UNRAVELING KEYSER: INVESTIGATING COMMUNITIES OF PRACTICE IN THE POTOMAC RIVER VALLEY

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ABSTRACT

The long-standing cultural continuity found in cordage twist direction reflects the shared social learning of traditional fiber spinning. This continuity can be indicative of durable communities of practice that cross time and space. Using a novel method to visually identify twist direction on cord-marked ceramics in the Potomac River drainage, we investigate the relationships that developed between communities within this region. By comparing variation in cordage twist direction, we examine a hypothesis that plural communities of practice merged at two Keyser sites amid a backdrop of migration and arrival in the 15th century Potomac region.

INTRODUCTION

Analysis of cordage impressions on ceramics has a rich history of being used to investigate social changes and stylistic choices among the Native Americans of the Middle Atlantic and Northeast (e.g. Johnson 1996, 2018). Cordage twist is often seen as an archaeologically durable marker of ethnicity or social boundaries, and analysis of cordage twist direction can indicate continuity or change in populations over time (Johnson and Myers 2004). The distribution of cordage twist directions on pottery is a useful tool for connecting ceramic attributes to social processes (Carr and Maslowski 1995). Because of the association between cordage twist direction and distinct populations or social groupings, this approach makes it possible to understand how groups of people may have related to one another across various social boundaries or between communities.

While variation in cordage twist direction sometimes makes it difficult to discern the boundaries of social units at the level of households (Custer 2004), a site-based analysis provides a lens by which to view large scale patterning. These trends can signal communities of practice in the archaeological record (Lave and Wenger 1991). The community of practice approach has been used to determine the ways that knowledge was transmitted within and between social groups, particularly through kinship relationships (Sassaman and Rudolphi 2001). Communities of practice refer to ways of learning where newcomers are socialized into a knowledge system, such as in a form of apprenticeship (Lave and Wenger 1991). The concept originated in information sciences and was appropriated into archaeology as a useful way to understand the transmission of knowledge in ancient communities (Cox 2005). Communities of practice cross cultural and ethnic boundaries, and while they are cultural traditions, they refer to people who are linked across ethno-cultural lines. Communities of practice unite people across boundaries and link them across migration and different groups, thus these links are durable and make the communities of practice concept a useful one to explore group connections across time and space.

Our usage of the concept is meant to highlight how groups of potters are linked through distinct ways of producing cordage. Instead of thinking about ethnic lines or traditional social boundaries, we consider traditions of potters training successive generations in how to produce cordage. While affinal relations or technological changes may affect the decoration, surface treatment, and form of ceramic vessels that potters choose, the twist direction of cordage is a durable practice that a potter carries with them from when they are first trained. A community of practice in cordage-making is durable beyond community lines and links potters across space and time. The communities of practice we are interested in are signaled by distributions of cordage twist direction within particular ceramic traditions, namely that of the Keyser complex.

During the 14th and 15th centuries, the Potomac Piedmont and Shenandoah River Valley received people migrating from the north and the west which have been identified in the archaeological record as the Keyser (or Luray) complex (Gallivan *et al*. 2023). In the present study, we focus on two sites linked to this complex which were occupied in the 15th century and into the early 16th century: the Hughes site in Montgomery County, Maryland and the Keyser Farm site in Page County, Virginia (Figure 1). Scholars have hypothesized that these two sites are linked across time and space as closely related communities (Gallivan *et al.* 2023; Jirikowic 1999). We pursued this hypothesis by analyzing cordage twist direction on the ceramics from both sites. Our data signal the presence of a persistent community of practice among the communities producing Keyser ceramics. The approach presented here contributes to parsing the history of migration and interaction during a complex time of the Late Woodland Potomac region.

