Ceramic Production in Middle Woodland Communities of Practice: A Cordage Twist Analysis in Tidewater Virginia

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By

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Abstract

The archaeology of Tidewater Virginia's Middle Woodland period presents an era of technological and social changes within hunter-gatherer societies, possibly including large-scale population movements across the Middle Atlantic. A greater understanding of this history can be obtained through the examination of pottery decoration as reflected in cordage twist patterns from a sample of Middle Woodland ceramics recovered from Chickahominy River sites and the nearby drainages of the James River. Since cordage twist is a learned motor skill linked by previous researchers to specific traditions, the distribution of different twist patterns allows researchers to make inferences regarding continuity and/or change in the region's Native populations. The data provide evidence for significant temporal and regional differences in twist directions, building a case for the existence of previously unrecognized migration waves and social relationships.

I. Introduction

This thesis summarizes the results of archaeological research in Tidewater Virginia designed to detect historical processes that unfolded within Middle Woodland (B.C. 500 to A.D. 800) hunter-forager communities by focusing on ceramic production patterns. Ceramic analysis has, of course, long been a staple of pre-contact archaeological research in the Chesapeake (e.g., Blanton 1992, McLearan and Mouer 1989, Egloff and Potter 1982). This study is designed to build on such earlier efforts, but also differs somewhat from them with its tight focus on the historical development of distinct hunter-forager "communities of practice" within a relatively small area surrounding the confluence of the James and Chickahominy rivers. Communities of practice result from a shared learning environment and a set of cultural dispositions that influence such daily activities as pottery style (e.g., Sassaman 2001). The emphasis on *local* historical processes and *specific* social histories places this study within the shift in Native archaeology of the Chesapeake toward more historically-oriented approaches (Gallivan 2009).

The processual revolution of the 1960s led archaeologists to search for universally applicable processes to explain the behavior of prehistoric peoples. Unfortunately, this interpretive shift occurred at the expense of culture-historical research which focused on local material cultures, and studies of this sort came under much critical scrutiny. Processualist approaches focused on the adaptive nature of human behavior, using functionalist explanations and systemic models to explain culture change. Today, adaptationist and evolutionary models are increasingly being replaced with more historically-oriented approaches. Specifically, scholars studying native societies have recently turned their attention to recovering native pre-contact history and meaning, rather than relying on colonial sources of European contact with native societies. To recover this native meaning, archaeologists have shifted their focus from the ceremonial and the elite to the daily activities of non-elites (e.g., Gallivan 2006). Practice theory, which emphasizes the relationship between cultural structures and daily activities, has emerged as an important component of these conversations (e.g., Nassaney 2001). Current research trends also stress the idea of agency, including how native societies actively shaped their own worlds, rather than merely engaging in *re*active behavior. Pauketat encourages a shift from the focus on goal-oriented, strategic behavior to the more fluid concept of practice, which involves human disposition (Pauketat 2001). Under this approach, "all people enact, embody, or re-present traditions in ways that continuously alter those traditions," so the process of creating tradition involves daily practices which are based on experience. (Pauketat 2001:79). To access such "historical processes," it is essential to focus on culture-historical aspects of native societies, and one of the best ways to do this is through studies of native material culture (e.g., Pauketat 2001).

Native societies in the New World existed in extensive populations, and to get a better handle on these culturally and socially diverse societies, archaeologists tend to search for ways to draw boundaries around specific cultural groups. Historically, anthropologists have used linguistic affiliations and environmental factors to delineate these culture groups. Archaeologists studying late prehistoric archaeology tend to focus on diverse ceramic technologies to determine cultural boundaries, specifically in the Middle Woodland period when use of ceramics rapidly flourished. In the Middle Atlantic region in particular, archaeologists created extensive ceramic typologies which formed the basis for models of cultural variation across time and space (e.g., Egloff and Potter 1982). These typologies are predominantly based on ceramic attributes such as temper and surface decoration, elements of ceramic technology which are subject to change. These typologies are by no means invalid as measures of cultural boundaries, but possess inherent flaws which weaken their usefulness. Ceramic typologies, as helpful as they are in organizing ceramic trends, tend to be subjective and limiting, as they involve restricted categories and often cannot account for slight variations. Alternatively, current studies focus on less stylistic and more consistent ceramic attributes to get at culture and ethnicity.

One such ceramic attribute, cordage twist direction, has been the recent focus of many studies in the Middle Atlantic region (Blanton 2004, Klein 2003, Johnson and Speedy 1992, Johnson 1996, Custer 2004). Cordage impressions, an extremely popular method of decorating Middle Woodland ceramics, involve the learned motor skill of final twist direction. The fibers eventually used to impress designs onto ceramics need first be twisted into cordage, and the direction of this twist is most likely a result of behavior that is taught from one producer to another, especially generationally (Minar 2001). Members of a community are likely taught to twist in the same direction, and thus final twist direction becomes a culturally identifiably trait which can be used to trace population movements and delineate cultural boundaries.

When combined with linguistic and other archaeological evidence of an Algonquian migration into the Chesapeake region around A.D. 200, this ceramic attribute provides a consistent method that may allow us to distinguish between Algonquian populations and the indigenous Tidewater communities they eventually replaced. By identifying and tracing communities with specific twist direction tendencies on ceramics from across the Chickahominy and James River drainages in Virginia's Tidewater region, this study aims to provide new insight into the historical processes of migration, population assimilation, and acculturation.

II. Chesapeake Regional Prehistory

Transition from the Archaic Period to the Woodland Period

The Woodland Period marks the beginning of a phase of significant increase in social interaction among native peoples (Dent 1995:217). Populations grew rapidly throughout this period, as evidenced by an increase in both the size and number of native sites (Custer 1994). Population growth can be attributed both to in-migration of non-local groups and to the shifting foodways of Chesapeake natives. Local groups gradually relied less on hunting and gathering and began to experiment with agriculture, and this more intensive food process is reflected in the increasing popularity of ceramics, which in turn reflects a more sedentary settlement system (Custer 1994). Small-scale agriculture combined with hunting and gathering provided a more stable and reliable source of food, allowing populations to grow.

Middle Woodland population movements

Numerous scholars (Custer 1994, Stewart 1989, Dent 1995) believe that the archaeological record indicates that from the Late Archaic through the beginning of the Middle Woodland, trade and exchange networks expanded and became much broader rather than localized. However, somewhere in the Middle Woodland (circa B.C. 400 to A.D. 900), these large-scale trading systems seem to collapse, ending the cultural continuity that had existed for some time (Custer 1994). Both Dent (1995) and Stewart (1989) corroborate this idea, as Dent sites technological homogenization of ceramics and lithics while Stewart mentions how group territories became less expansive, a trend that continues from B.C. 400 to around A.D. 200. Stuart Fiedel (1987:204) remarks that this decline in trading practices during the Middle Woodland could likely have a linguistic motivation – Algonquian migration into the Chesapeake, speculated to begin around A.D. 100, might have caused language barriers that restricted communication and thus restricted trade in the Middle Atlantic. Fiedel cites analyses of glottochronology, which estimates language family divergence rates, as linguistic evidence to approximate the date range of Algonquian expansion, from 1850 bp to 1050 bp (A.D. 100 to A.D. 900). However, Stephen Potter cautions that "contrary to the archaeologists' statements, the dates derived from applying glottochronological techniques to various Algonquian languages cannot be considered reliable," citing problems with the linguistic assumptions made about the Algonquian language (Potter 1993:2). Despite discounting glottochronology as evidence, he does allow for the fact that these Algonquian languages are *not* indigenous to the Middle Atlantic region, and agrees with other scholars about the likelihood that Algonquians likely began migrating into the region around A.D. 100 or 200 (Potter 1993). Custer (1994), too, comments that the disruptions seen in cultural patterns likely correspond to the arrival of Algonquian speakers from the Great Lakes region.

Settlement Patterns

While scholars agree that the Middle Woodland period in Virginia saw an increase in localized practices rather than broad regional trade networks, the general trend toward increased sedentism can still be applied to this time period. Blanton (1992:68) suggests population increase as a possible catalyst for this trend, noting that communities expanding in number would be required to adapt more structured and reliable subsistence methods in order to sustain the population growth. Engaging in more structured subsistence practices in turn required a more sedentary lifestyle, as natives settled in one place, practicing agriculture to supplement hunting and foraging methods. Blanton (1992) indicates that characteristics of settlement patterns do change across the A.D. 200 boundary, basing this on Stephen Potter's 1982 study on the Northern Neck, which dealt with settlement in the Middle Woodland II period. Potter (1982) found that in the early years of the Middle Woodland II period, settlements were either small, short-term procurement sites or more moderately sized shell midden sites. These intermediate-sized sites were commonly found on major river branches, rather than in interior Coastal Plain locations. In contrast, smaller early Middle Woodland sites, characterized by Pope's Creek, Varina, and Prince George ceramics, overwhelmingly occur at more interior, non-midden sites (Blanton places this occurrence at 82% (2004)). The presence of these ceramics at non-midden sites also highlights the contrast between these and sites with midden features, where shell-tempered sherds predominated (Blanton 2004). These smaller, short-term procurement sites were often more numerous and surrounded the larger, more intensively occupied sites. They occur in both riverine and interior settings (although more often the latter) and rarely have true pit features. They often contain both shell- and lithic-tempered sherds (although again, the latter occurs more frequently). The larger shell midden sites, in contrast, located in exclusively riverine settings, often contain deep pit features used for storage and are abundant with artifacts, predominantly Mockley pottery (Blanton 2004). The Great Neck site and Maycock's Point are both examples of shell midden sites that have been excavated extensively and contrast greatly to some of the smaller, interior Chickahominy River sites. These settlement patterns reflect more general trends which will be explored further, examining the heterogeneity that occurs at earlier Middle Woodland sites in contrast to the homogeneity at later shell midden sites.

Middle Woodland sites can be difficult to distinguish from Early Woodland sites, as occupations often extended between the periods. Domestic structures were more widely used in the Middle Woodland as sedentism increased in popularity, but evidence of these structures is unfortunately scarce (Dent 1995). In fact, according to Hantman and Gold, “houses were nonexistent in the archaeological record for the Woodland, despite the argument for increased intensity of site utilization,” and although some exceptions to this statement have been discovered, they are still a minority (Hantman and Gold 2002:276). One differing aspect of Middle Woodland settlements that is available archaeologically is the increase in shell middens, which result from large-scale exploitation of oysters and other coastal resources (Dent 1995, Custer 1994). The Middle Woodland was characterized by intensified food production, and the most archaeologically obvious of these new practices is the dramatic increase in shellfish as a food source. These middens are evidence of elaborate feasting practices that likely involved seasonal gatherings of kin-based native groups. Gallivan (2006) hypothesizes that at this time communities existed as relatively small groups of hunter-gatherers who periodically congregated at important places and would return to these important places annually.

III. History of Chesapeake Ceramics

The Middle Woodland period is often divided into Middle Woodland I and Middle Woodland II, predominantly based on a significant shift in ceramic technology that occurs at this time. From circa B.C. 400 to A.D. 200, most ceramics were tempered with either lithics or sand, and decorated with plain, net-impressed, or cord-marked surface treatments. These early Middle Woodland ceramics can be divided into specific wares based on certain attributes such as temper, and in this classification system the sand- or grit-tempered ceramics are referred to as Pope's Creek ware, while pebble-tempered ceramics are commonly called Prince George. Egloff and Potter (1982) cite Pope's Creek as a ware dating from B.C. 500 to A.D. 200, which corresponds to the Middle Woodland I period, and is found north of the James River in the Coastal Plain. Another common ware not discussed by Egloff and Potter but addressed by Blanton in a 2004 CRM report for The William and Mary Center for Archaeological Research (WMCAR), is Varina ware (Blanton 2004). Blanton (2004:23) cites Egloff describing Varina ware (Figure 1) as similar to Pope's Creek but tempered with coarser sand and crushed quartz (Egloff 1989:37).

Figure 1. Crushed Lithic-Tempered Cord-Marked Sherds

Varina ware is roughly contemporary with Pope's Creek (B.C. 500 to A.D. 200) but likely extends further into the Middle Woodland Period II (Blanton 2004). It is generally net-impressed, although Egloff (1989) has noted that around the fall line transition area, cord-marked Varina sherds are abundant. As with all typologies, this system of designated "wares" has its flaws, as these categories can be too general and leave too much room for anomalies that do not fit into any predetermined category. As a result of these flaws, the ceramics throughout the rest of this paper will be more commonly referred to on an attribute basis, described in terms of their temper and surface decoration rather than specific ware names.

The diverse array of Ware names applied to ceramics from the Early Woodland and Middle Woodland I periods "reflects appreciable local regional variety in temper and surface treatment that carries on until circa A.D. 200" (Hantman and Gold 2002:279). As Hantman and

Gold suggest, at around A.D. 200 a distinct change has been observed in the ceramic technology, as ceramics are suddenly tempered with crushed shell rather than lithic materials or sand. Shell-tempered ceramics are commonly referred to as Mockley ware, and this ceramic type dominated the middle Atlantic region after A.D. 200 (Figure 2). Blanton refers to this event as the “Mockley spread,” where shell-tempering became the norm across a region in which crushed-lithic tempers used to predominate (Blanton 2004).

