COSTLY SIGNALING AND GENDERED SOCIAL STRATEGIES AMONG SLAVES IN THE EIGHTEENTH-CENTURY CHESAPEAKE: AN ARCHAEOLOGICAL PERSPECTIVE

Jillian E. Galle

Evolutionary approaches to agency offer some of the most promising frameworks for identifying individual agents and their archaeological correlates. Agency theory calls attention to the individual as the fundamental feature of human relations, and evolutionary theory provides historically situated models that allow archaeologists to precisely investigate the complex behavioral strategies that underlie artifact patterns. The following paper offers one such model. Using data from 41 slave-site occupations from eighteenth-century Virginia, I explore how and why enslaved African Americans actively participated in the burgeoning "consumer revolution" that swept across the early modern Atlantic World. Artifact patterning suggests that the acquisition and display of costly imported goods functioned as a form of communication for slaves in both public and private venues. The data show that enslaved women and men used several different consumption strategies to solidify social and economic relationships within precarious and rapidly changing environments. Signaling theory, derived from evolutionary theory, illuminates the contextual factors that structured slaves' consumer choices and provides a model for understanding their choices as the result of dynamic and mutually beneficial behaviors.

Los enfoques evolutivos a la agencia ofrecen algunos de los esquemas más prometedores para identificar las estrategias y las respuestas de los agentes individuales a otros actores. Mientras que la teoría de la agencia llama la atención al individuo como la característica fundamental de las relaciones humanas, la teoría evolutiva proporciona modelos históricamente situados que permiten que los arqueólogos investiguen con precisión las estrategias complejas del comportamiento que subyacen los patrones de nuestros artefactos. Este ensayo ofrece un tal modelo. Usando datos de 41 yacimientos de esclavos, ocupados durante el siglo XVIII en Virginia, exploro cómo y por qué los afroamericanos esclavizados participaron activamente en la floreciente "revolución del consumidor" que se extendió a través del mundo atlántico a principios de la Edad Moderna. El patrón en los artefactos sugiere que la adquisición y la exhibición de artículos costosos importados funcionaron como una forma de comunicación para los esclavos en locales públicos y privados. Los datos demuestran que las mujeres y los hombres esclavizados utilizaron diversas estrategias de consumo para solidificar las relaciones sociales y económicas dentro de ambientes precarios y rápidamente cambiantes. La teoría de señalización, derivada de la teoría evolutiva, aclara los factores contextuales que estructuraron las opciones de consumo de los esclavos y proporciona un modelo para entender sus opciones como resultado de comportamientos dinámicos y mutuamente beneficiosos.

Perhaps the most surprising indication that Darwin is alive and well today is the recent declaration by David Brooks, a neo-conservative columnist for *The New York Times*, that postmodernity has been replaced by evolution as the "grand narrative that explains behavior and gives shape to history" (2007). Although the death of postmodernity is debatable, Brooks is right. Darwin is everywhere these days. From the origins of religion and morality to the ethical use of human DNA, the public is preoccupied with how evolution intersects with our daily lives (Dawkins 2006; Gottschall 2005; Haidt 2007; Reed et al. 2007; Sober 1998; Wilson 2002, 2007). Articles demonstrating the link between the genetic signatures of human body lice and the introduction of tailored clothing make *The New York Times*' top-ten emailed list (Wade 2007). Even stranger, we bake cakes to celebrate Darwin's birthday. We give Darwin awards. And Darwin bobble heads are available for those searching for that perfect gift for their thesis advisor.

Jillian E. Galle ■ The Digital Archaeological Archive of Comparative Slavery, Monticello Department of Archaeology, P.O. Box 316, Charlottesville, Virginia 22902 (jgalle@monticello.org)

American Antiquity 75(1), 2010, pp. 19–43

Despite this interest, and despite its uncontested centrality in the biological and environmental sciences, research guided by Darwinian evolutionary theory remains ghettoized within the larger anthropological community. Evolutionary approaches are often characterized as deterministic paradigms that reduce people to the pawns of unstoppable biological processes while denying them agency in the production of culture. As a result, evolutionists are hired primarily in anthropology departments committed to evolutionary agendas and dismissed by others as determinists unable to acknowledge contexts beyond the activities of their own genes.