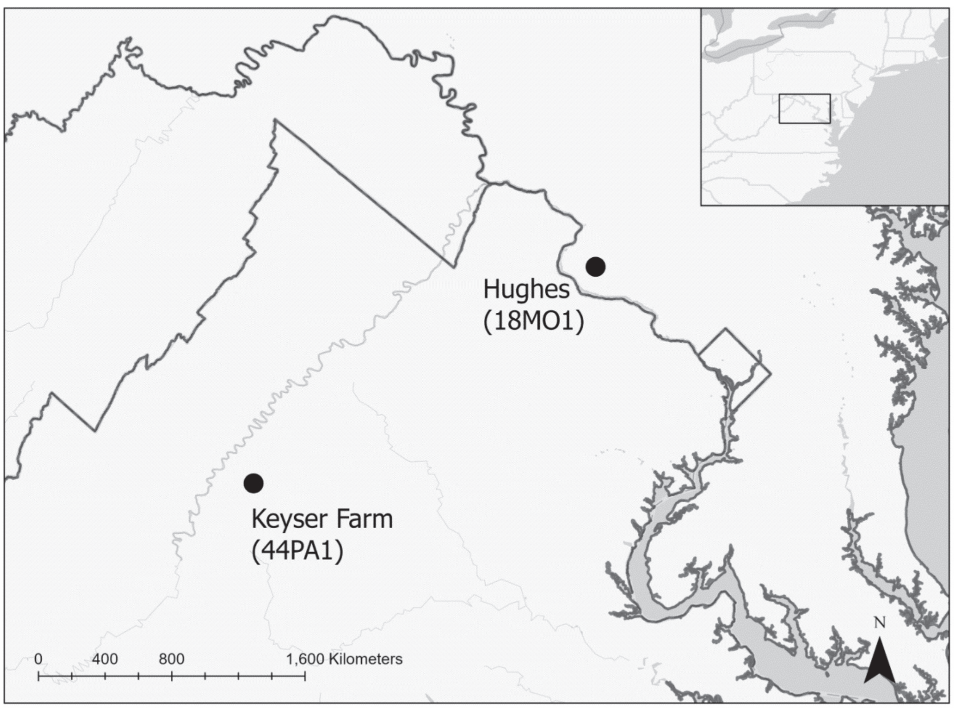

Figure 1. Map showing the locations of the two study sites: Hughes (18M01) and Keyser Farm (44PA1).

ARGUMENT HISTORY

Cordage refers to a class of spun fibers used to produce rope or string that involves the rolling of fibers either manually or with a spindle (Carr and Maslowski 1995:298). Fibers can only be twisted in one of two directions (Figure 2) when rolled, with the "S" twist direction producing a letter "S"-like slant between individual fibers when the fibers are manually rolled in an outward direction, and the "Z" twist being produced when fibers are rolled inward to create an indentation that mimics the letter "Z" (Carr and Maslowski 1995:298; Minar 2001:387). Cordage twist directions can be well-preserved via their impressions on cord-marked ceramics and are frequently cited as source of relational context for groups throughout North America (Herbstritt 2020; Johnson 2018; Johnson and Means 2020; Minar 2001).

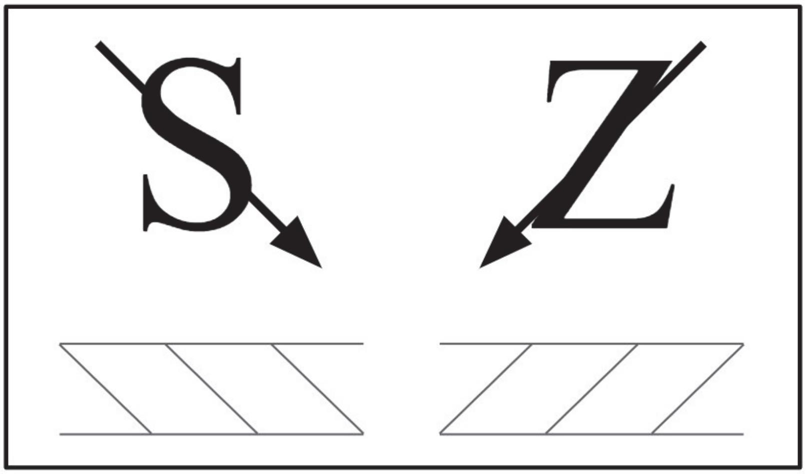

Figure 2. The appearance of the slant in a negative cordage impression, allowing the twist direction to be read directly from a ceramic sherd. Adapted from Minar (2001:Figure 3).