Figure 2. Shell-Tempered Cord-Marked Sherds

The similarities of this A.D. 200 date as the introduction of shell tempering and as the date of a possible Algonquian migration lead to the question of whether shell tempering was in fact introduced to the people of the Chesapeake by the newly arrived Algonquian people. It is interesting to note that McLearan and Mouer (1989) cite a discrepancy to these accounts of ubiquitous shell temper after A.D. 200. In the later years of the Middle Woodland period, around the James River Basin, Mockley ceramics seem to primarily dominate in the Middle and Outer Coastal Plain. Surprisingly, pockets of ceramics that were typical of the Middle Woodland I period (such as Prince George, Varina, and Pope's Creek) remained in the Inner Coastal Plain throughout Middle Woodland II while shell-tempering spread rapidly throughout the rest of the region. Denny, too, argues that along the coast, the use of shells as a ceramic temper became popular while further inland, ceramics maintained sand and grit tempers (Denny 2003). Denny suggests that these differing tempers could possibly be reflective of divisions in the population between newly-arrived Algonquian migrants and the local communities they either assimilated with or replaced.

The shift to shell-tempered ceramics is not thought to have been a functional one, as studies have shown that shell temper does not allow ceramics to be fired at a higher temperature (Stewart 1992). Thus the use of shell as a temper is thought to be stylistic rather than functional. Denny (2003) also argues that the wide-spread adoption of shell temper was stylistic rather than functional, because using shells to temper the clay for ceramics does not seem to have made them any stronger. Recent research has focused on finding an alternate explanation for this abrupt shift in ceramic technology, based on the evolution and movement of specific groups of people.

Archaeologists often turn to the study of ceramic technology as a cultural marker, used to distinguish between ethnic groups. However, attributes of ceramics are often highly stylistic, carrying meanings which complicate social boundaries. Of rising significance in this discourse are studies of specific cordage attributes, rather than general ceramic attributes. Throughout the Middle Woodland period in the Middle Atlantic, cord-marking was a relatively popular method of ceramic decoration. This method of decoration required a potter to impress twisted cordage into the wet clay of a freshly made vessel, leaving a negative impression of the cordage as decoration on the ceramic. This cordage exhibits an attribute referred to as final twist direction, referring to the direction the fibers were spun in the creation of the cordage. Fibers can be spun in an "S" direction, meaning the spinning motion is down and to the right, or in a "Z" direction, where the motion is down and to the left.

Figure 3. Cordage Twist Direction

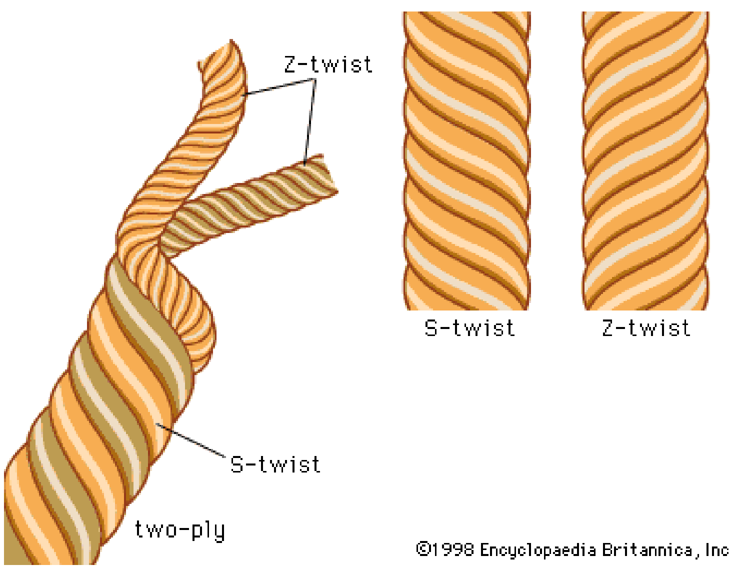
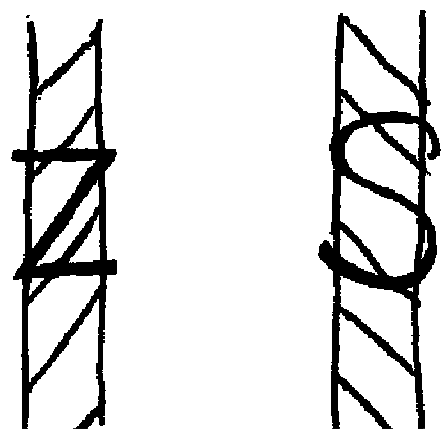


Figure 4. Cordage Twist Direction



IV. Introduction to Style

Ceramic attributes such as surface decoration generally fall under the category of "style." Style has been defined in various ways by different scholars, but most agree that at its most basic, style refers to a way of doing something (Hegmon 1992). In order for this *something* to be done, a choice must be made between the options available. These choices lead to variation in style, as producers naturally choose different options. Hegmon comments that based on style theory by Martin Wobst, “not all material variation is style; rather, style is that part of variation which conveys information” (Hegmon 1992:521). This leads to the question of whether or not cordage twist direction might be considered stylistic; while it may convey information to someone studying the ceramics, its low visibility indicates that it does not convey socially meaningful information to the producer’s community in general. This introduces the issue of intentionality in style, which has been addressed by many scholars as they create definitions for different kinds of style. The theory of style proposed by Wobst has been labeled specifically the *information-exchange* theory, based on his definition of style as “that part of the formal variability in material culture that can be related to the participation of artifacts in processes of information exchange” (Wobst 1977:321). However, this theory has come under much criticism because Wobst specified that stylistic information comes from visual aspects of an artifact. Specifically, Dietler and Herbich (1989) suggest that in terms of the decoration on the Luo pottery they studied, the information conveyed by decoration, effort involved in decoration, and visibility of the decoration are all minimal. Since the Luo decoration fails to meet any of Wobst’s criteria for style, some researchers began to look at style from a different direction, namely focusing on learning and production (Hegmon 1992). Out of this comes the learning-interaction theory of style, a perspective much more applicable to subtle decorative variations on ceramics than the information-exchange theory (Plog 1980).

The learning-interaction theory focuses on expression of style as a result of processes of learning and perpetuating tradition, rather than the actual function of the style. This view of style still involves a choice between equally viable alternatives, and encompasses what Sackett and Plog have referred to as *isochrestic variation* (Plog 1980, Sackett 1982, Klein 2003). Isochrestic variation emphasizes behaviors that are “acquired by rote learning and imitation and…employed automatically” (Plog 1980). Although some scholars may argue that cordage twist direction is by definition *not* style, since it does not convey meaning, cordage twist direction fits neatly into this expanded understanding of style variations. According to Sackett’s definition (1982), cordage twist direction is a perfect example of isochrestic variation, as a ceramic attribute which is minimally visible and results from learning processes. Isochrestic variation, like cordage twist direction, tends to remain constant throughout fluctuations in patterns of social interaction, making it ideal for the study of learning networks (Klein 2003). So while the highly visibly attributes involved in information-exchange theories can reflect multiple kinds of style, including isochrestic variation, less visible attributes tend to result specifically from the learning-production theory of style, from “enculturation or communication of personal identity within a regularly-interacting community” (Klein 2003:). Hegmon elaborates on this learning-production theory of style, suggesting that it may differ from information-exchange based theories in more than just theoretical ways. Hegmon proposes that the two theories operate on completely distinct levels of expression, and yet this distinction also allows them to coexist. While learned style may be expressed at one sublevel, simultaneously the producer might conform to a broader stylistic tradition on a broader level (Hegmon 1992). A pertinent example of this phenomenon is the distinction between cordage twist direction and cord-marking in general. Cordage twist direction is a poorly-visible attribute that conveys learning practices rather than social meaning, while the practice of using cord-marking as a method of decoration reflects a more regional stylistic trend. This multi-level analysis of style suggests that in any study of style, it is important to remember that there are different kinds of style, and each is defined in a slightly different way by various scholars. Style can also play different roles, some of which are less overt and could even be considered inactive (such as cordage twist direction), at which point some scholars might argue that the attribute is no longer functioning as style.

V. Cordage Twist

It is significant that Hegmon's discussion of style encompasses the learning-production theory of style, since learning theories are becoming increasingly relevant to the study of archaeology. In their canonical work on learning, Lave and Wenger (1991) posit that a community is the unit of learning, in which learning occurs through social interaction. Coining the term *community of practice*, these authors introduced a new way of thinking about learning, shifting the focus from the level of the individual to the level of the community. Within this community, knowledge is still transmitted from generation to generation by each individual, but it can be assumed that each individual is working with the same learned skill set, and will thus teach the same skill set to the next generation of learners. This *community* framework adds another level to the transmission of knowledge, suggesting that learning from generation to generation is facilitated by increased interaction within one's community of practice (Lave and Wenger 1991). Kenneth Sassaman took this concept of *community of practice* and applied it to pottery traditions, using learning practices to explain variability in decoration as well as other ceramic attributes (Sassaman 2001, 2005). Some aspects of pottery production, including certain decorative attributes, involve motor skills, which fall under the category of learning that is transmitted through communities of practice. Through participation in this activity, members of a community are simultaneously creating and reinforcing identity, as well as perpetuating the learning process. Hegmon adds to this discussion on the role of learning in the production of material culture, using Kalinga pottery as an example. In this society, the production of pottery is taught in a formal setting, and as a result different stylistic elements can be attributed to different teachers (Hegmon 1992). Studies such as these suggest that where the instruction setting is more formalized, the link between learning and similarity of production is strongest.

Cordage twist direction is an attribute of pottery production and decoration which is considered a learned motor skill, rather than a stylistic choice, as previously discussed. In fact cordage twist direction is frequently thought of as an explicit result of motor habits that are learned and routinized, rather than being considered a decorative ceramic attribute at all (Maslowski 1996, Minar 1999). The assumption that final twist direction represents a *learned* motor skill implies that it is executed almost subconsciously, rather than a conscious choice of specific stylistic ceramic attribute. The choice of twist direction is directly based on the process of teaching and learning, as a student will imitate the methods of the teacher. Once the motor skills become learned habits, they will be very hard to change, as they occur with little conscious effort on the part of the spinner. The spinner must have a significant reason to change twist direction (Minar 2001). Because cordage twist is not a readily visible ceramic attribute, it and similar techniques could be “passive indicators of enculturation,” i.e. attributes that are not intentionally created to convey social or cultural meaning (Neuzil 2008:2). Since twist direction becomes an unconsciously learned and transmitted motor skill from generation to generation, it carries with it greater temporal continuity than do other attributes of ceramics. Twist direction is much less likely to change over time within one constant community than socially meaningful stylistic attributes are. Essentially, twist direction is a "very stable, highly standardized attribute" of ceramic decoration, unlike other decoration methods (Minar 2001).

A number of researchers (e.g., Adovasio 1987, Carr and Maslowski 1995, Johnson and Speedy 1992) have conducted studies suggesting that final twist direction can indicate cultural boundaries within which specific social groups reside. Twist direction is unlikely to be a conscious social marker, and yet studies have shown that it does define grouping of populations to some extent, since it is not random. However, Maslowski also cautions against assuming a direct one to one relationship between cordage twist direction and culture group. While he and other scholars have begun to demonstrate that cordage twist direction can indeed be interpreted as an indicator of some type of cultural boundary, it is important to remember that the relationship between community of practice and social boundaries is complicated and subject to cultural and historical variability.

Minar (based on Adovasio, etc. 1986) argues that final twist direction is not stylistic, in contrast to some scholars who do label twist direction as stylistic but tighten the definition of style to do so. While style is an important aspect of ceramics that is frequently discussed, Minar suggests, twist direction does not fall under that category. To be stylistic, in Minar's approach, an element must be overtly visible, because the essence of style is that the element conveys meaning. Final twist direction is a ceramic attribute at the other end of the spectrum, as it is nearly invisible in the final product, and thus not likely meant to convey any meaning or symbolism. In fact, ethnographical studies of modern spinners conducted by Minar (2001) and others suggest that often the spinner is not even aware of the final twist direction being produced.

Another way to think about it is that twist direction in cordage used for decorating ceramics has no functional or adaptive value; thus it is unlikely that an individual or a group would adopt a new twist method for any conscious reasons. This is not to say that twist directions are completely uniform within a community of practice; as with any attribute variations can be expected. In the case of twist direction, these variations can often be explained through left- or right-handedness or mere idiosyncratic behavior. Maslowski (1996) advocates the use of cordage twist direction in conjunction with other forms of material culture to ensure that hypotheses have a more solid archaeological grounding.

So how is final twist direction chosen, if it is not a conscious stylistic element of ceramic decoration? It is possible that the type of fiber used in the cordage can impact the decision of twist direction; some fibers twist more naturally in one direction than the other. Despite this tendency, when one of these fibers is twisted in the opposite direction it does not significantly affect the strength of the final product (Carr and Maslowski 1995). Another suggestion is that the method of spinning the fibers results in different final twist directions. According to a survey of modern spinners, the majority of spinners indicated that the method of spinning did not affect final twist direction (Minar 2001). When fibers are spun together, each fiber added to the thread must be spun in the opposite direction of the previous fiber, to make the cordage stronger. Taking this into account, it becomes apparent that the final twist direction is merely the opposite of whatever the first spin direction happened to be. Evidence from modern spinners allows archaeologists to come to the conclusion that this initial spin direction is dictated by the set of motor skills that the spinner has learned. Spinners are unlikely to change their twist direction arbitrarily, either because the motor skill has been ingrained in their habits, or because some believe that spinning in the opposite direction from tradition has certain religious symbolism (such as sorcery) (Minar 2001). Twist direction as a reflection of cosmological beliefs is rare but not impossible; some societies imbue twist direction with ritual significance which takes precedence over the learned tendencies of the community of practice (Carr and Maslowski 1995). However, these ritual exceptions are unlikely to be present on common domestic pottery, leaving cordage twist as the likely result of learning networks (Klein 2003).

