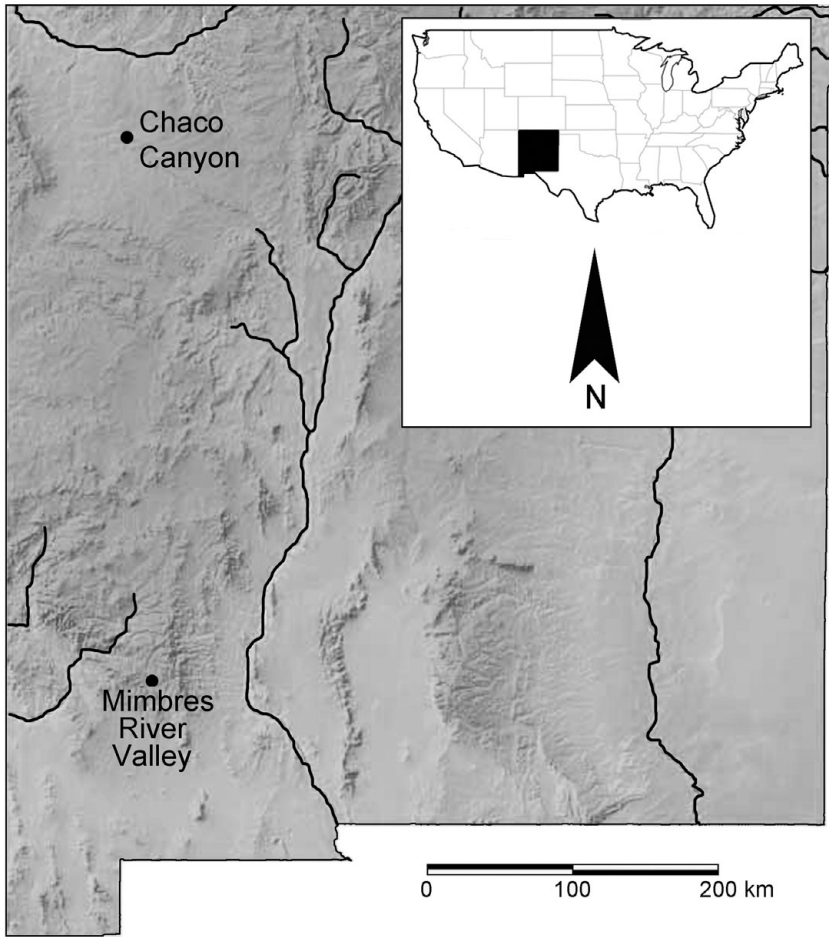


Figure 1. Map of New Mexico, showing locations of Chaco Canyon and Mimbres River Valley.

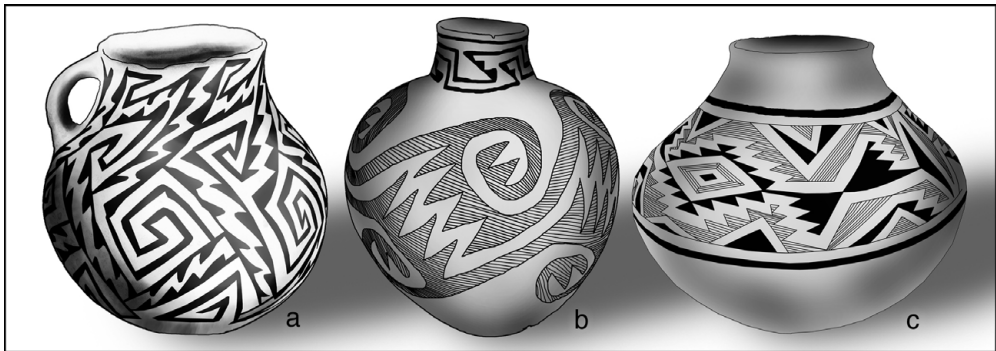
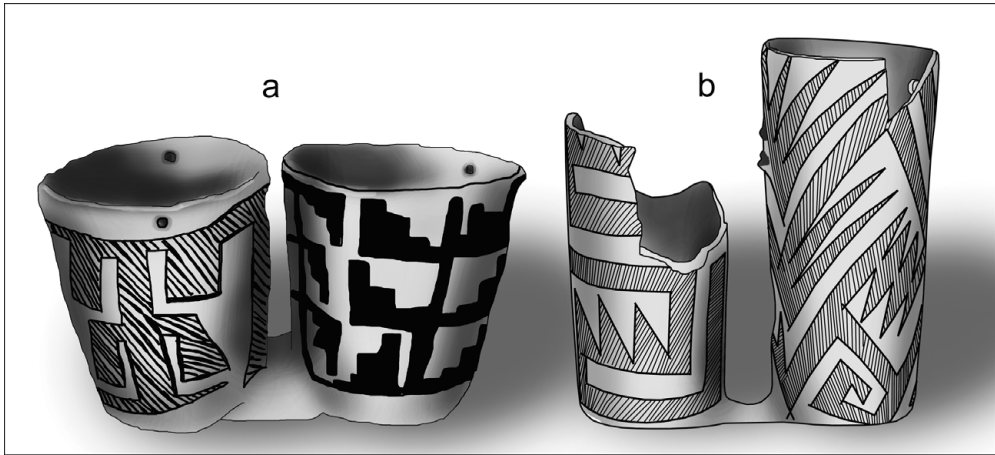


Figure 2. Three jars from the (2a, 2b) Chaco and (2c) Mimbres regions. (2a) Sosi Black-on-white pitcher, after image by American Southwest Virtual Museum; (2b) Gallup-Dogoszhi Black-on-white jar, after image by American Southwest Virtual Museum; (2c) Middle Style III Mimbres black-on-white jar, after MimPIDD 8729. Not to scale.



**Figure 3.** The only known Chacoan double-cylinder vessels, both decorated in the Gallup-Dogoszhi style. (3a) Extramural burial, LA59497, after Post (1993:Figure 7); (3b) kiva, Pueblo Bonito, after image by Peabody Museum of Archaeology and Ethnology. Not to scale.

the two styles with interlocking elements of solid and hachure (Plog 2003:678). While this combination was infrequent in San Juan pottery during the 1000s and early 1100s, it was increasingly common first in the Mimbres region (Mimbres black-on-white; Figure 2c) and then in the Mogollon Highlands (Reserve Black-on-white) (Brody 2004; Rinaldo and Bluhm 1956; Shafer and Brewington 1995). In fact, the use of interlocking solid and hachure appeared during the Three Circle phase (AD 750–1000) and became increasingly popular throughout the Mimbres Classic period (Russell 2009).

Stylistic relationships between hachure and solid black may have conveyed additional meaning. Chacoan vessels rarely incorporate both elements, but, when they do, the two are generally separated (Plog 2003:678). A notable example is a double-cylinder jar from LA59497 (see Figure 3a). The only other known double-cylinder jar (see Figure 3b), from Pueblo Bonito, is decorated entirely with hachure. In contrast, only half of the LA59497 specimen received this treatment, the other half being painted with a solid black design. Post wrote that the

separation of the solid and hachured layouts suggests a duality that cannot be fully appreciated by studying individual sherds or even individual vessels that have a single style represented. I doubt that the solid and

hachure design styles are indicative of cultural identity; instead, they are suggestive or symbolic of belief systems. (Post 1993:49)

We agree with Post's inference of dualism but suggest, based on Puebloan ethnographies, that the two design styles are more likely to represent opposing or complementary components within a single belief system rather than distinct systems. The question of how far this belief system extended coincides with our paper's primary objective. That is, Plog's symbolic findings and Post's hypothesized duality may have operated both within and beyond Chacoan society. At this scale, differences in the presentation of hachure may be "indicative of cultural identity" (Post 1993:49) after all.

We offer three analyses to test the hypothesis that Mimbres hachure, like Chacoan hachure, served as a proxy for blue-green. First, like Plog, we compare the use of hachured elements (in Mimbres pottery) to the use of blue-green elements (in nonceramic artifacts). Stylistic correlation would suggest conceptual interchangeability. Second, we compare the use of hachure (in Mimbres black-on-white vessels) to the use of color (in Mimbres Polychrome). If hachure was a substitute for blue-green, we would expect the two decorative techniques to be incorporated in similar ways. That is, hachured panels and colored panels should be incorporated similarly

despite occurring in different pottery types. Third, we examine differences in hachure use across a series of Mimbres motifs, some being more likely than others to have conceptual associations with blue-green. If hachure served as a proxy for blue-green, we would expect motifs with pan-Puebloan, blue-green associations to be preferentially decorated with hachure.

Because there is no universally accepted Mimbres typology, we need to define some of the Mimbres-specific terms we use. At the broadest scale, our concern is with what we call the *Mimbres ceramic series*. As a categorical scale, this is largely analogous to a pottery *ware*. Some authors refer to “Mimbres White Ware,” but we avoid the term because, with few exceptions, Mimbres potters used brown paste. Using “Mimbres Brown Ware” is no less problematic, in that the term is often used to describe unpainted pottery from the region.

The Mimbres ceramic series includes at least five distinct, decorated types: Three Circle Red-on-white, Style I Black-on-white, Style II Black-on-white, Style III Black-on-white, and Mimbres Polychrome (see Supplemental Table 1). Using pottery from well-dated contexts at the large, multicomponent site of NAN Ranch, Shafer and Brewington (1995) subdivided Styles I, II, and III into several refined micro-styles (see also Shafer and Taylor 1986).

One might add Mogollon Red-on-brown and/or San Francisco Red to the front end of the series, but their distributions are larger than the eventual extent of the Mimbres region, suggesting that they are best thought of as generally Mogollon, rather than specifically Mimbres. Livesay (2013) has argued for distinguishing, in select cases, between (reduced) black-on-white and (oxidized) red-on-white decoration during the Classic period. Her position has yet to be widely accepted, and we have decided not to make the distinction here. We also note that Mimbres Polychrome is not universally recognized as a distinct type. Some researchers see polychromatic vessels, which are quite rare, as a Style III Black-on-white variant. A portion of this paper involves the comparison of designs on Mimbres Polychrome vessels to those on vessels with only black-on-white color schemes. We refer to the latter as *Mimbres black-on-*

*white*, a colloquial term encompassing Styles I, II, and III, as well as Shafer and Brewington’s (1995) Style II/III Black-on-white and all micro-styles.