Within archaeological circles, this practice has led to a particularly rarefied version of David Sloan Wilson's "Ivory Archipelago," a phenomenon in which tribes of scholars form defensive groups bound by the dogmatic use of theory and a focus on related topics (2007). Archaeology's Ivory Archipelago solidified in the era of post-processualism when a reevaluation of processual approaches resulted in an increasing tendency among archaeologists to ignore the contributions of research guided by scientific methods. Described as "redlining" by Michael Schiffer (2000) and expanded on by Kristian Kristiansen (2004), the principal redliners of evolutionary theory embrace what David Harvey (1990) has called the postmodern condition: the search for individual and collective identity in the past and present.

Among archaeologists, this search is exemplified by practitioners of agency theory. Agency theorists have brought much needed attention to the iconic post-processual concerns: gender, race, and class as well as other facets of human identity. However, the relativistic nature of their postmodern position effectively discourages them from making concrete arguments about human actions and ideas (Harvey 1990). A common result is that among agency theorists, material culture is seen as a "site of ambiguity" in which artifacts, architecture and landscapes, as well as the agents who interacted with these objects and spaces, assume multiple meanings depending on their context (Dobres and Robb 2000; Dobres and Robb, eds. 2000; Hall 2000:27; Hodder 1982, 1986, 2001; Shackel 2000). In addition, the desire to create subjective conclusions in opposition to hegemonic scientific approaches has led many archaeologists to shy away from data-driven archaeological analyses (cf. D'Andrade 1995). As a result, many agency-based archaeological analyses are distanced from archaeological data and they often offer one lackluster conclusion: that context mattered (see Brumfiel [2000] and Kristiansen [2004] for concerns regarding the lack of data in agency-based analyses).

It is understandable that predictive evolutionary models that search for causal mechanisms have no place within this postmodern archaeological community. Evolutionary theorists, however, must take some responsibility for their redlined status. Many evolutionary archaeologists are expert redliners themselves, guilty of what Kristiansen (2004) calls the "salvation syndrome," the insistence that a Darwinian paradigm is the only framework for understanding human behavior (2004:79). The dogmatism of many evolutionary approaches is often exacerbated by some who use one small part of evolutionary theory as the explanatory model for *all* behavior (Lyman and O'Brien 1998; O'Brien et al. 1998; O'Brien and Holland 1995; for exceptions see McClure 2007; Shennan 2002, 2004). Those endeavoring to use evolutionary theory cannot ignore agency theory. After all, Darwin showed us that natural selection is all about context. If Darwinist archaeologists continue to avoid engaging with the issues raised by agency theory, namely how to understand the complexities of identity, gender, ethnicity, and other subtle social divisions through the archaeological record, they will remain irrelevant to current archaeological conversations about human behavior and culture.

In 2004 Kristiansen argued that both Darwinian and agency-based approaches to the archaeological record miss the real strength of archaeology, which is the ability to explain historical processes and human interactions through the study of material culture (2004:95). The following analysis suggests otherwise. I demonstrate that an evolutionary approach attuned to agency theory offers a promising framework for identifying the strategies and responses of individual agents to other actors, as well as to institutional structures over time. Agency theory calls attention to the individual as the fundamental feature of human relations, and evolutionary theory provides the historically situated models that allow us to precisely investigate the complex behavioral strategies that underlie our artifact patterns.

This paper offers one such model. Using data from 41 slave-site occupations in Virginia, I explore how and why enslaved African Americans actively and often illegally participated in the burgeoning "consumer revolution" that swept across the early modern Atlantic World. Signaling theory, derived from evolutionary theory, illuminates the contextual factors that structured slaves' consumer choices and provides a model for understanding artifact patterning as the result of dynamic and mutually beneficial behaviors. I offer expectations for the consumption and discard of two categories of expensive, imported artifacts that produced effective gendered signals in the rapidly changing Atlantic Word: metal buttons and refined ceramics. I then use an abundance index measure to estimate the discard rates of these artifacts found at the 41 slave quarter occupations. Generalized linear models and principal component analysis are used to test the signaling expectations. The artifact patterns reveal that enslaved men and women adopted contextually specific consumer strategies that helped to solidify social and economic relationships within precarious and rapidly changing communities throughout the early modern Atlantic World.