Yet another approach suggests that distinctions between final S-twist and final Z-twist cordage reflect handedness in populations. Studies have also been undertaken to address the issue of the effect of handedness on final twist direction. Generally, a population consists of 80-90% right-handed individuals and only 10-20% left-handed individuals. However, in studies of S- and Z-twisted cordage, the proportions do not match up. Some populations exhibit 100% either S- or Z- twist, and it is very unlikely that any population would have either left-handedness or right-handedness represented 100%. (Minar 2001). Handedness is a more likely candidate to explain small idiosyncrasies among a population than as an explanation for the preferred twist direction of an entire community of practice.

VI. Migration and Material Culture

The study of human migration has not always been considered a relevant aspect of archaeology. Explanations of culture change in terms of population movements or migration were popular in the 1950s, as archaeologists searched for patterns and regularities of culture contact. In this way, cultures could be classified according to their differences and similarities, and separated into bounded groups based on traits. With such distinct cultural delineations in place, any behavioral shifts would then be highly noticeable, and could be attributed to some form of movement, whether of people or ideas. However, by the 1960s, critique of this rather essentialized notion of culture prompted researchers to shift their focus from the search for historical trends to the testing of cross-culturally relevant hypotheses. These new processualist scholars aimed to make scientific methods the cornerstone of the discipline, rather than the construction of overarching cultural patterns (Anthony 1990). Explanations foregrounding migration fell into this latter category, and were therefore considered irrelevant.

The recent historical turn in archaeology has encouraged a resurgence in migration studies that highlight agency and meaning (Anthony 1990). Initially, one might assume that migration would be difficult to study archaeologically, since it involves the movement of peoples across landscapes, while significant archaeological evidence usually stems from the prolonged occupation of a specific point on the landscape. Proof of migration, however, can be found in the material culture, when analyzed from certain perspectives. Springing from an early cultural history approach, past scholars have attempted to trace migration archaeologically with a focus on changes in decorative styles, working on the assumption that different methods of decoration might indicate separate culture groups. However, Burmeister (2000:541) and other migration theory experts agree that "elements of material culture that reflect the economy or social representation are unsuitable for establishing proof of migrations." This argument against socially meaningful decorative attributes as reliable markers echoes the distinction discussed earlier between information-exchange and learning-production style theories. Burmeister points out that by focusing on highly stylized attributes, these scholars run the risk of oversimplifying differences in style and underemphasizing the role of individual agency in decorative attributes on ceramics. Instead, Burmeister writes, "focus has to be on the details of culture – on traits that have little effect on outsiders or lack social significance and cannot be adopted as objects of either prestige or fashion" (Burmeister 2000:542). These ideal qualities recall those of cordage twist direction, as discussed earlier. Twist direction is learned and unconscious, it does not reflect social representation or any form of identity, and has nothing to do with either prestige or fashion, making it a much more suitable attribute for tracing migration than stylistic decoration.

In addition to specifications for which forms of material culture are suitable for migration studies, parameters have also been laid out for the shape of migration patterns in general. The common conception about migrations probably involves a mental image of an entire population packing up and moving to a new place. Despite this image, mass migrations are in fact extremely rare, and this perspective is not the best way to conceptualize migration. Rather than an irregular or invasive occurrence, migration should be recognized as a much more gradual, long-term process (Burmeister 2000). Burmeister points out that migrations often begin with a few pioneers who identify a destination which suits specific needs, and only then do subsequent groups follow the migration path**.** In terms of the structure of migration, it is most likely to occur in a region where interaction is already frequent between groups. Migrants are not likely to move to a completely unknown place, but if they know something about another region through previous interaction (e.g., earlier, smaller migrations), they are more inclined to move (Anthony 1990). This indicates that a model of punctuated, spurt-like migration, where multiple waves occur, is not uncommon. Also, in theory, a migration of peoples which occurs across a relatively strong boundary, such as ecological or cultural boundaries, must have required planning to undertake, and thus should leave clear archaeological evidence (Anthony 1990). Once migration has occurred, the material culture should reflect the migration in specific ways. Most likely the highly functional traits will predominate while others are lost, but this may be offset by the fact that the dominant trait group usually prevails (Burmeister 2000). These models of migration are formed through exhaustive studies of recent and historical migrations. Although these studies involve people's movements in modern ages, they still focus on the basic human behaviors involved in the movement of a population, and are (at least in terms of forming a model) applicable to prehistoric peoples.

The motivations behind these movements and the processes of acculturation that necessarily follow them can be examined through practice theory. Practice theory is based on Bordieu's concept of *habitus*, which he describes as "that which exists in the everyday actions of individuals, but of which the individuals are not necessarily aware" (Bourdieu 1977). *Habitus* encompasses a community's set of daily practices which are not explicitly taught, but rather are subconsciously learned through social experiences and interactions (Bourdieu 1977, 1990). Through practice, which includes those habits and behaviors that are inherent to an individual's character, people can reproduce old traditions while simultaneously creating change (Pauketat 2001). The viewpoint that people themselves are in control of their traditions, rather than environmental factors, is labeled as *agency* by modern scholars. The concept of agency foregrounds how individuals intentionally act in ways that both produce and reproduce social traditions (Pauketat 2001). This contrasts previous theories of cultural ecology, where scholars primarily attributed social organization and change to human adaptation to the natural environment.

This shift to discussions of agency and practice in archaeology represent the intriguing direction of the discipline in general. However, Wesley Bernardini warns that this shift may be more nominal and ideological than functional, particularly with regard to such delicate topics as identity and human behavior (Bernardini 2005). Bernardini comments that while scholars may *talk* about behavior using terms like *practice* and *agency*, in reality many continue to rely on geographic distributions of material culture that apply to large-scale groups. In order to truly break away from the culture area approach to migration, according to Bernardini, scholars need to focus on the idea that prehistoric migrations are diachronic in nature and cannot be explained through synchronic, regional perspectives of large cultural groups. Migration decisions are more likely made by small groups of individuals than an entire culture group, and these small migrating groups probably engaged in what Bernardini terms *serial migration*. In this process, rather than a mass exodus from one region, migration can be described as a "pattern of successive movements, traced independently for each small group" (Bernardini 2005:7). The movements of these smaller groups of migrants are unsynchronized and varied in nature, resulting in the diversity of identities in any given area, and subsequently diversity in material culture. Thus identity can only be discovered by tracing these small social groups over time, instead of attributing identity to large culture areas.

Bernardini adopts Christopher Carr's "unified middle range theory of artifact design" to suggest how these variations in material culture can still be analyzed effectively to get at identity (Bernardini 2005:86). The appropriate approach involves the "search for embedded aspects of artifact production that reflect a producer's enculturated background, techniques learned in childhood and repeated without conscious intent to transmit a message to viewers. Techniques learned through enculturation are likely to be expressed in attributes with low contextual visibility." (Bernardini 2005:86). Thus, even though Bernardini's migration studies involved Hopi oral traditions rather than cordage twist direction on ceramics, his base theories about migration and identity promote the study of subtle material culture variations rather than overt style.

VII. Previous Cordage Twist Research

Cordage twist direction has been the focus of research for several archaeologists, including those interested in histories of migration. Robert Maslowski (1996) focused on cordage and textiles in the Ohio Valley region, addressing the ways in which cordage twist patterns, as standard and stabilized elements of production, can help delineate both social and ethnographic boundaries. Maslowski and Christopher Carr (1995) also extensively studied cordage twist direction in the Ohio Valley, analyzing the behavioral processes involved in the decision making of twist direction. Maslowski and Carr present specific patterns of twist direction that they have discovered through ceramic study and use these patterns to hypothesize about different levels of interaction occurring between 'learning pools,' or groups in which structured learning networks result in similar twisting methods. Outside of the Ohio Valley, Johnson and Speedy (1992) used cordage twist direction on ceramics from the Middle and Late Woodland periods on the James River in Virginia to advance their ideas about cultural continuity and change. Johnson and Speedy studied ceramics from James River drainages in Prince George County and discovered a significant shift in twist direction circa A.D. 800. Middle Woodland sherds showed predominantly S-twisted cords, while the Late Woodland sherds from after A.D. 800 predominantly exhibited Z-twisting. The authors suggest population replacement as an explanation for this shift in cordage twist direction. Johnson has continued to study cordage twist direction in the Susquehanna Valley of Pennsylvania and also on the Monongahela River, primarily focusing on possible population shifts corresponding to the Middle to Late Woodland transition. These studies include quite sizeable samples of ceramic sherds, allowing Johnson to make strong claims about cultural continuity in the Potomac River Basin as well as the Alleghany Plateau (Johnson 2007, Johnson and Myers 2004).

In a nearby region, Jay Custer has studied cordage twist in Delaware and Pennsylvania. Focusing on intra-site twist direction variability, Custer suggests that scholars should avoid using the presence of cordage twist variation as a direct implication of connections between twist direction and identity. Custer also warns against making sweeping inferences about population movement based on small sample sizes (Custer 2004). In the Potomac Valley, Mike Klein analyzed Middle and Late Woodland pottery, using cordage twist patterns to draw conclusions about cultural homogeny and social interactions (Klein 2003). According to Klein, the homogeneity in cordage twist direction during Middle Woodland II directly reflects loosely bound learning networks and fluidity of interactions across the region. These varied and numerous studies by important scholars indicate that cordage twist direction is an area of research with much potential to speak to ideas about migration, interaction, and cultural or social boundaries.

VIII. Methods

My analysis of cordage twist direction stemmed directly from procedures employed by William Johnson in his extensive analyses of cordage impressions on prehistoric ceramics. The methods I used, both for analyzing the ceramics and for recording results, were suggested to me by Johnson as methods that he had found useful. This ceramic study centers in the Coastal Plain region of Virginia, specifically the Chesapeake drainage, as defined by Blanton (1992).

Figure 5. Regional View of Sites Included in Study

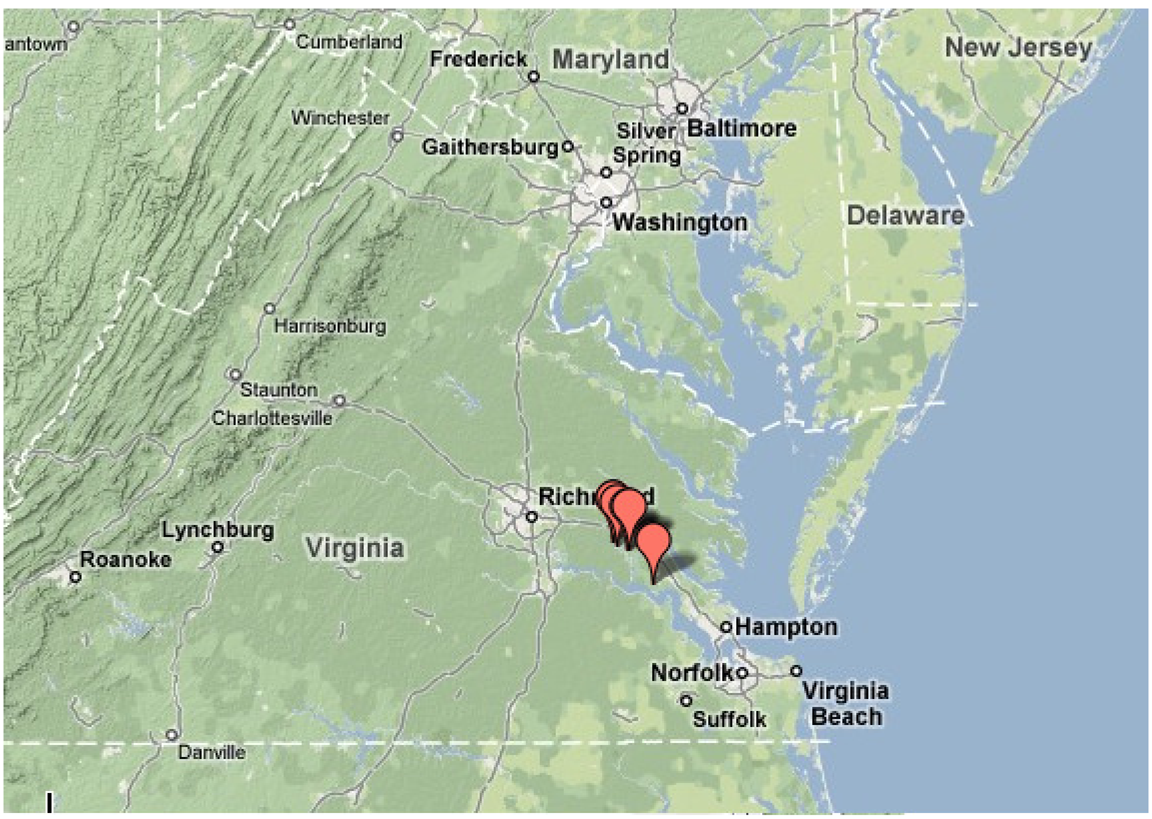


Image courtesy of Google Maps.