### Cross-Media Comparisons

Here, we mirror Plog’s (2003) analysis by comparing the use of color on nonceramic artifacts to the placement of hachure in Mimbres pottery designs. If Mimbres hachure, like Chacoan hachure, represents blue-green, we would expect stylistic similarities in how the two decorative approaches were incorporated into larger designs. We examine images of nonceramic artifacts in museums and private collections, along with photographs of vessels in the Mimbres Pottery Images Digital Database (MimPIDD).

Unlike at Chaco, there are few multicolored Mimbres artifacts. Many of those in our sample are also from poorly dated Mogollon cave deposits that may or may not correspond directly with Mimbres society. Turquoise mosaics at Mimbres sites are frequently encountered as concentrations of detached tesserae. Thus, while some comparisons are possible, they are largely anecdotal and produce mixed results. Supplemental Figure 1a, for example, shows one of two shell pendants from Swarts, each depicting a bird and snake, the latter’s tail encircling turquoise. One Mimbres vessel has a similar motif (Supplemental Figure 1b), repeated three times. In the bowl, however, the snakes are hachured, their tails do not form complete circles, and there is no hachure enclosed by the tail. Thus, there is no parallel use of turquoise and hachure in this cross-media example. There are several Mimbres bowls with quadrupeds whose tails encircle hachured elements (Supplemental Figure 1c), but this similarity is hardly compelling.

Elsewhere, correspondence between blue-green and hachure is entirely absent. In Supplemental Figure 2a, for example, turquoise was used to represent flower petals within a mosaic. Similar motifs, carved from wood and painted, are known from prehispanic caches (Supplemental Figure 2b) and some historic Pueblo altars (Fox 1988; Geertz 1987; Stevenson 1904:Plate 103; Wright 1973). Several Mimbres bowls depict similar flowers (Supplemental

Figure 2c), some with hachured centers, but none with hachured petals. Supplemental Figure 2d shows a wooden bird, from a Mogollon cave, that incorporates blue-green paint. A very similar bird is depicted in one Mimbres vessel (Supplemental Figure 2e), along with a series of somewhat-similar birds in other bowls (Supplemental Figure 2f). None incorporate hachure.

A potential parallel involves Hough's (1914:122) "basket *pahos*" from Bear Creek Cave (Supplemental Figure 2g), located in the Blue Range of east-central Arizona. Although the cave is on the periphery of what is generally considered to be the greater Mimbres region, it has been associated with the Mimbres cultural tradition (e.g., Webster 2007, 2008). The basket *pahos*' alternating rays of red and blue-green resemble those of solid black and hachure on some Mimbres vessels (Supplemental Figure 2h). The pottery motifs may reference or relate to basket *pahos*, but, if so, the hachure (on bowls) could represent either blue-green or red (as on baskets).

Perhaps Mimbres hachure represented colors other than blue-green. Supplemental Figure 3a, for example, shows a carved and painted fish from a cave in the Mimbres region (Shepard 2015; cf. Stevenson 1883:Figure 493). Decoration includes a yellow-brown, stepped-fret design. This may be the original color, or the faded remnants of a brighter yellow. The fish is likely part of a ceremonial mobile, like those depicted in six Mimbres bowls. Mobiles in two of the six bowls include pendant fish (e.g., Supplemental Figure 3c), one decorated with hachure (Townsend 2005:Plate 18).<sup>2</sup> Fish in Mimbres vessels generally do incorporate hachure (Supplemental Figure 3b). Does hachure in Mimbres painted fish represent blue-green (as it would at Chaco), yellow (like the wooden mobile), several colors, no colors, or a generalized notion of color?

An inference that Mimbres hachure could represent a particular color, a palette of colors, or color in general is supported by the absence of hachure on nonceramic Mimbres artifacts. That is, Mimbres artisans seem to have used hachure only when technological barriers prevented the direct application of color.<sup>3</sup> Thus far, however,

we find no convincing evidence of a specific association between Mimbres hachure and blue-green. In fact, what little evidence we find of an association with a particular color points toward shades ranging from yellow to red.

### Mimbres Hachure and Polychrome

Here, we compare the stylistic use of hachure in Mimbres black-on-white types (Styles I, II, II/III, and III) to that of color in Mimbres Polychrome. Interchangeability would suggest conceptual parallels, which could involve a particular color (uniform interchangeability) or the general concept of color (interchangeability with multiple colors).

Color identification is highly subjective. Munsell standardization helps, but colors can vary considerably within a single artifact. Use, deposition, and exposure are also likely to introduce change (especially fading) over time. Parlance adds another dimension of ambiguity, especially in cross-media comparisons. Similarly colored artifacts can be described as "tan," "buff," "beige," or "brown," depending on the medium. Lastly, the ways in which colors are conceptualized are contextually and culturally specific. We may differentiate between "blue" and "green," for instance, but this distinction is not universal (see Plog 2003:Note 3).

Of the over 10,000 Mimbres vessels documented in MimPIDD, 146 have been identified as Mimbres Polychrome. To avoid the inclusion of forged pottery, we restrict our polychrome sample to a group of 44 vessels with known provenance (Supplemental Table 2; see also Hegmon et al. 2017). Various portions of this sample are used in the analyses to follow, depending on the attributes in question.

#### *The Interchangeability of Hachure and Color*

First, we identify and assess associations between hachure (on Mimbres black-on-white) and color (on Mimbres Polychrome) by comparing the stylistic placement of both decorative techniques within geometric schemes. Our sample consists of a subset of 32 provenienced polychrome vessels wherein color is used as a geometric component. We exclude the other 12 polychrome vessels because color is used in

their designs only in the decoration of figurative motifs. Our concern is that the use of color in such cases could relate to the physical characteristics of the motif's referent, rather than to any abstract meaning associated with the color. Some of the 32 included vessels incorporate color in both figurative and geometric schemes, but our analysis is limited to geometric incorporation.

In 23 of the 32 polychrome bowls (71.9%), colored elements are incorporated in ways that approximate the placement of hachure in Mimbres black-on-white vessels (Supplemental Figure 4). Seven cases are ambiguous, involving the use of color in ways that could be analogous to either hachure or solid black. Only twice was color used in ways that clearly parallel the use of solid black.

Thus, within our sample, hachure and color were stylistically interchangeable—in geometric designs—far more often than not. This suggests that hachure and color may likewise have been conceptually interchangeable. However, the stylistic interchangeability was not universal, indicating some degree of artistic and/or social flexibility in the use of color and/or hachure.

### *Choice(s) of Color(s)*

If Mimbres hachure acted as a proxy for color (or *a* color), and if this hachure was conceptually linked to the colors of Mimbres Polychrome, the next logical step is to examine which colors occur in Mimbres Polychrome. For this exercise, we rely on another subset of vessels ( $n = 38$ ) for which we have color photographs. To reduce subjectivity in the identification of color, and to account for differences in lighting and preservation, we use Photoshop to select the highest color *value* per vessel. Selected colors, shown in Supplemental Figure 5, are translated into Munsell classifications (see Supplemental Table 2). Overall, they are decidedly brownish. To us, at least, this is an unexpected find, given that Mimbres Polychrome is often described by observers as including yellow (see Supplemental Figure 6).

The perception of yellow, generated through the juxtaposition of brown and black, was perhaps unintended. On the other hand, the technique may have been developed, as hachure may

have been, to produce or convey colors that were otherwise nonreplicable in ceramic form.

Our observations do not support the hypothesis that Mimbres hachure acted as a proxy for blue-green. If such an association did exist, it would make little sense for potters to use hachure interchangeably with any color other than blue-green. That is, if hachure did represent blue-green, it follows that it would either stand alone, or be stylistically interchangeable with blue-green. Although blue-green pigment would not have stayed blue-green after firing, it could have been added as fugitive paint (see Moulard 1984:121). Thus, if our comparison suggests any correlation between Mimbres hachure and a particular color, that color is either brown (objective) or yellow (subjective).

### *Polychrome, Sex, and Gender*

Because blue-green is conceptually linked to maleness in Puebloan societies (Parsons 1919:452; Stephen 1936:1191), we explore potential associations between Mimbres Polychrome and maleness. If the brown/yellow in these vessels is interchangeable with hachure, and if Mimbres hachure represents blue-green, we would expect the brown/yellow to be preferentially associated with male motifs. Sex or gender is determinable for seven polychromatic human motifs: five women and two men. Thus, color in Mimbres pottery is associated with depictions of women more than twice as often as with men, although the sample size prevents robust statistical assessment. In contrast, sex was determinable for only two polychromatic pronghorn motifs, both of which were male. Our observations are ambiguous and demonstrate no clear connection between Mimbres Polychrome colors, sex, or gender.

### **Mimbres Hachure and Figurative Motifs**

Here we consider a selection of figurative motifs in Mimbres pottery. Drawing from ethnographic information, we identify motifs that are likely or unlikely to have been associated, in prehispanic societies, with blue-green. If Mimbres hachure served as a proxy for blue-green, we would expect hachure to be preferentially associated with these motifs.

*Animals and Hachure.* Among the ethnographically documented Pueblos, blue-green and blue-green objects are closely associated with water and the sky. At Hopi, for example, the clinking together of turquoise nuggets approximates the sound of running water (Charles Loloma, in Hays-Gilpin et al. 2010:5). At Zuni, light reflects from the upper world's *Mountain of Turquoises*, turning the sky blue (Cushing 1901:39–40; Parsons 1930:50).