This study also addresses recent post-processual arguments that archaeological practice should engage with current social, political, and moral concerns (D'Andrade 1995; Franklin 2001; Meskell 2001; Mullins 1999, 2001; Orser 2001; Scheper-Hughes 1995; Shackel 2003; Wylie 2007). Signaling and other variants of evolutionary theory can help us understand the conditions under which women and men lived and can help predict responses to the constraints and opportunities presented by such conditions. As the evolutionary biologist Sarah Hrdy's groundbreaking work on motherhood suggests (1999), precisely understanding reactions to situations in the past allows us to understand, and change, how similar conditions impact people today. Identifying patterns in the archaeological signatures of costly displays can provide a number of key insights into the factors that give rise to different gendered consumption strategies, such as household composition and resource competition. By identifying the past contextual triggers for specific conditions, we can help offer predictions for and solutions to future social and environmental situations.

Signaling Theory

For over a decade, signaling theory (ST) has been used by anthropologists to model a range of phenomena in ethnographic and archaeological contexts, from unconditional generosity and decorative variability in craft traditions to gender relationships and wasteful behaviors such as inefficient subsistence activities and conspicuous consumption (Bird and O'Connell 2006; Bliege Bird and Smith 2005; Boone 2000; Galle 2006; Hawkes and Bliege Bird 2002; McGuire and Hildebrandt 2005; Neiman 1997, 2005, 2008; Plourde 2008; Smith and Bliege Bird 2000; Sosis 2000). Derived from behavioral ecology (Gurven et al. 2000; Johnstone 1997; Zahavi and Zahavi 1997) and influenced by Thorstein Veblen's theories on the conspicuous consumption of goods and leisure (1899, 1998), signaling theory contends that costly displays successfully transmit information that is vital to establishing and maintaining relationships, especially in large-scale, complex social environments. Costly signaling, one type of signaling, is a strategic competitive behavior that uses costly material and physical displays to communicate information about an individual that is generally difficult to assess during initial interactions. This information can range from a person's economic and social standing to more intangible qualities such as psychological character, physical skills and stamina, and possession of esoteric knowledge.

A signal works by conveying information that is useful to the person receiving it. A receiver decodes the information in the signal and uses it to decide what type of benefits might be gained by interacting with the signaler. A person who receives the signal may decide not to interact with the person sending the signal, or she may choose to interact in a variety of ways. The critical feedback mechanism in signaling is that both a successful signaler and a savvy receiver can benefit from the receiver's decision. Benefits, also known as payoffs, to interacting include recognition of social status, entrees into successful economic partnerships, a long-term social alliance, or the discovery of a well-matched mate. Payoffs can also be turned into tangible resources that influence a person's short- and long-term fitness (Boone and Kessler 1999:259). Signals that involve economic or physical risks most effectively advertise the benefits that a person could gain

by interacting with the person sending the signal. This is because un-fakable high-cost signals are guarantees that a person is honestly transmitting accurate information about themselves (Bliege Bird and Smith 2005; Getty 1998; Graffen 1990; Gurven et al. 2000; Hawkes and Bliege Bird 2002; Johnstone 1997; Zahavi and Zahavi 1997).

Cost is the only way to guarantee honesty in competitive contexts (Johnstone 1997:167). Known as the handicap principal, honest signals should have such high fitness costs that low-quality signalers cannot match them (Graffen 1990; Johnstone 1997:167). High-quality signalers produce honest signals that are received by individuals who gauge the intensity and cost of a signal, impacting the payoffs to the signal. High-quality signalers therefore attract high-quality receivers, resulting in a co-evolutionary dynamic that benefits both individuals in the interaction.

In addition to cost, critical variables can control the payoffs to a signal: audience size and familiarity. Signals that reach large audiences are initially more valuable than signals aimed at smaller audiences because the benefits for any given signal increase as the signal influences larger numbers of competitors (Neiman 1997:270–271). Costly signaling is also less likely to be directed at groups of familiar people. Low prior familiarity means that signals are more likely to contain novel information, thereby increasing the chances that receivers will alter their behavior in ways that benefit the signaler. The result is that the payoffs for signaling to a familiar social network are less than the payoffs received when signaling to a group of strangers (Neiman 1997:270–271).