The ceramic samples I analyzed were made available to me by the Anthropology Department at the College of William and Mary. These ceramic collections were products of the Chickahominy

River Survey, an archaeological survey performed by Dr. Norman Barka and Ben McCary in the 1960s and 70s. In organizing a representative sample of these ceramics, I chose examples from contexts that exhibited either temporal longevity or strict temporal specificity. The Chickahominy River Survey consists of artifacts from numerous sites along the Chickahominy River, but only five of these sites had artifact assemblages with sufficient ceramics exhibiting cordage patterns (Figures 5 and 6).

Figure 6. Local View of Sites Included in Study

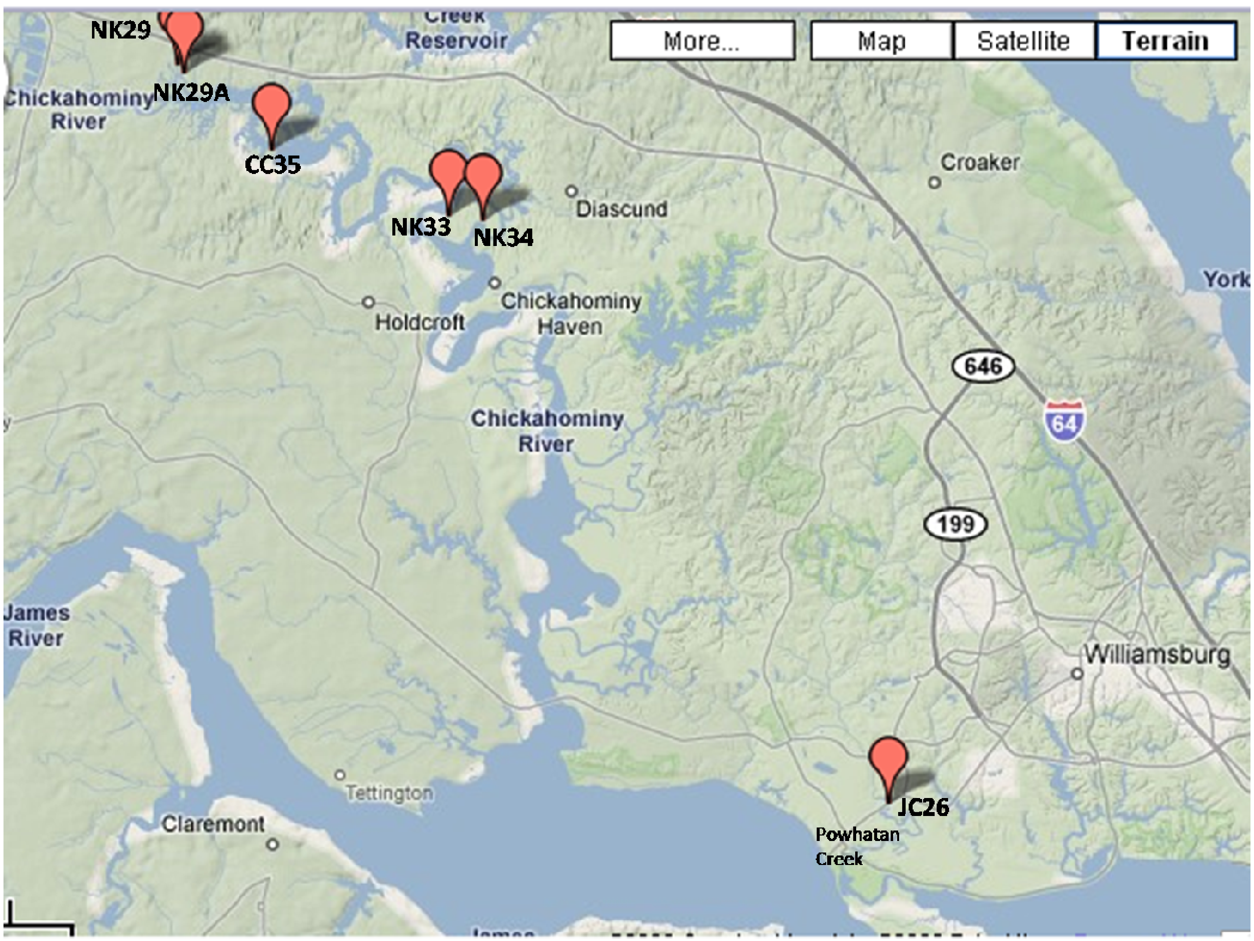


Image courtesy of Google Maps.

Of particular interest at these five sites were contexts with heavy concentrations of earlier ceramics, as these were much rarer in the collection than Late Woodland ceramics. By ‘earlier ceramics,’ I mean those which have either crushed lithic, sand, or pebble tempering, but not shell tempering, which is indicative of Algonquian populations from after A.D. 200. Once a sample was obtained containing ceramics diagnostic of both the Middle Woodland I and Middle Woodland II periods, I specifically chose ceramics with recognizable decorations created with cordage. These ceramics are primarily cord-marked but occasionally I included net-impressed sherds as well. I chose sherds based on how well the actual cordage patterns were preserved, as those with sharply defined cordage patterns presented the most potential for analysis. Once this representative sample from the Chickahominy River was complete, I repeated the process with ceramics from the Powhatan Creek site (44JC26), bolstering the sample size. The Powhatan Creek site was excavated under the direction of Dr. Theodore Reinhart, also of the Anthropology Department at the College of William and Mary.

The actual analysis of the sherds involved casting the surface of each sherd in latex to provide a positive image of the negative impression left by cordage used to decorate the sherd. When dry, the cast provided a sharper, positive impression of the cordage pattern, with the advantage of being malleable and more easily preserved than the actual sherd. I labeled the chosen sherds to preserve context, with each given a specific number. Next I recorded a basic ceramic analysis for each sherd based on attributes such as temper, surface decoration, axial and profile curvature measurements, and thickness measurements. I then brushed the surface of each sherd with talcum powder (with a soft toothbrush) in order to clean excess dirt out of the grooves of the cordage impressions and also to facilitate the removal of the cast. After spreading the sherds out on wax paper, I applied a latex mixture to each surface. The latex mixture consisted of a liquid latex product, Moldlene, combined with distilled water and a light shade of acrylic paint to color the mixture (which otherwise would dry opaque and make interpretation more difficult). This slightly runny liquid was applied to each sherd in three coats, waiting approximately 24 hours in between each coat for sufficient drying. When the molds were completely dry, curing for 24-48 hours, I removed them from the sherds. The latex mixture peeled off easily and left no residue behind, providing a rubber-like cast to which I assigned a unique surface cast number and labeled accordingly. The sherds were then returned to the collection. The casts provide a positive image of the cordage decorations on the sherd, allowing me to determine cordage twist direction, although sometimes a magnifying glass was required. I recorded the final cordage twist direction, whether 'S', 'Z', or "Undetermined," for each cast by context, and then entered the classification into a Microsoft Access Database.

The contexts chosen from the Chickahominy River collection represent five distinct sites (CC35, NK29, NK29A, NK33, and NK34[1], as shown in Figure 6) which are in close proximity to each other along the river in Charles City and New Kent counties. Although the ceramic sherds from the Chickahominy River Survey were recovered from feature contexts, none of these contexts were reliably dated pit features. Instead, these ceramics were found in clusters within thin deposits, not artifact-rich pits. Figure 7 shows an example of an artifact cluster found at the surface of a relatively shallow feature, while Figure 8 shows a more common pit feature.

[1] NK34 is Norm Barka's site designation; the Virginia Department of Historic Resources has since assigned the number 44NK167 to this site.

Figure 7. Site NK29 feature 3L2

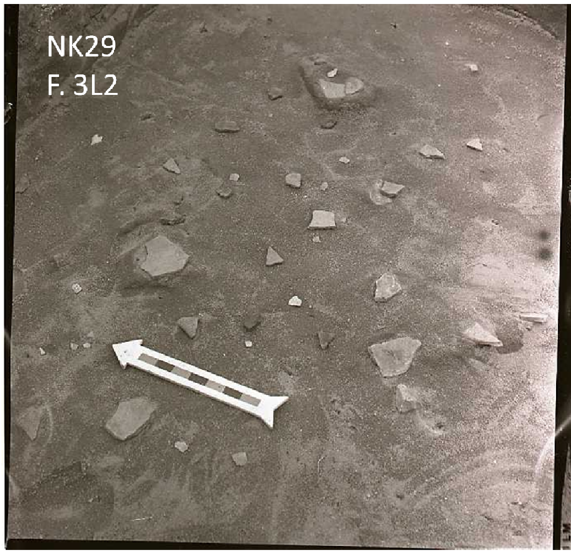
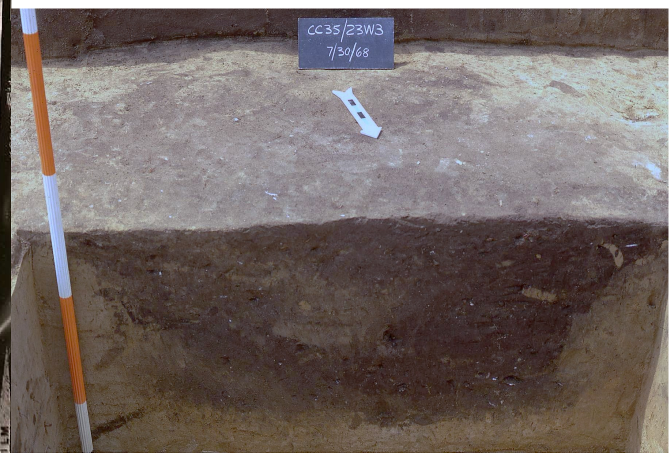


Figure 8. Site CC35 feature 23W3



I included contexts from the Powhatan Creek site along a tributary of the James River in the sample size, because, in relative terms, the site is still very close to those on the Chickahominy River, which are slightly more inland. The sherds from the Powhatan Creek site were also primarily larger and better preserved (and thus more easily analyzed) than those from the Chickahominy River survey. At JC26, excavations occurred based on arbitrary levels of stratigraphy (Reinhart 1973). Most contexts included excavation levels beginning at one, which was the plow zone, and going down to four or five, until ceramics were no longer present. The plow zone sherds were excluded from this study, and instead I examined only sherds from excavation levels two through five. The ceramics of the contexts included in the twist direction analysis are summarized briefly as follows (a full inventory of the ceramics in the study, including their context, temper, surface decoration, and twist direction, will be included in an appendix).

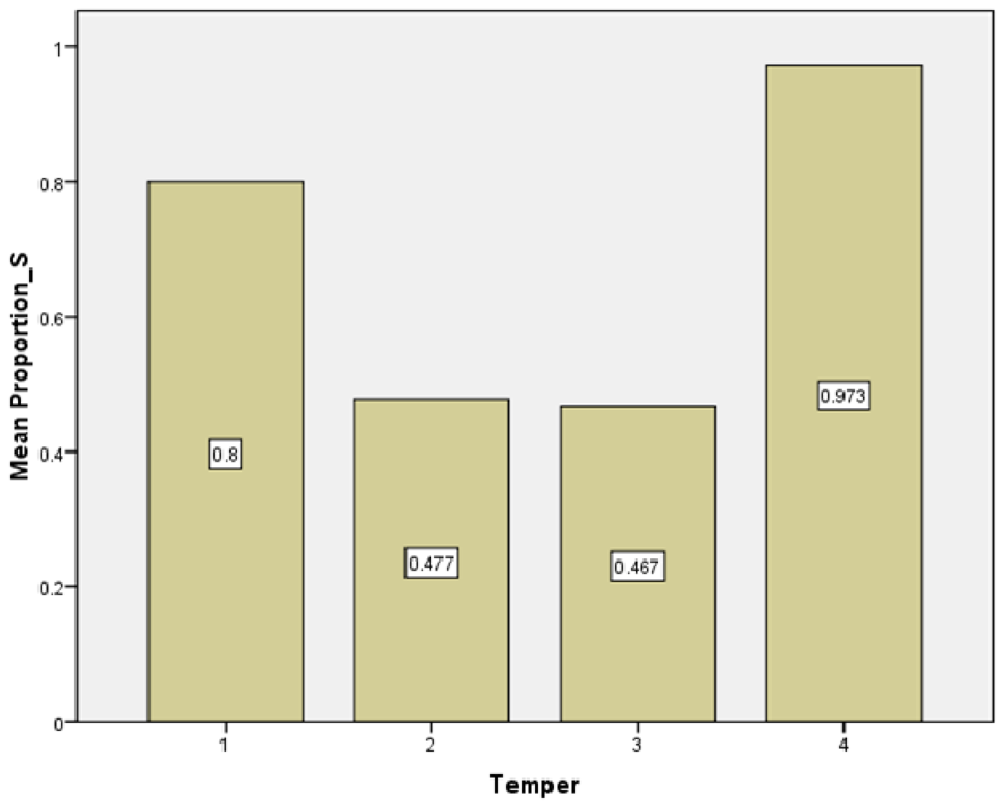
Table 1. Ceramic Sherd Sample Summary by Site

Site Name	Number Shell-Tempered	Number Crushed Lithic-Tempered	Number Rounded Lithic-Tempered	Number Fine Sand-Tempered	Totals
CC35	27	2	4	0	33
NK29	0	4	1	1	6
NK29A	1	16	6	2	26
NK33	0	4	0	0	4
NK34	23	5	2	0	25
JC26	77	35	2	6	120
Totals	128	66	15	9	214

IX. Data

Initially, I used Microsoft Access to organize the data and highlight any trends that became apparent. Then the statistical software SPSS allowed the data to be manipulated and grouped on different variables, allowing me to tease out trends that were more subtle and required further analysis. The most obvious result showed that final twist direction does vary by sherd temper to some degree (Figure 9).