We assume that some animals were understood, in Mimbres society, to have a stronger connection than others with water or the sky. These, in turn, are more likely to have been conceptually associated with blue-green. We cannot know with certainty which animals were conceptualized in this way, but we do know that, historically, Puebloan societies consistently associated fish with water and with blue-green. Likewise, many birds were routinely associated with the sky and with blue-green. Thus, we compiled two samples from MimPIDD. The first includes all provenienced vessels depicting fish (203 fish motifs, in 135 vessels, all bowls). The second includes all provenienced vessels depicting birds (86 bird motifs, in 51 vessels, all bowls).<sup>4</sup> We also assembled a control group consisting of all provenienced vessels depicting canids and lagomorphs (118 motifs, in 94 vessels, all bowls), neither of which have ethnographically documented Puebloan associations with water or sky (Supplemental Table 3). All date to the Classic period, save six fish bowls and one lagomorph bowl, which date to the late Three Circle phase. The paucity of pre-Classic vessels disallows diachronic analysis but is not surprising; hachure became more prevalent through time, and the MimPIDD universe is skewed heavily toward Classic period vessels.

If Mimbres hachure represents blue-green, we would expect higher relative frequencies of hachure in the fish and/or bird samples than in the control sample. Each of the 411 animal depictions are classified as either including or lacking hachure.<sup>5</sup>

We focus on *standard hachure*, but recognize that similar elements—what we call *pseudo-hachure*—may have been conceptualized similarly. We identify five pseudo-hachure elements: *zigzag hachure*, *stacked lines*, *nested shapes*,

*cross-hachure*, and the *captive bar* motif. We define *standard hachure* as straight, closely spaced, parallel lines used to fill a polygon (Figure 4a). While the lines used in *pseudo-hachure* are also closely spaced and equidistant, they are generally not straight (see Figures 4b–f). The exception to this criterion involves *stacked lines*, which resemble standard hachure in being straight, closely spaced, and parallel, but are differentiated from standard hachure for at least one of three reasons. First, stacked line panels (always rectangular) are in every case much longer than they are wide, often having a length-to-width ratio of at least 4:1 (Figure 4c1). Second, stacked lines may not be entirely framed (Figure 4c2). Third, stacked lines are at times embedded within fields of solid black, producing the illusion of white lines (Figure 4c3). Because some forms of pseudo-hachure more closely resemble standard hachure than others, analyses can include various combinations to examine results along a continuum of confidence (Supplemental Table 4).

We do not include “basket-weave” patterns (e.g., Figure 4g) in our pseudo-hachure category, given the possibility that they are literal representations of basketry (see Brew 1946:247; Brody 1991:61; Carlson 1982:208; Hays 1992:261–264; Hays-Gilpin 1995; Holmes 1886:247; Larralde 1977; Morris 1927:197; Nordenskiöld 1990:86; Ortman 2000).

We compare the relative frequencies of hachure, pseudo-hachure, and various permutations across motif classes (fish, bird, and control) and, given small sample sizes, assess differences using two-tailed Fisher's exact tests (Supplemental Tables 5 and 6), with Yule's  $Q$  as a measure of the strength of association. The most conservative of our comparisons, limited to standard hachure, indicates that hachure is associated with fish more than twice as often as lagomorphs ( $p = 0.03$ ;  $Q = 0.48$ ). However, the difference in relative hachure frequency between fish and land-animals in general is less than compelling ( $p = 0.11$ ), as were all other differences ( $p \geq 0.11$ ).

Because standard hachure and pseudo-hachure may have been stylistically analogous, we perform two additional sub-analyses. The first involves the combined consideration of standard



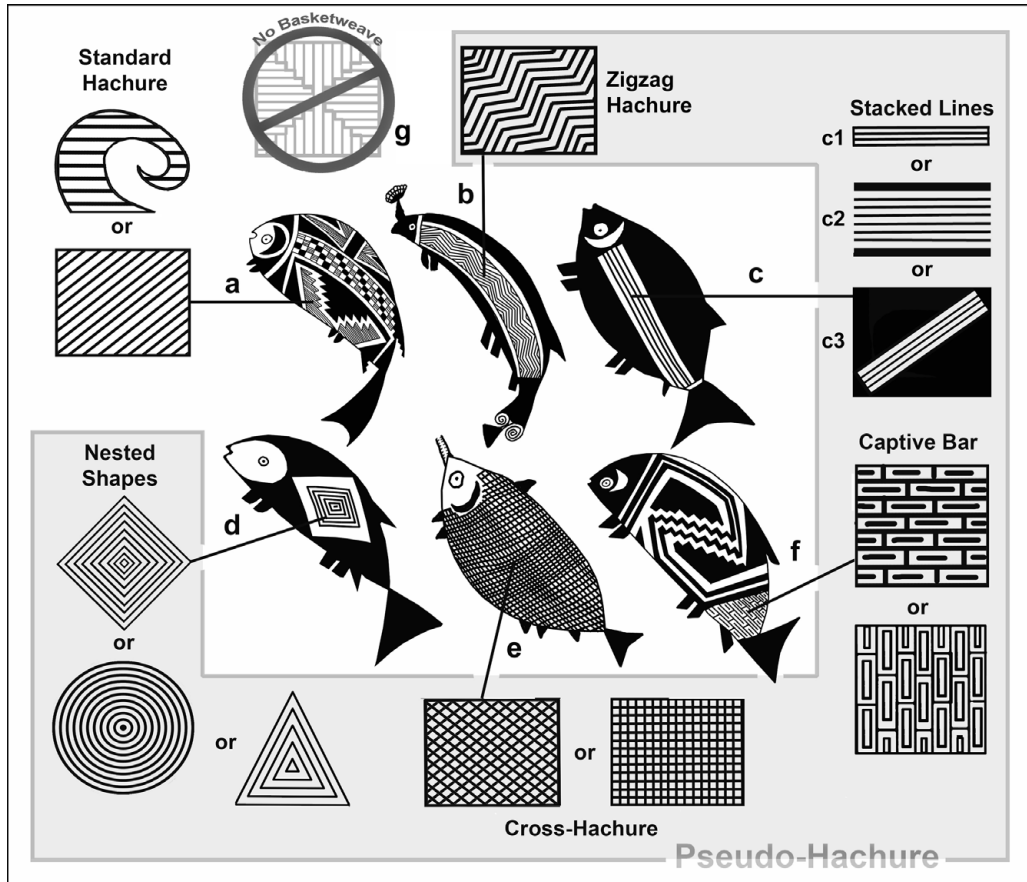


Figure 4. Examples of fish decorated with hachure and pseudo-hachure. (4a) standard hachure (after MimPIDD 1149); (4b) zigzag hachure (after MimPIDD 2100); (4c) stacked lines (after MimPIDD 2838); (4d) nested shapes (after MimPIDD 2272); (4e) cross-hachure (after MimPIDD 2069); (4f) captive bar motif (after MimPIDD 1595). Not to scale.

hachure, zigzag hachure, and stacked lines (Supplemental Tables 7 and 8). Results indicate that fish have a far higher relative frequency than land-animals in general ( $p < 0.01$ ;  $Q = 0.43$ ), lagomorphs in particular ( $p < 0.01$ ;  $Q = 0.72$ ), and birds ( $p < 0.01$ ;  $Q = 0.47$ ). The second recombination involves standard hachure and all forms of pseudo-hachure (Supplemental Tables 9 and 10). In this instance, fish have a relative frequency that is substantially greater than that of birds ( $p < 0.01$ ;  $Q = 0.52$ ), lagomorphs ( $p < 0.01$ ;  $Q = 0.77$ ), canids ( $p = 0.01$ ;  $Q = 0.37$ ), and the combined land-animal category ( $p < 0.01$ ;  $Q = 0.56$ ). Both birds and canids included hachure far more often than lagomorphs ( $p < 0.01$ ;  $Q = 0.56$  and  $p < 0.01$ ;  $Q = -0.55$ , respectively).

To summarize, cross-motif comparisons indicate that hachure was used preferentially in Mimbres fish motifs. While compelling, this can be explained in several ways. Hachure could indeed be linked conceptually to water and/or blue-green. Then again, it may depict scales, refraction, currents, or the color of the fish themselves.

*Pahos and Hachure.* Next, we consider depictions of *pahos* (prayer sticks), which have ethnographic and archaeological connections to blue-green. Historically, *pahos* were used to make and convey prayers (e.g., Boas 1928:241; Parsons 1939). Often dedicated to the procuring of moisture, efflorescence of crops (e.g., Parsons

1939:206), or rebirth in a watery underworld (e.g., Parsons 1939:72–73), *pahos* are frequently associated with blue-green. As quoted by Plog (2003:675), Stephen (1936:165) wrote that “All ordinary pá-ho [at Zuni] are painted ... a blue-green, because, they say, that is the color of vegetation” and “prayer sticks are painted green because it is vegetation that is asked for, prayed for.” Plog (2003:675) notes that at Hawikku, the only color reported for excavated *pahos* was blue (Smith et al. 1966:272–273). This monochromatic tendency is less pronounced to the south. Hough (1914:62), for instance, described a *paho*-like staff from a cave near Silver City as “painted in lively colors of red, yellow, green, and black.”

Archaeological and ethnographic *pahos* vary in size, form, style, and function. Archaeologically, one of the most widespread and stylistically heterogeneous types is the *roundel paho*, found in Mogollon caves (Hough 1914), Chaco Canyon (Pepper 1920), and elsewhere (e.g., Anderson et al. 1986; Cosgrove 1947; Gifford 1980; Haury 1945; Lambert and Ambler 1961; Martin et al. 1952; see also McGregor 1943). They are relatively long, staff-like, and grooved at one end. Roundel *pahos* were often, perhaps always, painted. Those recovered by Hough (1914) were decorated with combinations of blue, green, red, yellow, and black. Most of those excavated by Fewkes (1898, 1904) in northern Arizona were green or blue, although red and black are also encountered (Plog 2003:675).