Despite extensive research utilizing the final twist direction of cordmarked and cord impressed ceramics, the ability to use that data as a contributing determinant of group or cultural affiliation and a signifier of broader population dynamics has been debated (e.g. Custer 2004). In an attempt to describe why groups use a specific twist direction, Minar (2001) found no correlation between handedness (i.e., being right or left-handed) and final twist direction, a relationship which had been previously suggested by other scholars (e.g., Johnson and Speedy 1992). Instead, Minar argues that cordage twist direction is the result of a "community of practice," being the reflection of shared learnings in a social grouping (whether ethnicity, gender, etc.). While not necessarily an intentional signal of group membership, Minar (2001:397) states that such motor-skill dependent spinning attributes demonstrate long-term cultural continuity in the face of other more variable material culture. In contrast, data from other sites, such as Shenks Ferry in the Susquehanna Valley, have been used to emphasize intra-community variation, in addition to cross-cultural variation (Custer 2004). Such data complicate the linkage between cordage twist direction and long-term patterns in practice and highlights the importance of context (Custer 2023). While these variations problematize the linkage that other scholars draw between cordage twist and ethnicity (e.g. Maslowski 1996), the patterns that do emerge can provide useful information on group continuity through practice (Johnson 2018:67). Such durable traditions can be indicative of gendered division of labor and separated fiber spinning learning spheres resulting in varied final twist direction. This is further supported by evidence that twist direction is a fixed habit unaffected by changing artistic styles (Minar 2001). McBrinn and Smith (2006) further agree with Minar that cultural factors and cultural training direct the cordage spin choice, and recent research in Pennsylvania continues to show the efficacy of cordage twist patterns as a stable indicator of group affiliation (Herbstritt 2020; Johnson and Means 2020). Other scholars have highlighted the importance of the social environment of the apprentice, arguing that cordage production is guided by rote learning and muscle memory developed at a young age (Mitchell 2011). An individual's learning lineage informs the direction in which they learn to twist fiber and remains unchanged across their lifetime (Herbstritt 2020:581). This cultural continuity in cordage twist direction reflects the durable communities of practice behind cordage production.

METHODS

To answer our research questions regarding the dynamic nature of the Potomac Valley and the distribution of cordage twist directions on cordmarked ceramics in the region, we utilized a visual detection method employed by Scott Strickland of the Maryland Archaeological Conservation Lab. Strickland used this technique as part of St. Mary's College of Maryland's Rappahannock Indigenous

Cultural Landscape survey project (Strickland *et al.* 2016). The method can be described as a simplified derivative of a Reflectance Transformation Imaging (RTI) light dome—a device used to model an object under a variety of different lighting conditions and angles—utilizing the standard flashlight app on a smartphone or a singular light source. It is a visual and non-invasive means of examining cordage twist that does not rely on making casts or moldings using silicon, clay, or other material that could leave a residue on the ceramics being examined. In this method, light is raked across the ceramic sherd at different angles in real-time, unlike with an immobile RTI dome, to identify the angled indentations within the cordmarkings that reflect the cordage twist direction until a suitable clear candidate for closer inspection can be identified.

Once the visible twist indentations have been identified, rather than attempting to visualize the cordage vertically, which has often been the traditional way of identifying cord twists (Johnson 2001, 2018), we examined the impression horizontally. Because cordmarkings leave a negative impression within pliable clay, when viewed horizontally, the directional slant of the twisted impressions is more in line with a stylized Z or S (Figure 2). For example, a cord with a Z-twist will leave an impression when viewed directly on a ceramic as an S-pattern, and only when a mold is made can the Z-twist be identified. But the method we utilized removes the need for another medium such as an impression, it only requires that the ceramic be turned 90º to look at the slant direction of the cord impression in a horizontal orientation instead, where Z and S impressions can be seen directly, without the added challenge of thinking through a reversed positive Z or S impression or the time-consuming process of creating ceramic casts. When looking at the ceramic sherd with the cordmarkings turned horizontal, it becomes as simple as identifying whether the indented slants of the twist point to the left (like a Z) or to the right (like an S). This method acts as a cognitive shortcut that also speeds the cataloging process for thousands of sherds.

Sampling for cordage twist analysis requires careful consideration. Simply relying on sherd count potentially ignores the bias inherent in possibly sampling multiple sherds of the same vessel. Previous research suggests that sherd matching and vessel lot counts are a more reliable approach to sampling (Custer 2023). In the case of our analysis at the Keyser Farm and the Hughes sites, an approach using vessel lot counts was unfeasible—we cannot discern which specific sherds were part of the same vessel. To counter this problem, our sherds are spread across more than 100 distinct contexts, with the sample from each site representative of the overall ceramic distribution reported. The number and distribution of included sherds improves the reliability of our sample and the utilization of sherd counts and proportions.