Figure 9. Cordage Twist Direction by Temper



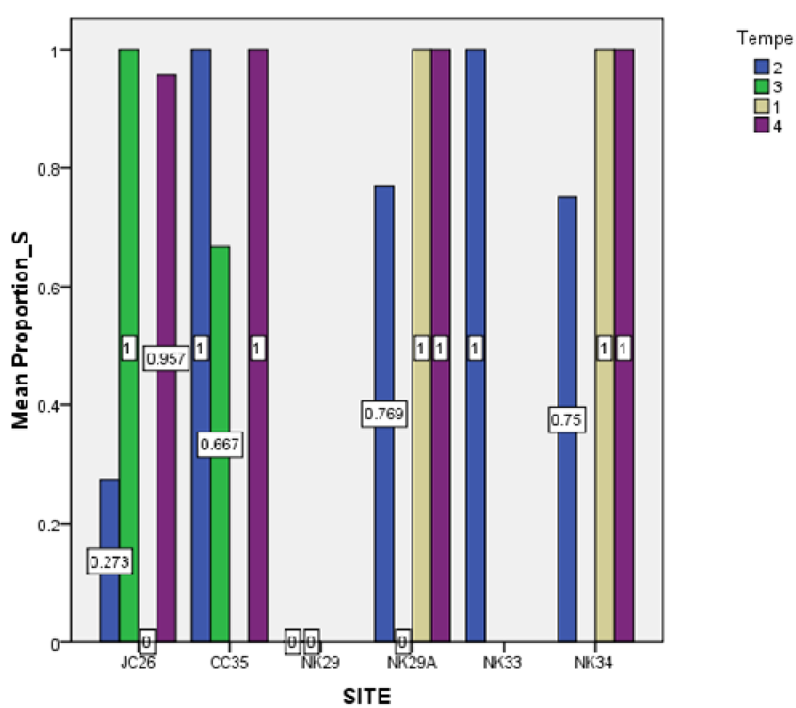
In Figures 9 and 10, temper 1 is rounded-lithic, temper 2 is fine sand, temper 3 is crushed-lithic, and temper 4 is shell. While shell-tempered Mockley ceramics exhibited an average final S-twist of 97%, fine sand- and crushed lithic-tempered ceramics each exhibited only a 47% final S-twist. These percentages indicate that only rarely were Mockley cord-marked ceramics found to have final Z-twist, while slightly more than 50% of Varina and Pope's Creek sherds were likely to show final Z-twist.

These cordage attributes were then examined at a more narrow level, and the ceramics from each individual site were analyzed to see if the previous trend held true at the site level. At the sites which contained shell-tempered ceramics (JC26, CC35, NK29A, and NK34), only one site exhibited less than 100% final S-twist for these sherds (JC26), and the percentage was still a very high 96%. These numbers match up well with the trends that occurred in the analysis of all of the sherds. In contrast, the percentages of crushed lithic-tempered sherds exhibiting final S-twist varied more widely between sites than in the general sherd analysis. The following results occurred for each site:

Table 2: Final S-twisted Crushed-Lithic Percentages by Site

Site	Percentage Final S-Twist
JC26	27%
CC35	100%
NK29	0%
NK29A	77%
NK33	100%
NK34	75%

Figure 10. Cordage Twist Direction by Site



These percentages are not quite as meaningful because the number of crushed lithic-tempered sherds at each site differed greatly. However, they are sufficient to indicate a similar finding to the initial trend, in that final S-twisting varies widely for crushed lithic-tempered sherds while remaining relatively constant for shell-tempered sherds.

It is also helpful to analyze the data of final Z-twisted sherds. While these percentages are just the opposite of those for final S-twist, some trends do become more apparent when the data are viewed from a different angle. For example, analysis of final S-twisting indicates that site NK29 exhibited 0% of that attribute. It is important to note that this site was rare in that the context analyzed from NK29 did not contain any shell-tempered ceramics. The ceramics at this site were predominantly crushed lithic-tempered, with small numbers of fine sand- and rounded lithic-tempered sherds as well. Importantly, despite the diverse tempers displayed in the ceramics, final Z-twisting still occurred at 100%.

However, in a context where both Mockley shell-tempered and crushed-lithic Varina sherds were present, such as CC35, all of the ceramics from both categories were 100% final S-twisted. Yet at JC26, which also contained both Mockley and Varina sherds, the Mockley sherds were 97% final S-twisted while the Varina sherds were only 27% final S-twisted. These numbers again reinforce the pattern of more highly variable cordage twisting in pre-Mockley ceramics, those with rounded lithic, fine sand, and crushed lithic tempering. Such variation is likely due to unknown social factors, as they do not seem to become more consistent with the presence of Mockley ceramics in the same context.

When the ceramics are analyzed at an even narrower level such as the context, the analysis becomes more complex. Unfortunately, at this level the sample sizes are much smaller, as an examination of each context naturally involves fewer sherds than does an examination at the site level. Thus specific final twist tendencies tend to vary greatly from context to context and are not entirely reliable, with sample sizes too small to represent statistically significant percentages. However, despite these weaknesses in the data, the context level analysis does indeed point toward patterns which support the general trends found at the site- and temper-level analyses.

Figure 11. Cordage Twist Direction by Context at Site JC26

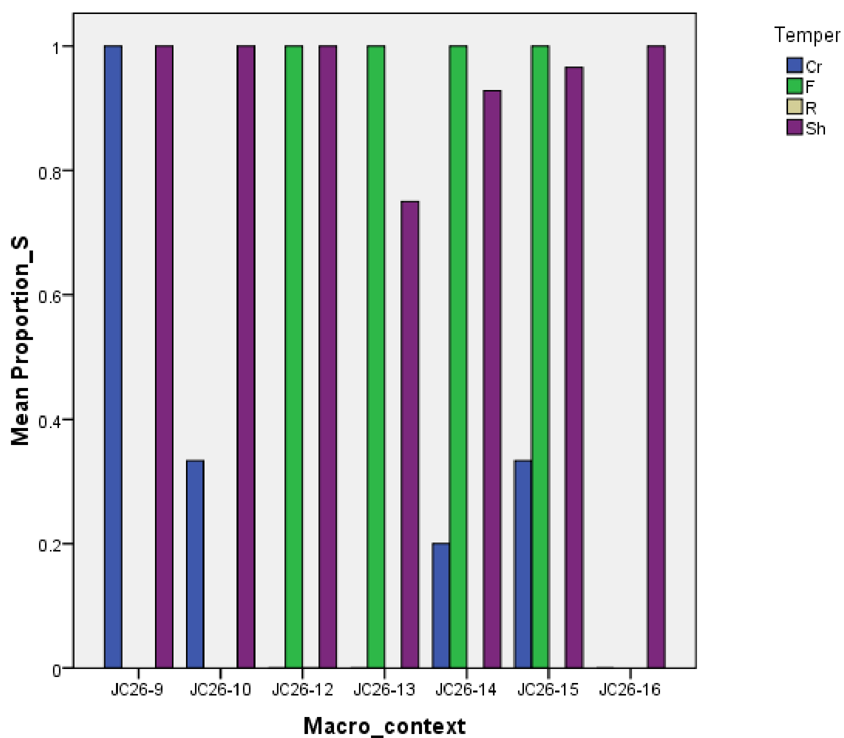
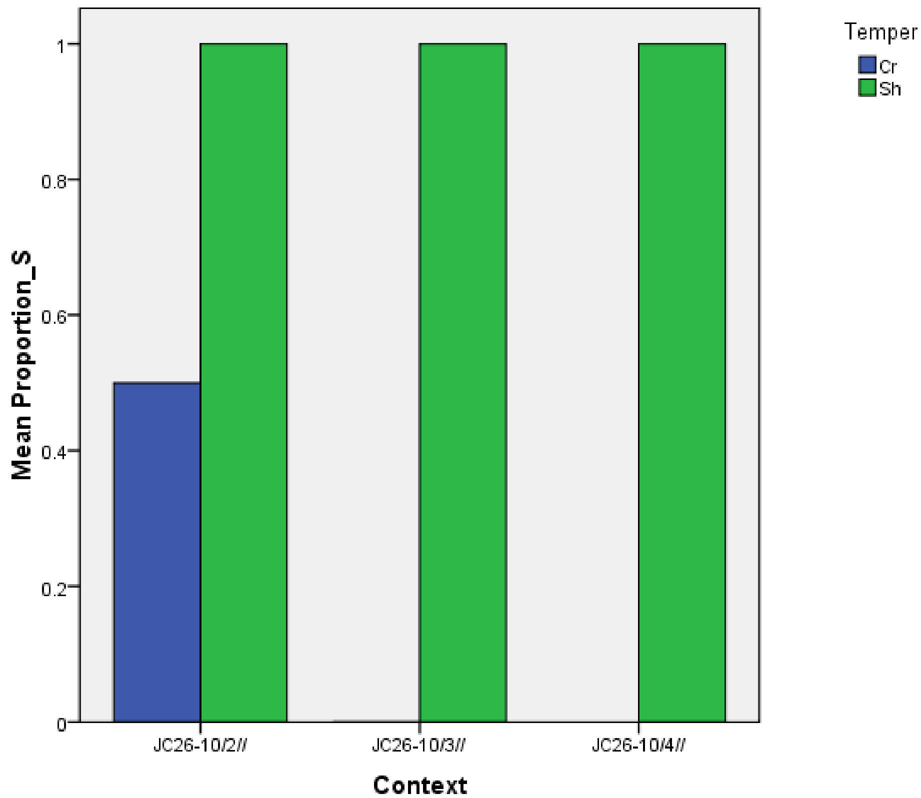


Figure 11 shows that between contexts at JC26, the most directly estuarine site included in the study, significant differences still exist between final twist direction of shell-tempered ceramics and that of lithic-tempered ceramics. In all but one context at the Powhatan Creek site, the percentage of shell-tempered ceramics which exhibited final S-twist is greater than

90%, and in the last context this percentage is still higher than 70%. In contrast, the percentage of lithic-tempered ceramics with final S-twist varies widely across the contexts. Context 9 at JC26 exhibits 100% final S-twisting of lithic-tempered ceramics, while contexts 10, 14, and 15 all have fewer than 40% lithic-tempered ceramics which are S-twisted. These contexts at Powhatan Creek indicate that when Mockley ceramics are introduced to a site, presumably by a new population, the learned twisting directions on the ceramics of the indigenous population do not immediately change.

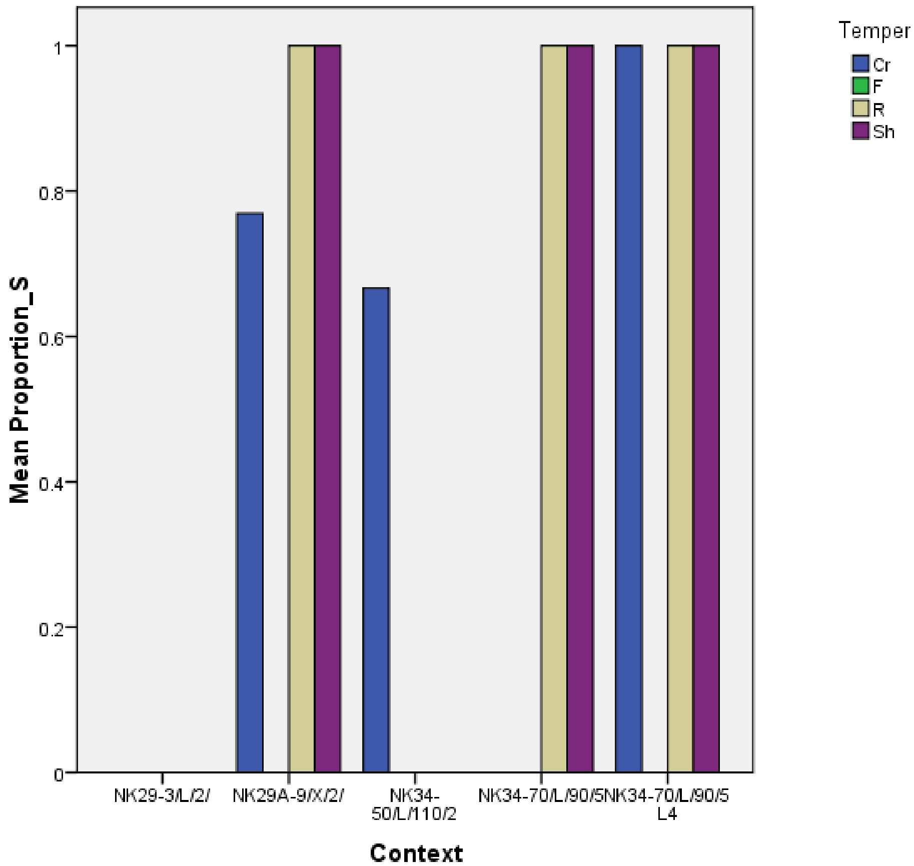
Blanton's report of the ceramics excavated at Chisel Run (2004) mirrors the situation for the ceramics at Powhatan Creek. While both sites were stratified, once the ceramics were analyzed it became clear that there was no distinct separation of levels with solely lithic-tempered sherds and levels with solely shell-tempered sherds. While the presence of shell temper increases gradually from lower levels to levels closer to the surface, no clear patterns exist, and shell tempered-ceramics are often found at the lowest levels along with the lithic-tempered sherds (Blanton 2004). Figure 12 uses Context 10 at JC26 as an example, showing that shell-tempered ceramics were found in all three levels of the context, indicating that the lithic-tempered ceramics cannot be exclusively older than the shell-tempered ceramics. Likely the two temper materials occur simultaneously at the site, or at least represent different occupations at the site with little temporal differentiation. The graph shows that despite the contemporaneous nature of the varied ceramics at JC26 in Context 10, twist direction is not homogeneous. Shell-tempered sherds are 100% final S-twisted, while lithic-tempered sherds are only around 50% final S-twisted, meaning they are also 50% final Z-twisted.