Similar objects are depicted in a small number of Mimbres bowls (LeBlanc 2004:33). These are often called “swords” because of their shape (see Supplemental Figure 7) and how they are held (see MimPIDD 2794). They have been interpreted as swallowing sticks (Brody 2004:48), staffs of office (Fewkes 1916:544), and weapons (Kabotie 1982:29), but are most frequently thought of as roundel *pahos* (Cosgrove and Cosgrove 1932:Plate 228; Riggs 2005; Webster 2009:285, 310).

If Mimbres “swords” depict *pahos*, it is reasonable to suspect that their execution on black and white pottery may have conveyed concepts of vivid color that were otherwise not replicable in a literal sense. While archaeologists have recovered many brightly painted artifacts resembling

“swords,” we are unaware of any decorated with hachure.<sup>6</sup>

We identify 25 sword motifs in MimPIDD, 12 of which are provenienced (in 11 bowls; Supplemental Table 11). Within the provenienced subset, five sword motifs are rendered in solid black (often as a simple black line). Each of the seven remaining motifs is decorated with zigzag hachure. We note also that all 13 non-provenienced swords are likewise decorated with zigzag hachure. These observations suggest a meaningful link between Mimbres swords (arguably *pahos*) and zigzag hachure, the latter likely representing an indeterminate color or the concept of color in general. While northern *pahos* were often blue-green, those to the south were more varied in color, preventing us from inferring a link between zigzag hachure and any one color in particular.

In the context of Mimbres pottery, zigzag hachure may have been polysemous, representing more than just color (or a color). Zigzag motifs, among the Pueblos, are associated with lightning and rain (Old Elk and Stoklas 2001; Parsons 1939; Wardle 1990). Thus, the zigzag hachure on Mimbres swords could represent both color and iconographic reference to moisture.

*Mimbres Hachure and Sex- or Gender-Specific Motifs.* Puebloan color symbolism includes references to gender. As noted above, blue-green and blue-green minerals are often associated with maleness (Parsons 1919:452; Stephen 1936:1191). Were this the case in Mimbres society, and if hachure was used by potters to convey the color and concepts of blue-green, we would expect hachure to be preferentially associated with male motifs. To investigate, we examined images of all provenienced Mimbres vessels with human motifs. Using hairstyle, clothing, and anatomy (see Hegmon et al. 2017; Munson 2000), we identified 43 male motifs (in 32 vessels) and 23 female motifs (in 17 vessels), listed in Supplemental Table 12.<sup>7</sup> Within each class we determined the number of individuals that do and do not incorporate hachure or pseudo-hachure (see Supplemental Table 13). Differences in relative frequency were assessed with two-tailed Fisher’s exact tests (Supplemental Table 14 and 15). All differences have a high

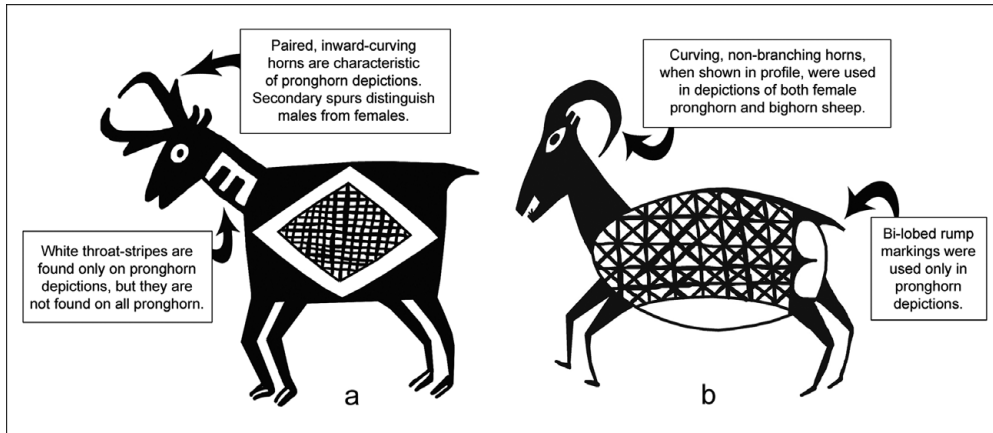


Figure 5. Examples of (a) male and (b) female pronghorn as depicted in Mimbres pottery. (a) After MimPIDD 3829; (b) after MimPIDD 7669. Not to scale.

probability of resulting from chance, whether considering standard hachure ( $p = 0.35$ ), a combination of standard hachure, zigzag hachure, or stacked lines ( $p = 0.12$ ), or both standard hachure and all forms of pseudo-hachure together ( $p = 0.23$ ). Thus, neither male nor female human motifs incorporate hachure more than the other.

Because hachure was so rarely encountered in human motifs, we extended our analysis to include pronghorn. Pronghorn motifs can be consistently sexed by way of conspicuous anatomical characteristics (Figure 5). Considering only provenienced vessels, eight female and 18 male pronghorn are identified in MimPIDD (in 16 vessels; Supplemental Table 16). Every female includes hachure or pseudo-hachure, compared to only 55.6% of males (Supplemental Table 17). Differences in relative frequency are assessed using a series of two-tailed Fisher's exact tests (Supplemental Tables 18 and 19). Differences involving standard hachure alone, as well as those concerned with standard hachure, zigzag hachure, and stacked lines are unlikely to be meaningful ( $p = 0.33$  and  $0.15$ , respectively). When hachure and all forms of pseudo-hachure are considered, the difference is found to have a low probability of attribution to chance ( $p = 0.03$ ;  $r = 0.56$ ).<sup>8</sup>

Once again, our results are ambiguous and potentially conflicting. Among human motifs, males and females were seldom hachured, but equally so. Among pronghorn motifs, all females were decorated with hachure or pseudo-hachure,

significantly more often than males. Each finding fails to suggest that Mimbres hachure was preferentially associated with maleness or, by extension, blue-green.

### Conclusion

In the analyses above, we asked whether Mimbres hachure, like Chacoan hachure, represented the color blue-green when used to decorate black-on-white pottery. In some ways, our results are ambiguous. On one hand, hachure is preferentially associated with fish and *paho* motifs, both having ethnographic connections to moisture and blue-green. On the other hand, Mimbres hachure rarely (if ever) corresponds stylistically with the use of blue-green on nonceramic artifacts. The most convincing, cross-media similarities, in fact, involve shades of yellow.

Ethnographically, blue-green is often associated with maleness, yet Mimbres hachure is not preferentially associated with male motifs. Rather, depictions of men and women are decorated with hachure in equal proportions. Among pronghorn motifs, females are decorated with hachure or pseudo-hachure significantly more often than males.

The use of colored elements in Mimbres Polychrome often parallels that of hachure in Mimbres black-on-white types, suggesting conceptual interchangeability. Polychrome colors, however, are not blue-green, instead appearing yellow. We find it unlikely that Mimbres potters

would use hachure, if it indeed represented blue-green, and brown paint (appearing yellow) interchangeably. Although depictions of women were colored more often than those of men, colored pronghorn motifs are exclusively male.

Some of our associative patterns are compelling, but none are absolute. While fish, sword, and female pronghorn motifs are preferentially associated with hachure, there are plenty of exceptions. Hachure is significantly underrepresented among canid, lagomorph, and male pronghorn motifs, but it is not absent. Rather than detracting from our inferences, however, this statistical imperfection is entirely consistent with what we would expect, based on Puebloan ethnographies. While turquoise is conceptually linked to maleness, for example, Puebloan women are not precluded from wearing turquoise jewelry. Maize is conceptually associated with femaleness, but Puebloan men are traditionally responsible for its planting, care, and harvesting.

In sum, our results fail to support the hypothesis that Mimbres hachure, like Chacoan hachure, represents the color blue-green. In fact, we can say with some confidence that Mimbres hachure *was not* representative of blue-green. Nevertheless, we do suggest that Mimbres hachure *was* representative of color in general, or of a particular color (see Bunzel 1929:35, 42). If the latter, the most convincing candidate is yellow. This stands as another way in which the two contemporaneous phenomena—Chaco and Mimbres—were at once similar and different. Both regions built large pueblos, kivas, and roads (e.g., Anyon and LeBlanc 1980; Creel 2006:233–242; Creel and Anyon 2003; Hegmon et al. 2006; Kincaid 1983; Lekson et al. 1994; Roney 1992; Shafer 1982; Vivian and Reiter 1960; Wills 2000). Both were consumers of turquoise, shell, and scarlet macaws (e.g., Creel and McKusick 1994; Gilman et al. 2014; Heacock 2015; Mathien 1984; Parks-Barrett 2001; Watson et al. 2015; Windes 1992). Both slipped their pottery white and used patterns of solid black and hachure, and, in both cases, hachure apparently represented color. These parallels, however, were manifest in differing ways, such as the shape of kivas, the juxtaposition of black and hachure, and the specific meaning attached to the latter. Specifically, Plog (2003) showed

that Chacoan hachure represented blue-green, while our results suggest that Mimbres hachure represented, if any particular color, yellow.

#### *Blue and Yellow*

Ethnographically, Puebloan societies often recognized and celebrated a dyadic relationship between blue (including blue-green) and yellow. Within this pairing, blue represents maleness, water, sun, and sky, whereas yellow is associated with femaleness, maize, earth, and moon (Bunzel 1932a:717, 1932b:500; Colton 1965:50–51; Parsons 1917a:193, 1919:452; Stephen 1936:1191). The Oraibi Flute Society altar includes a

maize mosaic ... representing a cloud with parallel lines symbolic of falling rain. Although outlined with a narrow band of black ... the design was filled in with grains of maize of two colors, yellow on the right, blue on the left. (Fewkes 1895:267)

The Zuni Corn Maidens are led by Yellow Corn Maiden and Blue Corn Maiden (Parsons 1917b:498 n. 1). An O'odham story describes how "Yellow Finch Shaman" and "Blue Jay Shaman" flew above the world, pulling out feathers and letting them fall to the ground, where they turned into yellow and blue flowers (Donald Bahr, in Skinner 2009:837). At Walpi, and prior to a *Lé-len-ti* ceremony, part of the *Moñ'kiva's* floor is separated into two parts, one covered with blue-green corn pollen, and the other with yellow corn pollen (Fewkes 1894:277). In Keresen cosmology, the two worlds below this one are associated with blue and yellow (White 1942:80–81). During his ceremonial retreat, the Zuni *Pekwin* priest visits outlying shrines, leaving offerings of blue-green turquoise and yellow cornmeal as supplication for rain and fertility, respectively (Bunzel 1932c:663).