CERAMIC CONTEXT

Ceramic typologies found at the Keyser Farm site and the Hughes site within the Piedmont region consist of a variety of established types—some more well defined than others. Some types, like Page, which were first identified at the Keyser Farm site (Manson *et al.* 1944) are now understood to include other identified types such as Mason Island and Noland's Ferry wares (Stewart 1982). Page is an early Late Woodland ware (approximately 900 – 1450 CE) that is categorized as having a limestone temper and a predominantly Z-twist cordmarked surface treatment vertical with the vessel rim. This ware is found predominantly within the western Piedmont and into the Appalachian plateau (Wall 2001). Similarities have been drawn between Page wares and early Monongahela wares (first appearing around the Middle and Late Woodland transition) found only rarely at the headwaters of the Potomac River such as far western Maryland and into the Ohio Valley. This ware was also limestone tempered and predominantly Z-twist, but it is contextually less understood (George 1983). Monongahela ceramics, compared to Page however, generally appear to have surface treatments applied deeper, with little evidence of smoothing over. Page ceramics may also exhibit decorations such as slashes and punctates just below the rim of vessels.

A later variant of Monongahela ceramics was constructed with a shell temper and shares many similarities to Keyser ware, suggesting cross-cultural exchange, though the two wares differ in overall surface treatment and decoration. While Monongahela vessels have a predominantly Z-twist cord, Keyser vessels are faintly cordmarked (but generally not smoothed) with an S-twist (Jirikowic 1999; Stearns

1940; Stewart 1982). Decorations on Keyser vessels frequently include pie-crust/crenulated rims and lug handles. Keyser wares are found throughout the Piedmont and into the Ridge and Valley of Maryland, Virginia, West Virginia, and Pennsylvania. Radiocarbon dates from the Hughes site in Montgomery County and the Moore Village and Barton Village sites in Allegany County suggest a range from around 1400 CE to about 1550 CE (Gallivan *et al.* 2023).

Shepard wares are found within the Piedmont region on sites dating from around 900 AD, but begin to disappear in place of Keyser ceramics around the 14th century. This ware was first identified at the Shepard site in Montgomery County, Maryland (Schmitt 1952). Temper among Shepard wares consist of crushed quartz or igneous rock (or a combination thereof). Surfaces are cordmarked with a Z-twist, oblique to the rim. Decorations are primarily located below the rim, with pseudo-cord and cordwrapped dowel/stick impressions consisting of horizontal and oblique lines. It has been suggested that around 1300 CE, Keyser complex populations migrated from the north or west into areas that once defined the Montgomery complex, and that Montgomery complex peoples had moved out of the Piedmont and into the Coastal Plain. Similarities in surface treatment, temper, and decoration between Shepard wares of the Montgomery complex and later Potomac Creek wares are used as evidence of this migration, known as the "Montgomery Hypothesis" (McNett and Gardner 1975; Potter 1993).

Potomac Creek wares began appearing on Coastal Plain sites around 1300 CE. These wares are especially prevalent within upper tidal Potomac River sites such as the Potomac Creek site in Stafford County, Virginia, and the Accokeek Creek site in Prince George's County, Maryland. The defining characteristic between Shepard and Potomac Creek ware is the exclusivity of crushed quartz temper versus a combination of crushed quartz and other igneous rock as well as the general chronological and spatial context in which they are found. Svokos (2004) notes that ceramics identified as Potomac Creek found at the Keyser Farm site share design motifs with Potomac Creek wares within the Coastal Plain, suggesting continued trade between these geographic regions (Clark 2019:168). Potomac Creek vessels are often smoothed, but smoothing appears to appear more on later vessels (Hall 2012).

The inclusion of mica within the paste of later crushed quartz vessels (sometimes separated from Potomac Creek as Moyaone) come to predominate in portions of the Coastal Plain, while farther downriver nearer to the Chesapeake Bay and on the Eastern Shore, Townsend series ceramics continued to be most prevalent (Potter 1993:114-125; WMCAR 2009). Oral history among the Piscataway suggests that there was also a migration from the Eastern Shore around the 13th century, with 17th century documents noting "that long a goe there came a King from the Easterne Shoare who commanded over all the Indians now inhabiting within the bound of this Province…and also over the Patowmecks and Sasquehannoughs…." (MD Archives 2:402-403).