Figure 12. Cordage Twist Direction by level in Context 10 at Site JC26



The features at the Chickahominy River sites included in my sample were not stratified. Instead most of the artifacts were recovered from clusters within shallow pit features. However, the shallow nature of these pits and the clustered artifacts likely indicate a single occupation, where production of multiple ceramic tempers occurred simultaneously. Figure 13 lists the different feature contexts at three New Kent County sites on the interior drainages of the Chickahominy River, NK29, NK29A, and NK33.

Figure 13. Cordage Twist Direction by Context at New Kent County Sites



Two of these feature contexts contain both shell-tempered and lithic-tempered ceramics which were likely in circulation simultaneously. In each the shell-tempered ceramics are 100% final S-twisted, similar to the data from Context 10 at JC26. However, lithic-tempered ceramics in these two features do not display such consistency; level 4 of feature 5 in context 70L90 at site NK34 did exhibit 100% final S-twisting on lithic-tempered ceramics, but feature 9X2 at NK29A showed a less significantly final S-twisted ceramic population (under 80%). These contexts follow general trends across the region where lithic-tempered ceramics display a more varied composition of final S-twisting than do shell-tempered ceramics, which are consistently final S-twisted.

X. Conclusions

Cordage twist research provides a stepping stool for hypotheses about cultural boundaries based on what was likely a subconscious element of ceramic production. The most striking result of the analysis is that cordage twist direction in this study does not appear to be consistent within specific sites (or even features), and thus the sites in the study are not likely to represent distinct cultural groups. Contexts without shell-tempered ceramics are 100% final Z-twisted, but that does not indicate a direct relationship between temper and twist direction, because non shell-tempered ceramics that were found in contexts together with shell-tempered ceramics are *not* 100% final Z-twisted. Neither do crushed lithic-tempered ceramics switch to being 100% final S-twisted when they occur in contexts with final S-twisted shell-tempered ceramics. These data show that people inhabiting one site or using one feature do not necessarily all employ the same twist direction. This may be a result of the mixing of communities of practice or the presence of ceramics that represent different periods of occupation. These sites are all from the same local area, and likely represent related groups that interacted frequently.

Nor do the distinctions lie along the lines of ceramic temper. Shell-tempered ceramics that are final Z-twisted do occur, although in small percentages, and crushed lithic-tempered sherds are almost exactly half S-twisted and half Z-twisted. If these sherds pre-date Mockley ceramics, as ceramic typologies from Egloff and Potter (1982) suggest, it could indicate that the population was not as homogenous pre A.D. 200. Final twist directions varied because the technology was not standardized across the region. But when shell-tempered ceramics arrive, presumably brought by Algonquian speakers migrating into the region, final twist direction becomes much more standardized (almost 100% S-twisting).

In order to come up with an explanation that clearly accounts for cordage twist direction across the A.D. 200 boundary, more temporal control is necessary. The data in this study are inconclusive with regard to chronology, since radiocarbon dates are not available for any of the contexts and temporal associations can only be loosely applied. It would be necessary to examine contexts where shell-tempered ceramics and crushed lithic-tempered ceramics were known to be contemporaneous in a dated context, and then analyze final twist direction.

Despite the speed bump caused by lack of temporal control, there are possible hypotheses which can be proposed. It is still possible that migration of Algonquian speakers around A.D. 200 accounted for the introduction of shell tempering to the Tidewater, and this new community of practice simultaneously introduced final S-twisting as a requisite element in ceramic production. The data overwhelmingly indicate that shell-tempered ceramics, assumed to date after A.D. 200, are final S-twisted 97% of the time. This is strong evidence that with Algonquian migration came homogenization of ceramic technology and production. Before A.D. 200, production was highly variable, as crushed lithic- and sand-tempered sherds exhibit about 50% final S-twisting and 50% final Z-twisting. Mike Klein's cordage twist analysis in the Potomac Valley largely echoes these findings to some degree (Klein 2003). Klein's analyses showed that final S-twisting persists throughout the Middle Woodland period, but this pattern declines in the Late Woodland and twist direction becomes much more variable. According to Klein, the final S-twisting predominant in the Middle Woodland likely indicates learning networks that are loosely bound, where individuals move around with relative ease and frequency. This fluidity results in the more widespread and homogenous use of specific twist directions, because learning networks have far-reaching spheres of influence. In contrast, as cordage twist homogeneity begins to break down in the Late Woodland, Klein hypothesizes that learning networks became increasingly bounded. The increased sedentism of the Late Woodland resulted in less fluid social interaction, and interpersonal relationships were restricted. This trend lead to small, isolated twisting traditions, with little to no influence from other communities, and thus twist direction varies widely throughout the period.

When combined with the results of this Chickahominy River study, Klein's data lends itself to the analysis of an even longer temporal trend. The early centuries of the Middle Woodland period display relative heterogeneity in cordage twist direction, and after the introduction of shell-temper to the region in the later half of the Middle Woodland, twist direction homogenizes quickly (to an overwhelming S-twist preference). While Klein's study places the homogenization of twist direction earlier in time, at the beginning of the Middle Woodland, this could be explained by the fact that his data come from the Potomac Valley, a region further to the North than the Chickahominy drainage, where Algonquian influences may have arrived sooner.

Following theories by Carr and Maslowski (1995), this situation could also involve a temporary overlap of settlement systems. The variations in final twist direction could be explained by thinking of the Chickahominy and James River drainages as meeting sites, where people return temporarily or come together briefly. Another suggestion by Carr and Maslowski (1995) is that sites with mixed proportions of final S- and final Z-twist might exist as boundary settlements. Settlements along cultural boundaries may have more opportunity to interact across that boundary with neighboring (and yet culturally different) groups. This suggestion is corroborated with evidence previously discussed from McLearen and Mouer (1989), who showed that pockets of ceramics that were typical of the Middle Woodland I period remained in the Inner Coastal Plain throughout Middle Woodland II, while shell-tempering spread rapidly throughout the rest of the region. The sites in this study which were further inland, such as the New Kent County and Charles City County sites, exhibited greater proportions of final Z-twisted crushed lithic-tempered ceramics than did the James City County site along a larger river branch. Pockets of cultural groups did remain distinct in terms of their ceramic production techniques, and that some interaction did occur between these groups and the homogenized shell-tempered, final S-twisted culture groups, explaining the variation in final twist direction at these sites.

Geographically, it seems clear that the JC26 site is a larger midden site, in a more direct coastal location, on a creek off the James River. At this site, which was almost certainly settled by estuarine-environment-seeking Algonquian people, shell-tempered ceramics are predominant and are consistently final S-twisted. However, some lithic-tempered sherds were recovered from this site, indicating that to some extent the ceramics of indigenous populations were still in circulation even after assimilation with Algonquians might have occurred. Interestingly, these lithic-tempered ceramics are not 100% final S-twisted, supporting the notion that cordage twist, as a learned motor skill, is not an element of decoration which changes quickly or easily. This attribute must change more slowly over time, as communities of practice become more and more predominantly Algonquian and new generations are being taught new twist directions. The lithic-tempered ceramics in this context were approximately

80% final S-twisted, which is a much higher percentage than that for lithic-tempered ceramics on sites further to the interior on the Chickahominy River. While ceramics at the inland sites vary widely between final S-twisting and final Z-twisting, the higher percentage of final S-twisting at JC26 of lithic-tempered ceramics reflects more intensive interactions between Algonquians and indigenous communities. The indigenous communities at the interior sites likely had less frequent contact with Algonquian communities who initially focused on direct riverine environments, explaining the less significant influence of homogeneous final S-twisting at these interior sites.

While many scholars have detected and examined the rapid spread of shell-tempered ceramics after A.D. 200, Blanton (2004) emphasizes that this ceramic adoption corresponds with cultural homogenization in the Chesapeake. However, Blanton also cites radiocarbon dates which suggest that both the spread of shell-tempered ceramics and the cultural homogenization of the region happened more gradually than the rate of progression which is usually assumed. Radiocarbon dates suggest that the period from B.C. 250 to A.D. 750 was characterized by the coexistence of lithic and shell tempers in ceramics. Even more specifically, consistent overlap occurs between the two tempers from A.D. 150 to A.D. 450, a span which encompasses almost half of the Middle Woodland II period (Blanton 2004:75).

Blanton's report of the ceramics excavated at Chisel Run mirrors the situation for the ceramics at Powhatan Creek. Lithic-tempered sherds and shell-tempered sherds occurred within the same levels within these stratified sites. While the presence of shell temper increases gradually from lower levels to levels closer to the surface, no explicit pattern exists, and shell tempered-ceramics are often found at the lowest levels along with the lithic-tempered sherds (Blanton 2004). Blanton's data for the Powhatan Creek Drainage indicate that ceramics were recovered from similar feature types as along the Chickahominy River, the thin deposits with artifact clusters rather than deep, radiocarbon-dated pit features. Blanton's shallow features almost always contained both Mockley and Varina sherds, as do the majority of the feature contexts included in this study. The assumption, then, is that these features do not appear in the record until after 200 A.D. and the appearance of shell tempers. If this is true, these small interior sites which contain both shell and lithic-tempered sherds probably represent co-existing groups (Blanton 2004). Another hypothesis about local ceramic diversity, where multiple tempers occur at one site, is that this phenomenon may indicate simultaneous development of local styles (McLearan and Mouer 1989). Hodges (1998) suggests that rather than the localization that McLearan and Mouer posit, a more likely explanation is that two different populations were moving within overlapping territories and occasionally occupied the same sites and exchanged vessels. This would make sense since these interior sites were closer to separate cultural groups that inhabited regions farther to the west, and thus could indeed occupy some overlapping territories.

Blanton's report (2004) also includes a description of how the proportions of shell-tempered ceramics decline from east to west, both across the Tidewater and at the transition zone between the Tidewater and the Piedmont. This finding mirrors the data in this study, where one of the highest frequencies of shell-tempered ceramics occurred at the Powhatan Creek site (JC26), which is the most eastern and coastal site in the study (68%). New Kent County sites contained fewer Mockley sherds than JC26, but these sherds were still present in relatively large numbers. The western-most site in the study, and coincidentally the most interior of the sites, NK29, was remarkable in its complete absence of shell-tempered sherds; instead the feature at the site contained predominantly Varina sherds (67%).

As mentioned earlier, Blanton (2004) presents data and radio-carbon dates which suggest the coexistence of shell-tempered sherds with lithic-, grit-, and sand-tempered sherds, specifically between A.D. 150 and A.D. 450. The evidence supports an emergent population of Mockley-producers which did not immediately replace previous populations of Varina, Prince George, and Pope's Creek communities, but instead coexisted with them for a significant span of time. The indigenous communities were likely replaced slowly over time, as the dominant Mockley culture took over the region. However, the data in this study as well as others suggest that this replacement was gradual and may never have been complete, since pockets of these indigenous communities remained in the most interior reaches of the region. Since the Mockley culture predominantly focused on large coastal and riverine sites with abundant shellfish, interior Varina, Prince George, and Pope's creek populations on smaller river drainages were not immediately impacted by the Algonquian migration which heralded the Mockley tradition. Eventually these Algonquian people expanded west as their population continued to grow and the demand for resources grew quickly. According to Binford's population studies (2001), statistics show that larger populations could not rely on hunting and thus focused on more direct estuarine sites to supplement their food supply. Additionally, Binford (2001) suggests that for dietary balance, these coastal dwellers likely engaged in *mutualism* with inland groups, arranging exchanges which benefitted both groups. Binford also suggests that interior Mockley ceramics may be the result of either resource exchange or mate exchange (Binford 2001). Both the occurrence of interior Mockley ceramics and the presence of deer bones in coastal shell middens suggest that resource exchange was indeed occurring between inland and coastal groups (Blanton 2004). This type of interaction could explain the presence of Mockley ceramics at interior sites which generally display preferences for lithic-, sand-, and grit-tempered ceramics, but in many cases are found to contain shell-tempered ceramics as well.

Intensive examination of final cordage twist direction may seem too narrow a topic to provide any information about more general community traditions. Some may even attempt to refute the validity of cordage twist analysis as an informative ceramic attribute, based on the producer's general lack of awareness about its significance. However, it is this very lack of awareness in the process which renders it an even more useful attribute to study for certain questions, since it represents a consistent and unbiased marker of communities of practice. For this reason Wobst and Hegmon clarify distinctions between different types of style, so that all decorative ceramic attributes are not simply written off as "stylistic" and therefore unreliable. *Information-exchange* aspects of style can be meaningful for the study of group relations at some specific point in time, while *learning-interaction* aspects of style provide more insight into trends of cultural continuity and/or change over time. Since cordage twist direction represents a learned skill which does not convey social meaning, it is a more constant decorative attribute, much less susceptible to change across temporal spans. This learned motor skill is also much more likely to remain constant throughout a community while differing across cultural boundaries, thus its analysis helps delineate communities of similar practices.