#### *The Nature of Differences*

At their respective heights, the Chaco and Mimbres phenomena were temporally coincident, spatially proximate, and likely aware of one another, yet remarkably (and probably intentionally) different. Their differences have yet to be systematically explored, and one way to approach the task would be to consider an element of interregional complementarity. That

is, Chaco may have emphasized one-half of a whole (sky, sun, day, north, round, winter, blue-green, male) while Mimbres emphasized the other (earth, moon, night, south, square, summer, yellow, female).

Although recent studies mark growing interest in Southwestern dualism and complementarity (e.g., Bernardini and Fowles 2011; Bernhart and Ortman 2014; Fowles 2005; Heitman and Plog 2005; Ware 2014), salient evidence has been collected by archaeologists and ethnographers for over a century, and at many socio-spatial scales. As discussed above, Post (1993:49) recognized such evidence within a single artifact. Lowell (1996:80, 81) noted that, historically, architectural distinctions within a single structure have corresponded with social dualism (see also Ellis 1979:358). At Nambe, for example, the Winter People and Summer People use different features within a single kiva (Parsons 1929:101). The “D” shape of some large, ancestral Zuni pueblos is essentially the combination of a square and a circle (Kintigh 1985), which Potter and Perry (2000:72) have interpreted as evidence of site-scale duality. Similarly, but at the intrasite scale, the presence of both square and round kivas at Atsinna Pueblo suggests complementarity. Historically, Eastern Keresan villages generally had a dual kiva system (Dozier 1970:155; Eggan 1983:727; Fox 1967:14; Goldfrank 1974 [1927]:10; Hawley 1950:291–292; Hoebel 1979:411; Lange 1979a:32; 1979b:384; Strong 1979:401; Strong 1927:14; White 1932:13, 1935:26, 1942:112, 1962:52), which Snead and Preucel (1999) were able to identify archaeologically. The two halves of this system are referred to as the Turquoise Kiva (often located in the northern part of the settlement), and the Squash Kiva (often located in the southern part). Of course, turquoise and squash are associated with blue-green and yellow, respectively. Similar two-kiva systems are known from several Tewa communities as well (Dozier 1966:73; Parsons 1929:99). Potter (1997:224–226; Potter and Perry 2000:72–74) suggested that the juxtaposition of oval pueblos and rectangular pueblos in the El Morro Valley suggests an element of dualistic complementarity at an intersite scale. And, finally, several authors have discussed duality and complementarity at

the societal scale, such as the incorporation of moiety systems (e.g., Ortiz 1969; Ware 2014).

The possibility of dualism and complementarity having cross-cut contemporaneous-yet-distinct cultural traditions has received little archaeological attention in the Southwest. Although beyond the scope of our present paper, we recognize that our findings may contribute to a broader and more multiscalar understanding of such phenomena.

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*Data Availability Statement.* Mimbres vessel data are available through the Mimbres Pottery Images Digital Database, which is maintained in perpetuity by the Digital Archaeological Record. Access is available online at <http://core.tdar.org/collection/22070>.

*Supplemental Materials.* For supplementary material accompanying this paper, visit <https://core.tdar.org/document/433658/supplemental-tables-russell-klassen-and-salazar-2017> and <http://core.tdar.org/document/427303/supplemental-figures-russell-klassen-and-salazar-2017>.

Supplemental Table 1. Mimbres Ceramic Typology

Supplemental Table 2. Mimbres Polychrome Vessels (Provenienced)

Supplemental Table 3. Select Animal Motifs (Provenienced)

Supplemental Table 4. Hachure Proportions: Animal Motifs

Supplemental Table 5. Contingency Tables: Animal Motifs (Standard)

Supplemental Table 6. Probability Matrix: Animal Motifs (Standard)

Supplemental Table 7. Contingency Tables: Animal Motifs (Standard/Zigzag/Stacked)

Supplemental Table 8. Probability Matrix: Animal Motifs (Standard/Zigzag/Stacked)

Supplemental Table 9. Contingency Tables: Animal Motifs (All Forms)

Supplemental Table 10. Probability Matrix: Animal Motifs (All Forms)

Supplemental Table 11. Sword Motifs (Provenienced)

Supplemental Table 12. Human Motifs with Determinable Sex or Gender (Provenienced)

Supplemental Table 13. Hachure Proportions: Sexed/Gendered Human Motifs

Supplemental Table 14. Contingency Tables: Sexed/Gendered Human Motifs

Supplemental Table 15. Probability Matrices: Sexed/Gendered Human Motifs

Supplemental Table 16. Pronghorn Motifs with Determinable Sex (Provenienced)

Supplemental Table 17. Proportions: Sexed Pronghorn Motifs

Supplemental Table 18. Contingency Tables: Sexed Pronghorn Motifs

Supplemental Table 19. Probability Matrices: Sexed Pronghorn Motifs

Supplemental Figure 1. Cross-Media Comparison of Mimbres Motifs with Curled Tails

Supplemental Figure 2. Cross-Media Comparison of Mogollon Flower, Bird, and Basket Motifs

Supplemental Figure 3. Cross-Media Comparison of Mogollon Fish Motifs

Supplemental Figure 4. Comparison of Black-on-white and Polychrome Designs

Supplemental Figure 5. Colors in Mimbres Polychrome Vessels

Supplemental Figure 6. Mimbres Polychrome Bowl

Supplemental Figure 7. Mimbres "Sword" Motif

## References Cited

- Anderson, Keith, Gloria J. Fenner, Don P. Morris, George A. Teague, and Charmion McKusick  
1986 *The Archeology of Gila Cliff Dwellings*. Publications in Anthropology 36. Western Archeological and Conservation Center, Tucson, Arizona.
- Anyon, Roger, and Steven A. LeBlanc  
1980 The Architectural Evolution of Mogollon-Mimbres Communal Structures. *The Kiva* 45:253–277.  
1984 *Galaz Ruin: A Prehistoric Mimbres Village in Southwestern New Mexico*. University of New Mexico Press, Albuquerque.
- Bernardini, Wesley, and Severin Fowles  
2011 Becoming Hopi, Becoming Tiwa: Two Pueblo Histories of Movement. In *Movement, Connectivity, and Landscape Change in the Ancient Southwest*, edited by Margaret C. Nelson and Colleen Strawhacker, pp. 253–274. University Press of Colorado, Boulder.
- Bernhart, Robert, and Scott G. Ortman  
2014 New Evidence of Tewa-style Moietiy Organization in the Mesa Verde Region, Colorado. In *Astronomy and Ceremony in the Prehistoric Southwest Revisited: Collaborations in Cultural Astronomy*, edited by Gregory E. Munson, Todd Bostwick, and Tony Hull, pp. 87–100.
- Maxwell Museum of Anthropology Anthropological Papers No. 9. University of New Mexico, Albuquerque.
- Boas, Franz  
1928 *Keresan Texts*. Publications of the American Ethnological Society Vol. 8, Pts. 1–2. American Ethnological Society, New York.
- Brew, J. O.  
1946 *The Archaeology of Alkali Ridge, Southeastern Utah*. Papers of the Peabody Museum of Archaeology and Ethnology No. 24. Harvard University, Cambridge, Massachusetts.
- Brody, J. J.  
1991 *Anasazi and Pueblo Painting*. University of New Mexico Press, Albuquerque.  
2004 *Mimbres Painted Pottery*. School for Advanced Research, Santa Fe, New Mexico.
- Bunzel, Ruth Leah  
1929 *The Pueblo Potter: A Study of Creative Imagination in Primitive Art*. Dover Publications, New York.  
1932a Introduction to Zuñi Ceremonialism, Zuñi Origin Myths, Zuñi Ritual Poetry, Zuñi Katcinas. *Twenty-seventh Report of the Bureau of Ethnology, 1933–1938*. U.S. Government Printing Office, Washington, DC.  
1932b *Zuni Katcinas: An Analytical Study*, Vol. 47. Rio Grande Press, Glorieta, New Mexico.  
1932c *Zuñi Ritual Poetry*. 47th Annual Report of the Bureau of American Ethnology for the Years 1929–1930. Government Printing Office, Washington, DC.
- Carlson, Roy L.  
1982 The Polychrome Complexes. In *Southwestern Ceramics, A Comparative Review*, edited by Albert H. Schroeder, pp. 201–234. The Arizona Archaeologist No. 15. Arizona Archaeological Society, Phoenix.
- Colton, Mary-Russell Ferrell  
1965 *Hopi Dyes*. Museum of Northern Arizona Bulletin No. 41. Museum of Northern Arizona, Flagstaff.
- Colton, Harold S., and Lyndon L. Hargrave  
1937 *Handbook of Northern Arizona Pottery Wares*. Museum of Northern Arizona Bulletin No. 11. Museum of Northern Arizona, Flagstaff.
- Cosgrove, C. B.  
1947 *Caves of the Upper Gila and Hueco Areas in New Mexico and Texas*. Peabody Museum of American Archaeology, Cambridge, Massachusetts.
- Cosgrove, Harriet S., and C. B. Cosgrove, Jr.  
1932 *The Swarts Ruin, a Typical Mimbres Site in Southwestern New Mexico*. Papers of the Peabody Museum of American Archaeology and Ethnology No. 15. Harvard University, Cambridge, Massachusetts.
- Creel, Darrell  
2006 *Excavations at the Old Town Ruin, Luna County, New Mexico, 1989–2003*. Vol. 1. U.S. Bureau of Land Management, New Mexico State Office, Santa Fe.
- Creel, Darrell, and Roger Anyon  
2003 New Interpretations of Mimbres Public Architecture and Space: Implications for Cultural Change. *American Antiquity* 68:67–92.
- Creel, Darrell, and Charmion McKusick  
1994 Prehistoric Macaws and Parrots in the Mimbres Area, New Mexico. *American Antiquity* 59: 510–524.
- Crown, Patricia L., and Hurst, W. Jeffrey  
2009 Evidence of Cacao Use in the Prehispanic American Southwest. *Proceedings of the National Academy of Sciences* 106:2110–2113.