Movement of people throughout the Piedmont and Coastal Plain left behind notable changes in ceramic assemblages and typologies. It is clear, however, that there is overlap, influence, and evidence of trade among groups that influenced the vessel decoration and surface treatment techniques. The scale and chronology of these influences are more difficult to discern, as Algonquian, Iroquoian, and Siouan cultures were present in the Maryland and Virginia Piedmont during the Late Woodland period. Analysis of cordage twist direction at the site-level can better define these changes and influences, indicating potential interaction and movement by way of durable communities of practice.

RESULTS

Cordage twist direction was detected and analyzed on ceramic sherds from both the Keyser Farm site and the Hughes site (Figure 3). At the Hughes site, a total of 2,051 sherds from the Maryland Archaeological Conservation Laboratory (MAC Lab) were examined for their final twist direction, but due to extensive smoothing and wear, twist direction could only be read on 213 of the sherds at Hughes (Table 1), which were distributed across 10 site contexts. Most sherds at Hughes were shell-tempered Keyser ceramics, and the resulting data using the new visual method aligned closely with the percentages found by Jirikowic (1999) and Herbstritt (2020), with each reporting 89.7% and 85% S-twist cordage respectively at the Hughes site. Our analysis determined the distribution of twist direction on

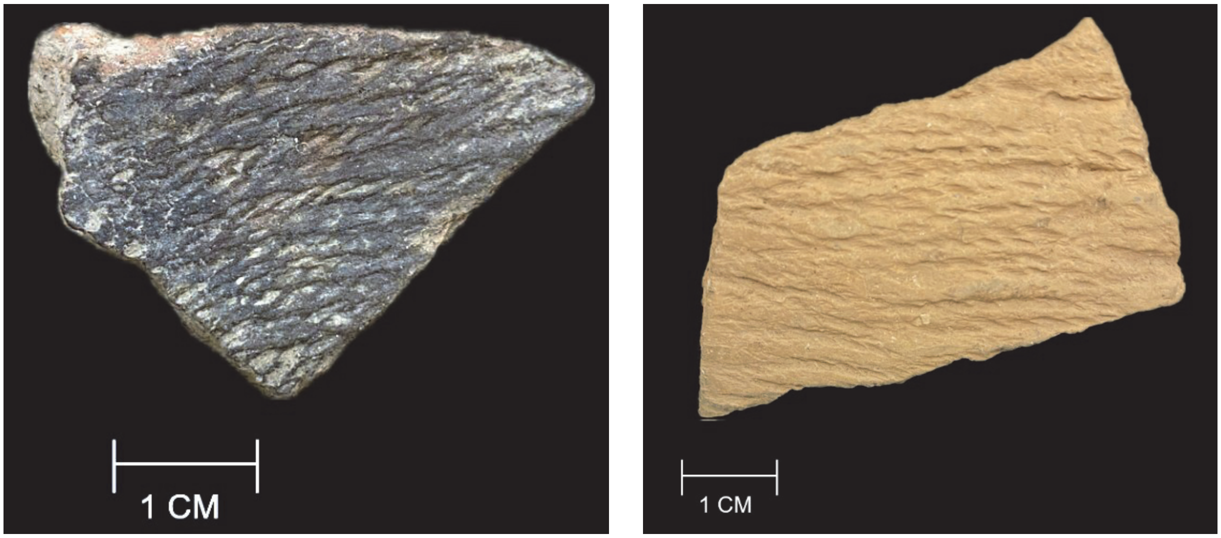

Figure 3. Representative shell-tempered Keyser ceramic (left) with S-Twist and sand/quartz-tempered Shepard ceramic with Z-Twist (right).