With this analysis of ceramics from the Chickahominy and James River drainages, I have suggested that communities of practice can be traced through final cordage twist direction. The results support the claim that a shift occurred circa A.D. 200 in terms of ceramic production in the Tidewater, brought about by the arrival of shell-tempering community of practice. I suggest that indigenous communities with more heterogeneous tempering methods simultaneously exhibited more heterogeneous cordage twist direction, indicating localized interactions and patterns of ceramic production. When shell-tempering practices began to sweep the region, beginning on the Outer Coastal Plain, the homogenization in ceramic temper resulted in the homogenization of twist direction, both explained by increasingly fluid spheres of interaction. Despite this new dominant tradition, isolated communities maintained their traditional practices with bother temper and twist direction. This phenomenon can be seen both in the continued heterogeneity of ceramic production on more interior, upland sites and in the continuation of heterogeneous final cordage twist direction on pre-Mockley ceramics found at Mockley sites.

Future studies with increased samples sizes and indisputable temporal control would do much to further the ideas presented here. Ample material culture exists for further analyses to add important information to the discussion about communities of practice and the preservation of identity. Additionally, expanded cordage twist research could shed increasingly more light on the dynamic and complex nature of the movement of prehistoric peoples in the Chesapeake.

XI. Works Cited

Adovasio, James M.
1986 Artifacts and Ethnicity: Basketry as an Indicator of Territoriality and Prehistoric Population Movements in the Prehistoric Great Basin. In Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings. Ed by Carol J. Condie and Don D. Fowler. University of Utah Press, Salt Lake City. pp. 43-88.

Anthony, David W.
1990 Migration in Archaeology: The Baby and the Bathwater. American Anthropologist. 92: 895-914.

Bernardini, Wesley.
2005 Hopi Oral Tradition and the Archaeology of Identity. Tuscon, Arizona: University of Arizona Press.

Binford, Lewis R.
2001 Constructing Frames of Reference: An Analytical Method for Archaeological Theory Building Using Ethnographic and Environmental Data Sets. Berkeley: University of California Press.

Blanton, Dennis B.
1992 Middle Woodland Settlement Systems in Virginia. In Middle and Late Woodland Research in Virginia: A Synthesis. Ed by Theodore R. Reinhart and Mary Ellen Hodges. Special Publication No. 29 of the Archaeological Society of Virginia. pp 65-96.

Blanton, Dennis B. and S.C. Pullins.
2004 Middle Woodland Settlement and Environment in the Chisel Run/Powhatan Creek Drainage: Archaeological Data Recovery at Sites 44JC127 and 44JC850 Associated with the Route 199 Project, James City County, Virginia. WMCAR Technical Report.

Bourdieu, Pierre.
1977 Outline of a Theory of Practice. Cambridge: Cambridge University Press.

1990 The Logic of Practice. Cambridge: Polity Press.

Burmeister, Stefan.
2000 Archaeology and Migration. Current Anthropology. 41: 539-567.

Carr, Christopher and Robert F. Maslowski.
1995 Cordage and Fabrics: Relating Form, Technology, and Social Processes. In Style, Society, and Person: Archaeological and Ethnological Perspectives. Ed by Christopher Carr and Jill Neitzel. Plenum Press, New York. pp. 297-344.

Custer, Jay F.
2004 Cultural Context and Cordage Twist Direction. North American Archaeologist. 25: 139-152.

Custer, Jay F.
1994 Current Archaeological Research in the Middle Atlantic Region of the Eastern United States. Journal of Archaeological Research. 2: 329-360.

Denny, J. Peter.
2003 Archaeological Signs of Eastern Algonquians. In Essays in Algonquian, Catawban, and Siouan Linguistics in Memory of Frank T. Siebert, Jr. Ed by Blair Rudes and David J. Costa. Algonquian & Iroquoian Linguistics, Memoir 16. Winnipeg: Voices of Rupert's Land, University of Manitoba.

Dent, Richard J.
1995 Chesapeake Prehistory: Old Traditions, New Directions. New York: Plenum Press.

Dietler, M. and I. Herbich.
1989. Tich Matek: the technology of Luo Pottery Production and the Definition of Ceramic Style. World Archaeology. 21: 148-164.

Egloff, Keith T.
1989 *Native American Sites in a Fall Line Transition Study Area*. Research Reports Series No. 5. Richmond: Virginia Department of Historic Resources.

Egloff, Keith T. and Stephen R. Potter.
1982 Indian Ceramics from Coastal Plain Virginia. Archaeology of Eastern North America. 10: 95-117.

Fiedel, Stuart J.
1987 Algonquian Origins: A Problem in Archeological-Linguistic Correlation. Archaeology of Eastern North America. 15: 1-11.

Gallivan, Martin D.
2006 The Archaeology of History and Meaning: Algonquian Communities of the Tidewater Virginia. Paper delivered at the American Society for Ethnohistory Conference.

Gallivan, Martin D.
2009 (in press)The Archaeology of Native Societies in the Chesapeake: New Investigations and Interpretations. Journal of Archaeological Research.

Hantman, Jeffrey and D. Gold.

2002 The Woodland in the Middle Atlantic: Ranking and Dynamic Political Stability in The Woodland Southeast, Ed. by D. Anderson and R. Mainfort, University of Alabama Press, pp. 270-291.

Hegmon, Michelle.
1992 Archaeological Research on Style. Annual Review of Anthropology. 21:517-536.

Hodges, Mary Ellen Norrisey.
1998 Native American Settlement at Great Neck: Report on VDHR Archaeological Investigations of Woodland Components at Site 44VB7, Virginia Beach, Virginia,1981-1987. Research Report Series No. 9. Richmond: Virginia Department of Historic Resources.

Johnson, William C.
1996 A New Twist to an Old Tale: Analysis of Cordage Impressions on Late Woodland Ceramics from the Potomac River Valley. In A Most Indispensable Art: Native Fiber Industries from Eastern North America. Ed by James B. Petersen. Knoxville: University of Tennessee Press. pp. 144-159.

2007 Cordage Twist and Ethnicity during the Woodland Period in the Potomac River Basin Revisited. Paper presented at the 74th Annual Meeting of the Eastern States Archaeological Federation. Burlington, Vermont.

Johnson, William C. and Andrew J. Myers.
2004 Population Continuity and Dispersal: Cordage Twist Analysis and the Late Woodland in the Glaciated Allegheny Plateau of Northwestern Pennsylvania. In Perishable Material Culture in the Northeast. Ed by P.B. Drooker. New York State Museum Bulletin Number 500. pp. 87-128.

Johnson, William C. and D. Scott Speedy.
1992 Cultural Continuity and Change in the Middle and Late Woodland Periods in the Upper James Estuary, Prince George County, Virginia. Journal of Middle Atlantic Archaeology. 8: 91-106.

Klein, Michael J.
2003 Ceramics, Style, and Society in the Potomac Valley of Virginia. Journal of Middle Atlantic Archaeology. 19: 25-35.

Lave, J. and E. Wenger.
1991 Situated Learning. New York: Cambridge University Press.

Maslowski, Robert F.

1996 Cordage Twist and Ethnicity. In A Most Indispensable Art: Native Fiber Industries from Eastern North America. Ed by James B. Petersen. University of Tennessee Press, Knoxville. pp. 88-99.

McLearen, Douglas C., and L. Daniel Mouer.
1989 Middle Woodland Typology and Chronology in the Lower James River Valley, Virginia. Paper presented at the Middle Atlantic Archaeological Conference, Rehobeth Beach, Delaware.

Minar, Cynthia Jill.
2001 Motor Skills and the Learning Process: The Conservation of Cordage Final Twist Direction in Communities of Practice. Journal of Anthropological Research. 57: 381-405.

Nassaney, Michael S.
2001 The Historical-Processual Development of Late Woodland Societies. In The Archaeology of Traditions: Agency and History Before and After Columbus. Ed by Timothy Pauketat. Gainsville: University Press of Florida. pp. 157-173.

Neuzil, Anna A.
2008 In the Aftermath of Migration: Renegotiating Ancient Identity in Southeastern Arizona. Tucson, University of Arizona Press.

Pauketat, Timothy.
2001 Practice and History in Archaeology: An Emerging Paradigm. Anthropological Theory. 1: 73-98.

Plog, Stephen.
1980 Stylistic Variation in Prehistoric Ceramics. Cambridge: Cambridge University Press.

Potter, Stephen R.
1982 An Analysis of Chicacoan Settlement Patterns. Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

1993 Commoners, Tribute, and Chiefs: The Development of Algonquian Culture in the Potomac Valley. Charlottesville: University Press of Virginia.

Reinhart, Theodore R.
1973-74 Powhatan Creek (44JC26) Field Notes. Personal Unpublished Notes.

Sackett, James R.
1982 Approaches to Style in Lithic Archaeology. Journal of Anthropological Archaeology. 1: 59-112.

Sassaman, Kenneth and Wictoria Rudolphi.

2001 Communities of Practice in the Early Pottery Traditions of the American Southeast. Journal of Anthropological Research. 57: 407-425.

Sassaman, Kenneth.
2005 Structure and Practice in the Archaic Southeast. In North American Archaeology. Ed. By Timothy Pauketat and Diana DiPaolo Loren. Malden, MA: Blackwell Publishing. pp 79-107.

Stewart, R. Michael.
1989 Trade and Exchange in Middle Atlantic Region Prehistory. Archaeology of Eastern North America. 17: 47-78.

1992 Observations on the Middle Woodland Period of Virginia: A Middle Atlantic Regional Perspective. In Middle and Late Woodland Research in Virginia: A Synthesis. Ed by Theodore R. Reinhart and Mary Ellen Hodges. Special Publication No. 29 of the Archaeological Society of Virginia. pp 1-38.

Wobst, H. M.
1977 Stylistic Behavior and Information Exchange. In For the Director: Research Essays in Honor of James B. Griffin. Ed by C. E. Cleland. Ann Arbor Museum of Anthropology. Anthropology Paper 61, Museum of Michigan. pp. 317-42.

XII. Appendix A. Ceramic Analysis Data.

Site	Context	Sherd Number	Temper	Surface Treatment	Twist Direction
NK29	Feature 3L2	1	Crushed-Lithic	Cord-marked	Z
NK29	Feature 3L2	2	Crushed-Lithic	Net-impressed	Z
NK29	Feature 3L2	3	Rounded-Lithic	Net-impressed	U
NK29	Feature 3L2	4	Fine Sand	Net-impressed	Z
NK29	Feature 3L2	5	Crushed-Lithic	Cord-marked	U
NK29	Feature 3L2	6	Crushed-Lithic	Fabric-impressed	Z
NK29A	9X2	1	Crushed-Lithic	Cord-marked	S
NK29A	9X2	2	Fine Sand	Net-impressed	Z
NK29A	9X2	3	Crushed-Lithic	Cord-marked	U
NK29A	9X2	4	Shell	Cord-marked	S
NK29A	9X2	5	Crushed-Lithic	Cord-marked	U
NK29A	9X2	6	Crushed-Lithic	Cord-marked	S
NK29A	9X2	7	Crushed-Lithic	Cord-marked	S
NK29A	9X2	8	Crushed-Lithic	Cord-marked	S
NK29A	9X2	9	Crushed-Lithic	Cord-marked	S
NK29A	9X2	10	Crushed-Lithic	Net-impressed	Z
NK29A	9X2	11	Crushed-Lithic	Cord-marked	U
NK29A	9X2	12	Crushed-Lithic	Cord-marked	S
NK29A	9X2	13	Crushed-Lithic	Net-impressed	Z
NK29A	9X2	14	Crushed-Lithic	Cord-marked	S
NK29A	9X2	15	Rounded-Lithic	Cord-marked	S
NK29A	9X2	16	Crushed-Lithic	Cord-marked	S
NK29A	9X2	17	Crushed-Lithic	Cord-marked	S
NK29A	9X2	18	Fine Sand	Cord-marked	U

NK29A	9X2	19	Fine Sand	Cord-marked	Z
NK29A	9X2	20	Fine Sand	Net-impressed	Z
NK29A	9X2	21	Fine Sand	Cord-marked	Z
NK29A	9X2	22	Crushed-Lithic	Cord-marked	S
NK29A	9X2	23	Crushed-Lithic	Net-impressed	Z
NK29A	9X2	24	Rounded-Lithic	Net-impressed	S
NK29A	9X2	25	Clay	Cord-marked	U
NK29A	9X2	26	Fine Sand	Cord-marked	Z
NK29A	9X2	27	Fine Sand	Cord-marked	Z
NK33	Trench 106 F	1	Grog	Cord-marked	U
NK33	Trench 106 F	2	Crushed-Lithic	Cord-marked	S
NK33	Trench 106 F	3	Crushed-Lithic	Cord-marked	U
NK33	Trench 106 F	4	Crushed-Lithic	Cord-marked	U
NK33	Trench 106 F	5	Crushed-Lithic	Cord-marked	U
NK34	50L110 Feature 2	1	Crushed-Lithic	Cord-marked	S
NK34	50L110 Feature 2	2	Crushed-Lithic	Cord-marked	S
NK34	50L110 Feature 2	3	Crushed-Lithic	Cord-marked	Z
NK34	50L110 Feature 2	4	Shell	Cord-marked	U
NK34	50L110 Feature 2	5	Crushed-Lithic	Cord-marked	U
NK34	70L90 Feature 5	1	Shell	Cord-marked	S
NK34	70L90 Feature 5	2	Shell	Cord-marked	S
NK34	70L90 Feature 5	3	Shell	Cord-marked	S
NK34	70L90 Feature 5	4	Shell	Cord-marked	S
NK34	70L90 Feature 5	5	Shell	Cord-marked	S
NK34	70L90 Feature 5	6	Shell	Cord-marked	S
NK34	70L90 Feature 5	7	Shell	Cord-marked	S
NK34	70L90 Feature 5	8	Shell	Cord-marked	S
NK34	70L90 Feature 5	9	Shell	Cord-marked	S