- Cushing, Frank Hamilton  
1886 *A Study of Pueblo Pottery as Illustrative of Zuñi Culture-Growth*. Government Printing Office, Washington, DC.
- 1901 *Zuñi Folk Tales*. G. P. Putnam's Sons, New York.
- Di Peso, Charles Corradino  
1968 *Casas Grandes and the Gran Chichimeca*. Museum of New Mexico Press, Albuquerque.
- Dozier, Edward P.  
1966 *Hano: A Tewa Indian Community in Arizona*. Harcourt School Publishers, San Diego, California.
- 1970 *The Pueblo Indians of North America*. Holt, Rinehart and Winston, New York.
- Eggan, Fred  
1983 Comparative Social Organization. In *Southwest*, edited by Alfonso Ortiz, pp. 723–742. Handbook of North American Indians, Vol. 10, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.
- Ellis, Florence Hawley  
1979 Isleta Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 351–365. Handbook of North American Indians, Vol. 9, Smithsonian Institution, Washington, DC.
- Fewkes, Jesse Walter  
1894 The Walpi Flute Observance: A Study of Primitive Dramatization. *The Journal of American Folklore* 7(27):265–288.
- 1895 The Oraibi Flute Altar. *The Journal of American Folklore* 8(31):265–284.
- 1898 *Archaeological Expedition to Arizona in 1895*. Seventeenth Annual Report of the Bureau of American Ethnology. U.S. Government Printing Office, Washington, DC.
- 1904 *Two Summers' Work in Pueblo Ruins*. 22nd Annual Report of the Bureau of American Ethnology. Government Printing Office, Washington, DC.
- 1916 Animal Figures on Prehistoric Pottery from Mimbres Valley, New Mexico. *American Anthropologist* 18:535–545.
- Fowles, Severin M.  
2005 Historical Contingency and the Prehistoric Foundations of Moiety Organization among the Eastern Pueblos. *Journal of Anthropological Research* 61: 25–52.
- Fox, Nancy  
1988 Hopi Kachina Mantas. *American Indian Art Magazine* 14(1):60–67.
- Fox, Robin  
1967 *The Keresan Bridge: A Problem in Pueblo Ethnology*. Humanities Press, New York.
- Frisbie, Theodore H.  
1980 Social Ranking in Chaco Canyon, New Mexico: A Mesoamerican Reconstruction. *Transactions of the Illinois State Academy of Science* 72(4): 60–69.
- Geertz, Armin W.  
1987 *Hopi Indian Altar Iconography*. Iconography of Religions: North America Vol. 5. Brill, Leiden, Netherlands.
- Gifford, James C.  
1980 *Archaeological Explorations in Caves of the Point of Pines Region, Arizona*. University of Arizona Press, Tucson.
- Gilman, Patricia A., Marc Thompson, and Kristina Wyckoff  
2014 Ritual Change and the Distant: Mesoamerican Iconography, Scarlet Macaws, and Great Kivas in the Mimbres Region of Southwestern New Mexico. *American Antiquity* 79:90–107.
- Goldfrank, Esther S.  
1974 *The Social and Ceremonial Organization of Cochiti*. Reprinted. Kraus Reprint Company, Millwood, New York. Originally published 1927, *Memoirs of the American Anthropological Association* 33, Menasha, Wisconsin.
- Harbottle, Garman, and Phil C. Weigand  
1992 Turquoise in Pre-Columbian America. *Scientific American* 266(2):78–85.
- Haury, Emil W.  
1945 The Problem of Contacts between the Southwestern United States and Mexico. *Southwestern Journal of Anthropology* 1:55–74.
- Hawley, Florence  
1950 Big Kivas, Little Kivas and Moiety Houses in Historic Reconstruction. *Southwestern Journal of Anthropology* 6:286–302.
- Hays, Kelley A.  
1992 Anasazi Ceramics as Text and Tool: Toward a Theory of Ceramic Design “Messaging.” PhD dissertation, Department of Anthropology, University of Arizona, Tucson.
- Hays-Gilpin, Kelley A.  
1995 Art and Archaeology of the Puebloan Region: New Views from the Basement. *Museum Anthropology* 19:47–57.
- Hays-Gilpin, Kelley, and Eric van Hartesveldt (editors)  
1998 *Prehistoric Ceramics of the Puerco Valley, Arizona: The 1995 Chambers-Sanders Trust Lands Ceramic Conference*. Ceramic Series No. 7. Museum of Northern Arizona, Flagstaff.
- Hays-Gilpin, Kelley, and Jane H. Hill  
2000 The Flower World in Prehistoric Southwest Material Culture. In *The Archaeology of Regional Interaction: Religion, Warfare, and Exchange across the American Southwest and Beyond*, edited by Michelle Hegmon, pp. 411–428. University Press of Colorado, Boulder.
- Hays-Gilpin, Kelley, Emory Sekaquaptewa, and Elizabeth A. Newsome  
2010 Siitálpuva, “Through the Land Brightened with Flowers”: Ecology and Cosmology in Mural and Pottery Painting, Hopi and Beyond. In *Painting the Cosmos: Metaphor and Worldview in Images from the Southwest Pueblos and Mexico*, edited by Kelley Hays-Gilpin and Polly Schaafsma, pp. 121–138. Bulletin 67. Museum of Northern Arizona, Flagstaff.
- Heacock, Erikalyn, and Karen Bassaraba  
2015 Shell Use in the Mimbres Region: Not so Black and White. MA thesis, Department of Anthropology, University of Arizona, Tucson.
- Hedquist, Saul L.  
2016 Ritual Practice and Exchange in the Late Prehispanic Western Pueblo Region: Insights from the Distribution and Deposition of Turquoise at Homol’ovi I. *Kiva* 82:209–231.
- 2017 A Colorful Past: Turquoise and Social Identity in the Late Prehispanic Western Pueblo Region. PhD dissertation, Graduate College, University of Arizona, Tucson.
- Hegmon, Michelle, Jennifer A. Brady, and Margaret C. Nelson  
2006 Variability in Classic Mimbres Room Suites: Implications for Household Organization and Social Differences. In *Mimbres Society*, edited by Valli S.

- Powell-Martí and Patricia A. Gilman, pp. 45–65. University of Arizona Press, Tucson.
- Hegmon, Michelle, James R. McGrath, and Marit K. Munson  
2017 The Potential and Pitfalls of Large Multi-Source Collections. *Advances in Archaeological Practice*. DOI:10.1017/aap.2017.2, accessed May 19, 2017.
- Heitman, Carolyn C., and Stephen Plog  
2005 Kinship and the Dynamics of the House: Rediscovering Dualism in the Pueblo Past. In *A Catalyst for Ideas: Anthropological Archaeology and the Legacy of Douglas W. Schwartz*, edited by Vernon Scarborough, pp. 69–100. School of American Research Press, Santa Fe, New Mexico.
- Hill, Jane H.  
1992 The Flower World of Old Uto-Aztecan. *Journal of Anthropological Research* 48:117–44.
- Hoebel, E. Adamson  
1979 Zia Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 407–417. Handbook of North American Indians, Vol. 9, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.
- Holmes, William Henry  
1886 A Study of the Textile Art in Its Relation to the Development of Form and Ornament. *Fourth Annual Report of the Bureau of American Ethnology*, pp. 189–252. Smithsonian Institution, Washington, DC.
- Hough, Walter  
1914 *Culture of the Ancient Pueblos of the Upper Gila River Region, New Mexico and Arizona*. Second Museum-Gates Expedition Bulletin No. 87. United States National Museum, Smithsonian Institution, U.S. Government Printing Office, Washington, DC.
- Hull, Sharon, Mostafa Fayek, Frances Joan Mathien, Phillip Shelley, and Kathy Roler Durand  
2008 A New Approach to Determining the Geological Provenance of Turquoise Artifacts Using Hydrogen and Copper Stable Isotopes. *Journal of Archaeological Science* 35:1355–1369.
- Judge, W. James  
1989 Chaco Canyon–San Juan Basin. In *Dynamics of Southwest Prehistory*, edited by Linda S. Cordell and George Gummerman, pp. 209–261. Smithsonian Institution Press, Washington, DC.
- Judge, W. James, William B. Gillespie, Stephen H. Lekson, and H. Wolcott Toll  
1981 Tenth Century Developments in Chaco Canyon. In *Collected Papers in Honor of Erik Kellerman Reed*, edited by Albert H. Schroeder, pp. 65–98. Papers of the Archaeological Society of New Mexico No. 6. Albuquerque Archaeological Society Press, Albuquerque.
- Kabotie, Fred  
1982 *Designs from the Ancient Mimbresños, with a Hopi Interpretation*. Northland Press, Flagstaff, Arizona.
- Kantner, John  
1999 The Influence of Self-Interested Behavior on Sociopolitical Change: The Evolution of the Chaco Anasazi in the Prehistoric American Southwest. PhD dissertation, Department of Anthropology, University of Colorado, Boulder.
- Kincaid, Chris  
1983 *Chaco Roads Project, Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin, 1983*. Department of the Interior, Bureau of Land Management, New Mexico State Office, Albuquerque.
- Kintigh, Keith W.  
1985 *Settlement, Subsistence, and Society in Late Zuni Prehistory*. Anthropological Paper No. 44. University of Arizona, Tucson.
- Lambert, Marjorie F., and J. Richard Ambler  
1961 *A Survey and Excavation of Caves in Hidalgo County, New Mexico*. School of American Research Monograph No. 1. School for American Research, Santa Fe, New Mexico.
- Lange, Charles H.  
1979a Cochiti Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 366–377. Handbook of North American Indians, Vol. 9, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.  
1979b Santo Domingo Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 379–389. Handbook of North American Indians, Vol. 9, William C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.
- Larralde, Signa L.  
1977 Pottery and Textile Design Relationships in Prehistoric Arizona, 1100–1350 A.D. MA thesis, Department of Anthropology, University of Denver, Denver, Colorado.
- LeBlanc, Steven A.  
2004 *Painted by a Distant Hand*. Harvard University Press, Cambridge, Massachusetts.
- Lekson, Stephen H.  
1992 Mimbres Art and Archaeology. In *Archaeology, Art and Anthropology: Papers in Honor of J.J. Brody*, edited by Meliha S. Duran and David T. Kirkpatrick, pp. 111–122. Archaeological Society of New Mexico, Albuquerque.  
1999 *The Chaco Meridian: Centers of Political Power in the Ancient Southwest*. Rowman Altamira, Lanham, Maryland.
- Lekson, Stephen H. (editor)  
2007 *The Architecture of Chaco Canyon, New Mexico*. University of Utah Press, Salt Lake City.
- Lekson, Stephen H., Thomas C. Windes, John R. Stein, and W. James Judge  
1994 The Chaco Canyon Community. *Scientific American* 256(1):100–109.
- Livesay, Alison K.  
2013 Oxidized Mimbres Bowls: An Example of Technological Style. Master's thesis, Graduate College, University of Oklahoma, Norman.
- Lowell, Julia C.  
1996 Moieties in Prehistory: A Case Study from the Pueblo Southwest. *Journal of Field Archaeology* 23:77–90.
- Lummis, Charles F.  
1920 *A Tramp across the Continent*. University of Nebraska Press, Lincoln.
- McGregor, John C.  
1943 Burial of an Early American Magician. *Proceedings of the American Philosophical Society* 86: 270–298.
- Martin, Paul S. Jr., John B. Rinaldo, Elaine Bluhm, Hugh C. Cutler, and Roger Grange  
1952 Mogollon Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves. *Fieldiana: Anthropology* 40:1–528.
- Mathien, Frances Joan  
1981 Neutron Activation of Turquoise Artifacts from Chaco Canyon, New Mexico. *Current Anthropology* 22:293–294.