TABLE 1: SAMPLE COUNTS FOR ANALYZED CERAMICS FROM THE HUGHES SITE (18MO1)

Type	Sherds w/ Detectable Twist
Keyser	198
Shepard	15
Total	213

shell-tempered ceramics was overwhelmingly S-twist, with an 82% S-twist and 18% Z-twist split in our collected Hughes data (Table 2) The quartz-tempered Shepard ceramics found at Hughes also stand out as they were far less decisively Z-twist than usually found across the Shepard tradition, showing a 53% Z-twist and 47% S-twist distribution. While there was a far smaller sample size for quartz-tempered ceramics at Hughes and twist direction was only identifiable on 15 of those sherds, the quartz-tempered sherds were distributed across four separate features, suggesting that these sherds were not from a single vessel.

TABLE 2: THE DISTRIBUTION OF CORDAGE TWIST DIRECTION ON CORDMARKED CERAMIC SHERDS AT THE HUGHES SITE, ORGANIZED BY CERAMIC TYPE

Type, Twist Direction	Counts
Keyser, S	163
Keyser, Z	35
Shepard, S	8
Shepard, Z	7

We then detected twist direction on 209 ceramic sherds from the Keyser Farm site, with half of the sample coming from the Virginia Department of Historic Resources (VDHR) and half coming from the Smithsonian Museum of Natural History. Of these, 159 belonged to the Keyser type, 42 belonged to the

Potomac Creek type, and 8 belonged to the Page type (Table 3). These sherds were distributed across multiple contexts, with the Keyser sherds in particular being dispersed through at least 90 distinct features or contexts, suggesting that these sherds likely came from multiple distinct vessels. Our collection of final cordage twist direction at the Keyser Farm site has 53% of its Keyser shell-tempered ceramics marked with a Z-twist and 47% with an S-twist (Table 4). When comparing the results of cordage twist direction on shell-tempered ceramics from both Keyser Farm and Hughes, the twist distribution is spread across a similar range as the data reported by Herbstritt (2020), Jirikowic (1999), and Johnson (2018), and thus supporting the accuracy of the visual detection method as an alternative to the traditional impression-based, plastic modeling method described elsewhere (e.g., Minar 2001:383). In addition, the smaller amount of Page ceramics are 100% Z-twist cordage impressions, and Potomac Creek ceramics are 95% Z-twist.

TABLE 3: SAMPLE COUNTS FOR ANALYZED CERAMICS FROM THE KEYSER FARM SITE (44PA1)

Type	Sherds w/ Detectable Twist
Keyser	159
Potomac Creek	42
Page	8
Total	209

TABLE 4: THE DISTRIBUTION OF CORDAGE TWIST DIRECTION ON CORDMARKED CERAMIC SHERDS AT THE KEYSER FARM SITE, ORGANIZED BY CERAMIC TYPE

Type, Twist Direction	Counts
Keyser, S	75
Keyser, Z	84
Potomac Creek, S	2
Potomac Creek, Z	40
Page, S	0
Page, Z	8

These data further emphasize the unusually equal distribution of twist direction among the Keyser ceramics at Keyser Farm as an outlying occurrence, breaking the trend of one twist direction being favored over the other across most ceramic complexes at surrounding Potomac Valley sites. Johnson and Myers (2004:91) put the frequency of S-twist cordmarking on shell-tempered Keyser ceramics in the Potomac region at 75% - 93%, a stark contrast to the near even split of S- and Z-twist cordage on the Keyser ceramics at the Keyser Farm site. Because cordage twist direction follows durable learning lineages (Herbstritt 2020:581), the data would suggest the presence of multiple communities of practices located at Keyser Farm. While less significant in number, the earlier quartz-tempered Shepard ceramics found at the Hughes site share a similarly equal (53% Z-twist and 47% S-twist) split between cordage twist direction as the Keyser ceramics found at Keyser Farm. Although analysis of additional cordmarkings on quartz-tempered ceramics at Hughes (and other potential Shepard sites) is needed, the deposition of highly varied twist directions across features may also point to the presence of multiple lineages of quartz-tempered Shepard ceramic producers at the Hughes site. A chi-squared test of the cordage twist results at both sites supported our findings that the distributions of cordage twist directions in each sample was significant (see Appendix).