NK34	70L90 Feature 5	10	Shell	Cord-marked	S
NK34	70L90 Feature 5	11	Shell	Cord-marked	S
NK34	70L90 Feature 5	12	Shell	Cord-marked	S
NK34	70L90 Feature 5	13	Shell	Cord-marked	S
NK34	70L90 Feature 5	14	Shell	Cord-marked	U
NK34	70L90 Feature 5	15	Rounded-Lithic	Cord-marked	S
NK34	70L90 Feature 5	16	Shell	Cord-marked	S
NK34	70L90 Feature 5	17	Rounded-Lithic	Cord-marked	S
NK34	70L90 Feature 5	18	Crushed-Lithic	Cord-marked	S
NK34	70L90 Feature 5	19	Shell	Fabric-impressed	U
NK34	70L90 Feature 5	20	Shell	Cord-marked	S
NK34	70L90 Feature 5	21	Shell	Cord-marked	S
NK34	70L90 Feature 5	22	Shell	Cord-marked	S
NK34	70L90 Feature 5	23	Shell	Cord-marked	S
NK34	70L90 Feature 5	24	Shell	Cord-marked	S
NK34	70L90 Feature 5	25	Shell	Cord-marked	S
CC35	23W3	1	Shell	Cord-marked	S
CC35	23W3	2	Shell	Cord-marked	S
CC35	23W3	3	Shell	Cord-marked	S
CC35	23W3	4	Fine Sand	Cord-marked	S
CC35	23W3	5	Shell	Cord-marked	S
CC35	23W3	6	Shell	Cord-marked	S
CC35	23W3	7	Shell	Cord-marked	S
CC35	23W3	8	Shell	Cord-marked	U
CC35	23W3	9	Shell	Cord-marked	U
CC35	23W3	10	Shell	Cord-marked	S
CC35	23W3	11	Shell	Cord-marked	S
CC35	23W3	12	Shell	Cord-marked	S

CC35	23W3	13	Shell	Cord-marked	S
CC35	23W3	14	Fine Sand	Cord-marked	U
CC35	23W3	15	Crushed-Lithic	Cord-marked	U
CC35	23W3	16	Shell	Cord-marked	U
CC35	23W3	17	Shell	Cord-marked	S
CC35	23W3	18	Shell	Cord-marked	S
CC35	34F3	1	Shell	Cord-marked	S
CC35	34F3	2	Shell	Cord-marked	S
CC35	34F3	3	Shell	Cord-marked	S
CC35	34F3	4	Shell	Cord-marked	S
CC35	34F3	5	Shell	Cord-marked	S
CC35	34F3	6	Shell	Cord-marked	S
CC35	34F3	7	Fine Sand	Cord-marked	U
CC35	34F3	8	Fine Sand	Cord-marked	Z
CC35	34F3	9	Shell	Cord-marked	S
CC35	34F3	10	Shell	Cord-marked	S
CC35	34F3	11	Crushed-Lithic	Cord-marked	S
CC35	34F3B	12	Shell	Cord-marked	U
CC35	34F3B	13	Shell	Cord-marked	S
CC35	34F3B	14	Shell	Cord-marked	S
CC35	34F3B	15	Fine Sand	Cord-marked	S
JC26	9/2	1	Crushed-Lithic	Cord-marked	S
JC26	9/2	2	Crushed-Lithic	Cord-marked	S
JC26	9/2	3	Shell	Cord-marked	S
JC26	9/2	4	Shell	Cord-marked	S
JC26	9/2	5	Shell	Cord-marked	S
JC26	9/2	6	Shell	Cord-marked	S
JC26	9/2	7	Shell	Cord-marked	S

JC26	9/2	8	Shell	Cord-marked	S
JC26	10/2	1	Crushed-Lithic	Net-impressed	S
JC26	10/2	2	Crushed-Lithic	Cord-marked	Z
JC26	10/2	3	Shell	Cord-marked	S
JC26	10/3	4	Crushed-Lithic	Cord-marked	Z
JC26	10/3	5	Crushed-Lithic	Cord-marked	U
JC26	10/3	6	Shell	Cord-marked	U
JC26	10/3	7	Shell	Cord-marked	S
JC26	10/3	8	Shell	Cord-marked	S
JC26	10/4	9	Shell	Cord-marked	S
JC26	10/4	10	Shell	Cord-marked	S
JC26	10/4	11	Shell	Cord-marked	S
JC26	12/2	1	Fine Sand	Cord-marked	S
JC26	12/2	2	Crushed-Lithic	Cord-marked	U
JC26	12/3	3	Fine Sand	Cord-marked	U
JC26	12/3	4	Shell	Cord-marked	S
JC26	12/3	5	Crushed-Lithic	Cord-marked	U
JC26	12/3	6	Fine Sand	Cord-marked	S
JC26	12/3	7	Shell	Cord-marked	S
JC26	12/3	8	Shell	Cord-marked	S
JC26	12/4	9	Shell	Cord-marked	S
JC26	12/4	10	Shell	Cord-marked	S
JC26	12/4	11	Shell	Cord-marked	S
JC26	12/4	12	Crushed-Lithic	Cord-marked	Z
JC26	12/4	13	Shell	Cord-marked	U
JC26	12/4	14	Rounded-Lithic	Cord-marked	Z
JC26	12/4	15	Crushed-Lithic	Cord-marked	Z
JC26	12/4	16	Crushed-Lithic	Cord-marked	Z

JC26	12/5	17	Crushed-Lithic	Cord-marked	Z
JC26	12/5	18	Rounded-Lithic	Net-impressed	U
JC26	12/5	19	Crushed-Lithic	Cord-marked	Z
JC26	13/2	1	Fine Sand	Cord-marked	S
JC26	13/2	2	Shell	Cord-marked	U
JC26	13/2	3	Shell	Cord-marked	S
JC26	13/2	4	Crushed-Lithic	Cord-marked	U
JC26	13/2	5	Crushed-Lithic	Cord-marked	U
JC26	13/2	6	Crushed-Lithic	Cord-marked	Z
JC26	13/2	7	Crushed-Lithic	Cord-marked	U
JC26	13/3	8	Crushed-Lithic	Cord-marked	U
JC26	13/3	9	Shell	Cord-marked	U
JC26	13/3	10	Crushed-Lithic	Cord-marked	U
JC26	13/3	11	Shell	Cord-marked	S
JC26	13/3	12	Shell	Cord-marked	U
JC26	13/3	13	Shell	Cord-marked	S
JC26	13/3	14	Shell	Cord-marked	U
JC26	13/3	15	Shell	Cord-marked	Z
JC26	13/3	16	Crushed-Lithic	Cord-marked	Z
JC26	14/2	1	Crushed-Lithic	Cord-marked	S
JC26	14/2	2	Shell	Cord-marked	S
JC26	14/2	3	Crushed-Lithic	Cord-marked	S
JC26	14/2	4	Shell	Cord-marked	S
JC26	14/2	5	Crushed-Lithic	Cord-marked	S
JC26	14/2	6	Shell	Cord-marked	U
JC26	14/2	7	Shell	Cord-marked	S
JC26	14/3	8	Fine Sand	Cord-marked	S
JC26	14/3	9	Shell	Cord-marked	S

JC26	14/3	10	Shell	Cord-marked	S
JC26	14/3	11	Shell	Cord-marked	S
JC26	14/3	12	Shell	Cord-marked	S
JC26	14/3	13	Shell	Cord-marked	S
JC26	14/3	14	Shell	Cord-marked	U
JC26	14/3	15	Shell	Cord-marked	Z
JC26	14/3	16	Shell	Cord-marked	S
JC26	14/3	17	Shell	Cord-marked	S
JC26	14/3	18	Crushed-Lithic	Cord-marked	Z
JC26	14/3	19	Crushed-Lithic	Cord-marked	Z
JC26	14/3	20	Shell	Cord-marked	S
JC26	14/3	21	Shell	Cord-marked	S
JC26	14/3	22	Crushed-Lithic	Cord-marked	Z
JC26	14/3	23	Shell	Cord-marked	S
JC26	14/4	24	Crushed-Lithic	Cord-marked	U
JC26	14/4	25	Crushed-Lithic	Cord-marked	U
JC26	14/4	26	Crushed-Lithic	Cord-marked	Z
JC26	15/2	1	Shell	Cord-marked	S
JC26	15/2	2	Shell	Cord-marked	S
JC26	15/2	3	Shell	Cord-marked	S
JC26	15/2	4	Shell	Cord-marked	S
JC26	15/2	5	Shell	Cord-marked	S
JC26	15/2	6	Shell	Cord-marked	S
JC26	15/2	7	Shell	Cord-marked	Z
JC26	15/2	8	Shell	Cord-marked	S
JC26	15/2	9	Shell	Cord-marked	S
JC26	15/2	10	Crushed-Lithic	Net-impressed	Z
JC26	15/2	11	Shell	Cord-marked	S

JC26	15/2	12	Shell	Cord-marked	S
JC26	15/2	13	Fine Sand	Cord-marked	S
JC26	15/2	14	Shell	Cord-marked	S
JC26	15/2	15	Shell	Cord-marked	S
JC26	15/3	16	Crushed-Lithic	Cord-marked	S
JC26	15/3	17	Crushed-Lithic	Net-impressed	Z
JC26	15/3	18	Shell	Cord-marked	U
JC26	15/3	19	Shell	Cord-marked	U
JC26	15/3	20	Shell	Cord-marked	U
JC26	15/3	21	Crushed-Lithic	Net-impressed	Z
JC26	15/3	22	Shell	Cord-marked	S
JC26	15/3	23	Shell	Cord-marked	S
JC26	15/3	24	Shell	Cord-marked	S
JC26	15/3	25	Crushed-Lithic	Cord-marked	Z
JC26	15/3	26	Shell	Cord-marked	S
JC26	15/3	27	Shell	Cord-marked	U
JC26	15/3	28	Shell	Cord-marked	S
JC26	15/3	29	Shell	Cord-marked	S
JC26	15/3	30	Shell	Cord-marked	S
JC26	15/3	31	Shell	Cord-marked	S
JC26	15/3	32	Shell	Cord-marked	S
JC26	15/3	33	Shell	Cord-marked	S
JC26	15/3	34	Shell	Cord-marked	S
JC26	15/3	35	Shell	Cord-marked	S
JC26	15/3	36	Shell	Cord-marked	S
JC26	15/4	37	Shell	Cord-marked	S
JC26	15/4	38	Shell	Cord-marked	S
JC26	15/4	39	Shell	Cord-marked	S

JC26	15/4	40	Shell	Cord-marked	S
JC26	16/2	1	Shell	Cord-marked	S
JC26	16/2	2	Shell	Fabric-impressed	U
JC26	16/2	3	Shell	Cord-marked	S
JC26	16/2	4	Shell	Fabric-impressed	U
JC26	16/3	5	Shell	Cord-marked	S
JC26	16/3	6	Shell	Cord-marked	S
JC26	16/3	7	Shell	Cord-marked	S
JC26	16/3	8	Crushed-Lithic	Cord-marked	Z
JC26	16/3	9	Shell	Cord-marked	S

Appendix B. Example Form for Ceramic Analysis.

Chickahominy Ceramic Study   Analyst's initials: ________________   Page: ____   Date: ________   Data entered? (circle when complete): Yes

Version: 5.28.08

	Site	Op. #	Unit Letter	Cont #	< 3.0 cm? (i.e. small sherd)	Temper type None Fine sand Crshd lthc Rnded lthc Shell Grog Undet.	Surface Treatment Plain Cord-mrked Fabric-imprsd Net-imprsd SSimpl stmpd SCraped Undet.	Portion Wall Rim Base Undet.	Axial L (around the pot) mm	Axial M. mm	Profile L. (from top to bottom) mm	Profile M. mm	Thicknes (mm) (At sherd center)	Interior Smoothed Scraped	Dec?	Rim form Straight Everted Inverted Folded Undet.	Comments (include description of decoration if present)
1					■										■		
2					■										■		
3					■										■		
4					■										■		
5					■										■		
6					■										■		
7					■										■		
8					■										■		
9					■										■		
10					■										■		
11					■										■		
12					■										■		
13					■										■		
14					■										■		
15					■										■		
16					■										■		
17					■										■		
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22					■										■		
23					■										■		
24					■										■		
25					■										■		

Appendix C. Example Form for Cordage Twist Analysis

CORDAGE TWIST DIRECTION SHORT FORM

SITE NO: ______________________ PAGE _____ of _____

SITE NAME: ______________________ COMPONENT: ____________

POTTERY TYPE: ______________________

TEMPER TYPE: ______________________ DECORATION/ ____________

SURFACE FINISH: ______________________ DECORATIVE ____________

TECHNIQUE : ____________

Surface Cast No.	FS/FC. Number	Provenience	Twist Direction			COMMENTS
			Z	S	Unk	