- 1984 Social and Economic Implications of Jewelry Items of the Chaco Anasazi. In *Recent Research on Chaco Prehistory*, edited by W. James Judge and John D. Schelbert, pp. 173–186. Reports of the Chaco Center No. 8. National Park Service, Albuquerque, New Mexico.
- 1986 External Contacts and the Chaco Anasazi. In *Ripples in the Chichimec Sea: New Considerations of Southwestern-Mesoamerican Interactions*, edited by Randall H. McGuire and Frances Joan Mathien, pp. 220–242. Southern Illinois University Press, Carbondale.
- 1993 Exchange Systems and Social Stratification among the Chaco Anasazi. In *The American Southwest and Mesoamerica: Systems of Prehistoric Exchange*, edited by Jonathon E. Ericson and Timothy G. Baugh, pp. 27–63. Springer, New York.
- 2001 The Organization of Turquoise Production and Consumption by the Prehistoric Chacoans. *American Antiquity* 66:103–118.
- Mills, Barbara J.  
2008 Remembering While Forgetting: Depositional Practices and Social Memory at Chaco. In *Memory Work: Archaeologies of Material Practices*, edited by Barbara J. Mills and William H. Walker, pp. 81–108. School for Advanced Research Press, Santa Fe, New Mexico.
- Morris, Earl H.  
1927 The Beginnings of Pottery Making in the San Juan Area: Unfired Prototypes and the Wares of the Earliest Ceramic Period. *Anthropological Papers of the American Museum of Natural History* 28:125–198.
- Moulard, Barbara L.  
1984 *Within the Underworld Sky: Mimbres Ceramic Art in Context*. Twelvetees Press, Santa Fe, New Mexico.
- Munson, Marit K.  
2000 Sex, Gender, and Status: Human Images from the Classic Mimbres. *American Antiquity* 65:127–144.
- Nordenskiöld, Gustaf  
1990 *The Cliff Dwellers of Mesa Verde, Southwestern Colorado: Their Pottery and Implements*. Originally published 1893, Norstedt and Soner, Stockholm, Sweden. facsimile ed. Translated by D. Lloyd Morgan. Mesa Verde Museum Association, Mesa Verde, Colorado.
- Old Elk, Arlene, and Jackie Stoklas  
2001 *After the Rain*. Heard Museum, Phoenix, Arizona.
- Ortiz, Alfonso  
1969 *The Tewa World: Space, Time, Being and Becoming in a Pueblo Society*. University of Chicago Press, Chicago.
- Ortman, Scott G.  
2000 Conceptual Metaphor in the Archaeological Record: Methods and an Example from the American Southwest. *American Antiquity* 65:613–645.
- Parks-Barrett, Maria Shannon  
2001 Prehistoric Jewelry of the NAN Ranch Ruin (LA15049), Grant County, New Mexico. PhD dissertation, Department of Anthropology, Texas A&M University, College Station, Texas.
- Parsons, Elsie Clews  
1917a *Notes on the Zuñi, Parts I and II*. Memoirs of the American Anthropological Association Vol. 19. American Anthropological Association, Menasha, Wisconsin.  
1917b A Zuñi Folk-Tale. *Journal of American Folklore* 30:496–499.  
1919 Waiyautitsa of Zuñi, New Mexico. *The Scientific Monthly* 9(5):443–457.
- 1929 *The Social Organization of the Tewa of New Mexico*. Memoirs of the American Anthropological Association 36. Menasha, Wisconsin.
- 1930 Zuñi Tales. *Journal of American Folklore* 43(167):1–58.
- 1939 *Pueblo Indian Religion*. 2 vols. University of Nebraska Press, Lincoln.
- Pepper, George Hubbard  
1920 *Pueblo Bonito*. Anthropological Papers of the American Museum of Natural History Vol. 27. American Museum of Natural History, New York.
- Plog, Stephen  
2003 Exploring the Ubiquitous through the Unusual: Color Symbolism in Pueblo Black-on-White Pottery. *American Antiquity* 68:665–695.
- Plog, Stephen, and Carrie Heitman  
2010 Hierarchy and Social Inequality in the American Southwest, AD 800–1200. *Proceedings of the National Academy of Sciences* 107:19619–19626.
- Post, Stephen S.  
1993 *Archaeological Excavation at La 59497, along State Road 264, McKinley County, New Mexico*. Archaeology Notes 85. New Mexico Office of Archaeological Studies, Santa Fe.
- Potter, James M.  
1997 Communal Ritual, Feasting, and Social Differentiation in Late Prehistoric Zuni Communities. PhD dissertation, Department of Anthropology, Arizona State University, Tempe.
- Potter, James M., and Elizabeth M. Perry  
2000 Ritual as a Power Resource in the American Southwest. In *Alternative Leadership Strategies in the Prehispanic Southwest*, edited by Barbara J. Mills, pp. 60–78. University of Arizona Press, Tucson.
- Reed, Paul F.  
2004 *The Puebloan Society of Chaco Canyon*. Greenwood Publishing, Santa Barbara, California.
- Reyman, Jonathan E.  
1995 Value in Mesoamerican-Southwestern Trade. In *The Gran Chichimeca: Essays on the Archaeology and Ethnohistory of Northern Mesoamerica*, edited by Jonathan E. Reyman, pp. 269–280. Avebury Worldwide Archaeology Series 12. Avebury, Aldershot, United Kingdom.
- Rice, Prudence M.  
1987 *Pottery Analysis: A Sourcebook*. University of Chicago Press, Chicago.
- Riggs, Gene  
2005 Rock Art Frontiers of the Classic Mimbres. In *Nuevo Casas Grandes, Mexico*, edited by Marilyn Sklar, pp. 155–163. American Indian Rock Art Vol. 31. American Rock Art Research Association, San Jose, California.
- Riley, Carroll L.  
1980 Trade and Contact in the Prehistoric Southwest. *Transactions of the Illinois Academy of Science* 72(4):13–19.
- Rinaldo, John B., and Elaine A. Bluhm  
1956 Late Mogollon Pottery Types of the Reserve Area. *Fieldiana: Anthropology* 36:149–187.
- Roediger, Virginia More  
1941 *Ceremonial Costumes of the Pueblo Indians*. University of California Press, Berkeley.
- Roney, John R.  
1992 Prehistoric Roads and Regional Integration in the Chacoan System. In *Anasazi Regional Organization*