DISCUSSION

The Potomac River region experienced a series of social changes during the Late Woodland period (Potter 1993). One such change was the arrival of communities identifiable through the Keyser ceramic complex (Gallivan *et al.* 2023). The ceramic evidence discussed above is indicative of one way these communities were organized and how they may have related to one another. William Strachey's 1612 account describes native women producing cordage in Virginia "of which their women betweene their handes and thighes spin a threed very even and readely, and this threed serveth for many vses, as about their howsing, their mantells of feathers, and their Trowses and they make also with yt lynes for Angells" (Strachey 1952 [1612]:82). These cordage makers would then use the same cordage they produced to mark their ceramics as well, a process which Carr and Maslowski (1995) saw as creating communities of practice resulting from a sexual division of labor. With potters using their own paddle to add cordmarking from cordage that they produced themselves, it demonstrates that the same social units produced both the ceramic and the cord that marked it, linking the twist directions on cordmarked ceramics to specific communities of practice. The unusual cordage twist distribution at Keyser Farm signals the presence of blended communities of practice. It appears that potters of another community, one that was likely producing cordage with a final Z-twist, had at some point joined the community at Keyser Farm. William Johnson (2018) presented a similar hypothesis, suggesting that the community at Keyser Farm had absorbed potters of local complexes seeking refuge. Recent chronological evidence demonstrates that the community at Keyser Farm likely originated from the community at the Hughes site (Gallivan *et al.* 2023: 94; Jirikowic 1999). The odd distribution of cordage twist direction on Shepard ceramics at the Hughes site may indicate the beginning of a practice of intermarriage with local communities, a product of the same process as at Keyser Farm—with Shepard potters absorbing new lineages. This practice at Hughes likely continued even after the Keyser Farm community was established.

Luray Complex communities may have been pluralistic in some way. Whether through intermarriage or some other joining of lineages, these settlements were comprised of multiple communities of practice. It's possible that the evidence of violence and unsettlement noted by other scholars (Jirikowic 1999; Potter 1993) points to Keyser communities absorbing members of refugee groups during a transitional period (Johnson 2018). It's also possible that marriage between communities was part of a different strategy deployed by different ancestral peoples in the Potomac either to ameliorate tensions or to create ties to neighboring villages. In either case, at least some communities associated with the Keyser Complex appeared to be comprised of multiple communities of practice, evidenced by blended traditions in cordage and ceramic making.

CONCLUSION

Cordage twist analysis presents a unique methodology for exploring the social boundaries within and between communities throughout antiquity. The final twist direction on cordmarked ceramics is indicative of durable communities of practice. While surface treatment and decoration may change even during one's life, the learned practice of producing cordage is persistent through a potter's life. In villages associated with the Keyser ceramic complex, these communities of practice point toward plural communities where multiple learning lineages were brought together through a number of possible processes. We hypothesize that the distribution of twist direction at two sites in the Potomac drainage signal a tradition of intermarriage that persisted beyond the migration of a Late Woodland village. Potters of at least two traditions came together within a single settlement. This movement of people between communities in the Late Woodland Potomac adds further nuance to a complicated and unsettled landscape in the centuries prior to European colonialism.

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APPENDIX

To test the statistical significance of our cordage twist results, we conducted a chi-squared test for the data at each site in our study, Keyser Farm and Hughes. Given the relatively small sample sizes, we evaluated the use of a Yates Correction for each test. We followed the guidelines in Thomas (1986) for determining the applicability of a chi-squared test and the Yates Correction.

For our Keyser Farm sample, we met the requirements for performing a chi-squared test without using a Yates Correction given that only 1 expected value was below 5. The results of our test were as follows:

n =	209
df =	2
α=	0.1
Critical Value =	4.60517019
p-value =	0.00000023457
χ^2 =	30.5310401
Cramer's V =	0.38220614

The test revealed that our Keyser Farm data was significant, and the Cramer's V value indicated that there was a strong association between the variables.

For our Hughes sample, we met the requirements for performing a chi-squared test, but given that >20% of our expected values were below 5, we required a Yates Correction. The results were as follows:

n =	103
df =	1
α=	0.1
Critical Value =	2.705543
p-value =	0.078302
χ^2 =	4.457947
Corrected χ^2 =	3.099792
Cramer's V =	0.173479

The test revealed that our Hughes data was significant, though Cramer's V indicated that the association was not as strong as in the Keyser Farm sample.

REFERENCES CITED

Thomas, David Hurst
1986 *Refiguring Anthropology: First Principles of Probability & Statistics*. Waveland Press, Inc. Prospect Heights, IL.