- and the Chaco System, edited by David E. Doyel, pp. 123–131. Anthropological Papers No. 5. Maxwell Museum of Anthropology, Albuquerque.
- Russell, Will G.  
2009 Mimbres Stylistic Continuity in the Mogollon Highlands of the U.S. Southwest. Manuscript on file, School of Human Evolution and Social Change, Arizona State University, Tempe.
- Shafer, Harry J.  
1982 Classic Mimbres Phase Households and Room Use Patterns. *Kiva* 48:17–37.
- Shafer, Harry J., and Robbie L. Brewington  
1995 Microstylistic Changes in Mimbres Black-on-White Pottery: Examples from the NAN Ruin, Grant County, New Mexico. *Kiva* 61:5–29.
- Shafer, Harry J., and Anna J. Taylor  
1986 Mimbres Mogollon Pueblo Dynamics and Ceramic Style Change. *Journal of Field Archaeology* 13:43–68.
- Shepard, Anna O.  
1961 *Ceramics for the Archaeologist*. Carnegie Institution of Washington, Washington, DC.
- Shepard, Lindsay  
2015 Using a Multidisciplinary Approach to Interpret Artifacts. Electronic document, <https://www.archaeologysouthwest.org/2015/07/17/using-a-multidisciplinary-approach-to-interpret-artifacts>, accessed February 8, 2017.
- Shepard, Lindsay M., Christopher W. Schwartz, Will G. Russell, Robert S. Weiner, and Ben A. Nelson  
2017 Blue-Green Stone Mosaics in the U.S. Southwest and Northwestern Mexico: Origins, Spatiotemporal Distribution, and Potential Meanings. Manuscript on file, School of Human Evolution and Social Change, Arizona State University, Tempe.
- Skinner, Jonathon  
2009 Ethno Plunderphonics: On Some Mockingbird Transcriptions. *Interval(le)s* II.2-III.1:830–853.
- Smith, Watson, Richard Woodbury, and Natalie Woodbury (editors)  
1966 *The Excavation of Hawikuh by Frederick W. Hodge: Report of the Hendricks-Hodge Hawikuh Expedition 1912–1923*. Museum of the American Indian, Heye Foundation, New York.
- Snead, James E., and Robert W. Preucel  
1999 The Ideology of Settlement: Ancestral Keres Landscapes in the Northern Rio Grande. In *Archaeologists of Landscape: Contemporary Perspectives*, edited by Wendy Ashmore and A. Bernard Knapp, pp. 169–200. Blackwell Publishing, Oxford.
- Snow, David H.  
1973 Prehistoric Southwestern Turquoise Industry. *El Palacio* 79(1):33–51.
- Stephen, Alexander M.  
1936 *Hopi Journal*. Edited by Elsie Clews Parsons. Columbia University Contributions to Anthropology No. 23. Columbia University Press, New York.
- Stevenson, James  
1883 Illustrated Catalogue of the Collections Obtained from the Indians of *New Mexico and Arizona* in 1879–[1880]. Government Printing Office, Washington, DC.
- Stevenson, Matilda Coxé  
1904 *The Zuñi Indians*. Rio Grande Press, Albuquerque, New Mexico.
- Strong, Pauline T.  
1979 Santa Ana Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 398–406. Handbook of North American Indians, Vol. 9, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.
- Strong, William D.  
1927 An Analysis of Southwestern Society. *American Anthropologist* 29:1–61.
- Swentzell, Rina  
2004 A Pueblo Woman's Perspective on Chaco Canyon. In *In Search of Chaco: New Approaches to an Archaeological Enigma*, edited by David Grant Noble, pp. 49–53. SAR Press, Santa Fe, New Mexico.
- Townsend, Richard F. (editor)  
2005 *Casas Grandes and the Ceramic Art of the Ancient Southwest*. Art Institute of Chicago, Chicago.
- Vivian, Gordon, and Paul Reiter  
1960 *The Great Kivas of Chaco Canyon and Their Relationships*. Monographs No. 22. School of American Research, Santa Fe, New Mexico.
- Wardle, Barbra L.  
1990 Native American Symbolism in the Classroom. *Art Education* 43(5):12–24.
- Ware, John A.  
2014 *A Pueblo Social History: Kinship, Sodality, and Community in the Northern Southwest*. SAR Press, Santa Fe, New Mexico.
- Watson, Adam S., Stephen Plog, Brendan J. Culleton, Patricia A. Gilman, Steven A. LeBlanc, Peter M. Whiteley, Santiago Claramunt, and Douglas J. Kennett  
2015 Early Procurement of Scarlet Macaws and the Emergence of Social Complexity in Chaco Canyon, NM. *Proceedings of the National Academy of Sciences* 112:8238–8243.
- Webster, Laurie  
2007 Mogollon and Zuni Perishable Traditions and the Question of Zuni Origins. In *Zuni Origins: Toward a New Synthesis of Southwestern Archaeology*, edited by David A. Gregory and David R. Wilcox, pp. 270–317. University of Arizona Press, Tucson.
- 2008 Technological Style and Social Boundaries of Perishable Artifacts of the Early Agricultural/Basketmaker II Period. In *The Latest Research on the Earliest Farmers*, edited by Sarah A. Herr. Electronic document, [www.archaeologysouthwest.org/what-we-do/investigations/earliest-farmers](http://www.archaeologysouthwest.org/what-we-do/investigations/earliest-farmers), accessed September 18, 2016.
- 2009 Mogollon and Zuni Perishable Traditions and the Question of Zuni Origins. In *Zuni Origins: Toward a New Synthesis of Southwestern Archaeology*, edited by David A. Gregory and David R. Wilcox, pp. 270–317. University of Arizona Press, Tucson.
- Weigand, Phil C.  
1992 The Macroeconomic Role of Turquoise within the Chaco Canyon System. In *Anasazi Regional Organization and the Chaco Canyon System*, edited by David E. Doyel, pp. 169–173. Maxwell Museum of Anthropology, Anthropology Papers No. 5. University of New Mexico, Albuquerque.
- 1994 Observations on Ancient Mining within the Northwestern Regions of the Mesoamerican Civilization, with Emphasis on Turquoise. In *In Quest of Mineral Wealth: Aboriginal and Colonial Mining and Metallurgy in Spanish America*, edited by Alan K. Craig and Robert C. West, pp. 21–35. *Geoscience and Man*, Vol. 33. Department of Geography and Anthropology, Louisiana State University, Baton Rouge.

- Weigand, Phil C., and Garman Harbottle  
1993 The Role of Turquoises in the Ancient Mesoamerican Trade Structure. In *The American Southwest and Mesoamerica*, edited by Jonathan E. Ericson and Timothy G. Baugh, pp. 159–177. Springer, New York.
- Weigand, Phil C., Garman Harbottle, and Edward V. Sayre  
1977 Turquoise Sources and Source Analysis: Mesoamerica and the Southwestern USA. In *Exchange Systems in Prehistory*, edited by Timothy K. Earle and Jonathon E. Ericson, pp. 15–34. Academic Press, New York.
- Weiner, Robert S.  
2015 A Sensory Approach to Exotica, Ritual Practice, and Cosmology at Chaco Canyon. *Kiva* 81:220–246.
- White, Leslie A.  
1932 *The Pueblo of San Felipe*. Memoirs of the American Anthropological Association 38. American Anthropological Association, Menasha, Wisconsin.  
1935 *The Pueblo of Santo Domingo, New Mexico*. Memoirs of the American Anthropological Association 43. American Anthropological Association, Washington, DC.  
1942 *The Pueblo of Santa Ana, New Mexico*. Memoirs of the American Anthropological Association 44. American Anthropological Association, Washington, DC.  
1962 *The Pueblo of Sia, New Mexico*. Bureau of American Ethnology Bulletin 184. Smithsonian Institution, Washington, DC.
- Whiteley, Peter  
2012 Turquoise and Squash Blossom: A Pueblo Dialogue of the Long Run. In *Turquoise in Mexico and North America: Science, Conservation, Culture and Collections*, edited by Jonathan C.H. King, Max Carocci, Caroline Cartwright, Colin McEwan, and Rebecca Stacey, pp. 145–54. Archetype Publications and British Museum, London.
- Wills, Wirt H.  
2000 Political Leadership and the Construction of Chacoan Great Houses, AD 1020–1140. In *Alternative Leadership Strategies in the Prehispanic Southwest*, edited by Barbara J. Mills, pp. 19–44. University of Arizona Press, Tucson.
- Winds, Thomas C.  
1987 *Investigations at the Pueblo Alto Complex, Chaco Canyon, New Mexico, 1975–1979*. Publications in Archeology 18F, Vols. 1 and 2. National Park Service, Santa Fe, New Mexico.  
1992 Blue Notes: The Chacoan Turquoise Industry in the San Juan Basin. In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, pp. 159–168. Maxwell Museum of Anthropology, Anthropology Papers No. 5. University of New Mexico, Albuquerque.
- Wright, Barton  
1973 *Kachinas: A Hopi Artist's Documentary*. Northland Press, Flagstaff, Arizona.
- Young, Suzanne M. M., David A. Phillips, Jr, and Frances J. Mathien  
1994 Lead Isotope Analysis of Turquoise Sources in the Southwestern USA and Mesoamerica: A Preliminary Report. In *Archaeometry 94: The Proceedings of the 29th International Symposium on Archaeometry, Ankara, 9–14 May, 1994*, edited by S. Demirci, A. M. Ozer and G. D. Summers, pp. 147–150. Tubitak, Ankara, Turkey.

## Notes

1. This has led some authors to distinguish between “chemical turquoise” or “mineralogical turquoise,” on one hand, and “cultural turquoise,” on the other.
2. This vessel (MimPIDD 7972) is privately owned and thus not illustrated. Images of the bowl suggest it is genuine.
3. Hough (1914:Figures 340, 347, 348) did illustrate several wooden artifacts from Bear Creek Cave, in the Mogollon Highlands, that were decorated with zigzag hachure.
4. Our bird sample excludes wading and floating birds (e.g., cranes, ducks), largely earthbound species (e.g., turkeys), and vultures. Within the ethnographic record, these bird types are not consistently (or exclusively) associated with the sky.
5. Only animal decorations are considered; surrounding geometric elements and adjacent motifs are excluded.
6. The wooden objects painted with zigzag hachure, found in Bear Creek Cave (Hough 1914:Figures 340, 347, 348), do not resemble the swords in Mimbres bowls.
7. This sample excludes therianthrope depictions. Our male/female categorization may conflate, in some cases and to varying degrees, ontological differences between sex and gender, as well as indicia thereof. From an iconographic perspective, we prioritize anatomical characteristics over hair style or clothing.
8. Four pronghorn motifs in MimPIDD (two provenienced) are decorated with polychromatic color. All four are identifiable as male.

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