The Signaling Agent

Although signaling is understood as a phenotypic behavior that enhances a person's long-term fitness, the form of a signal is a direct result of individual choices that are embedded in cultural and historical contexts. Successful signalers recognize these contexts and modify or change their signals as status values, signal costs, and social environments shift. They not only choose appropriate signaling media for a given situation but they are also able to predict the response of the receivers. In situations of potential competition, and when people interact with unfamiliar people, a signaling agent has specific interests that she hopes to achieve by convincing receiving agents to respond to her in certain ways. Receiving agents have conflicting interests, specifically not to be fooled by the signaling agent. It is precisely the interaction between individuals as signalers and receivers that actively shapes the form and intensity of signaling displays (Bliege Bird and Smith 2005; Boone 2000; Neiman 1997).

Signaling theory can address many of the pressing questions raised by agency theorists: how do agents act based on their gender, ethnicity, age, and status? How might we expect agents to react to changing contextual factors, such as shifting population size and the development of unyielding power structures or the more everyday life changes that accompany family development and aging? In turn, how might we see agents shaping their environment through their signaling and receiving strategies?

By providing us with the tools to explain individual and household decisions and behaviors over time and space, ST allows us to say more than "context mattered" or, in this study, "gender mattered." A number of ethnographers and archaeologists have effectively used ST and a related approach known as "show-off" theory to model gender relations (Hawkes 1991, 1993; McGuire and Hildebrant 2005; Smith et al. 2003). These studies demonstrate that male and female signaling strategies are different in large part because men and women have conflicting interests. The costs and benefits, as well as the desired outcomes of signaling, will vary for men and women in different historical contexts and at different phases in a person's life history. For example, signaling used by males and females for mate choice will likely extend for longer periods in societies that condone polygyny or serial monogamy. On the other hand, signaling between men and women in established relationships will be restricted in societies that discourage divorce or polygyny. In addition, when there are high endogamy rates within a community, information about mates should be readily available without overt signaling effort whereas signaling will be much more intense when mates come from outside the community (Bliege Bird and Smith 2005:17–18).

Signaling in the Early-Modern Atlantic World

The past two decades have witnessed a growing consensus among social and economic historians

that the "consumer revolution" was among the most important developments in the history of the early-modern Atlantic World (Breen 1986; Brewer and Porter 1993; Campbell 1987; Carson et al. 1994; Styles and Vickery 2006). The availability and importance of material culture at all scales, from houses to ceramics, accelerated throughout the seventeenth, eighteenth, and early-nineteenth centuries. During this same period, the Atlantic World was transformed by the influx of people who spoke unfamiliar languages and employed different social customs. As they came together in living and working situations, old ways of identifying status, such as bloodlines, property ownership, and religious affiliation, were no longer easily identified or universally understood (Carson 1994, 2003). It was in this new world that the acquisition and use of consumer goods played an essential role in the strategies invented by people to communicate shifting social identities and conceptions of self.

The "consumer revolution" made visible the ambitions and anxieties of those struggling for a foothold in this new world. Rapidly changing demographic and social conditions during the last half of the eighteenth century increased the payoffs to signaling for people at all levels, especially as individuals had opportunities to interact with large groups of unfamiliar people. Economic changes also made some degree of non-essential consumption viable for almost everyone in the Chesapeake region of North America. Women and men participated in the market economy depending on their ability and the payoffs to participation. Some purchased only the occasional ribbon or refined ceramic ware while others updated tea sets and clothing styles with regularity (Ashelford 1996; Carson 1990; Carson 1994; Martin 1994, 2008; Styles and Vickery 2006; Walsh 1992).

Even slaves found ways to earn money that they then used to purchase a range of non-essential consumer goods (Baumgarten 1988; Fox-Genovese 1988; Heath 2004; Martin 2008; Penningroth 2003; Schlotterbeck 1995; Walsh 1992). Despite the passage of legislation in the late-seventeenth century that made it illegal to trade with slaves (Berlin 1998:35), the economic activities of slaves grew and diversified throughout the eighteenth century. Eighteenth-century planter's journals demonstrate that slaves earned money through the production and sale of vegetables, poultry, and eggs (Berlin 1998; Heath 2004; Morgan 1998:359–360; Stanton 1996:38; Walsh 1995a:102–104, 1995b, 1997). Enslaved women and men also made and sold items such as baskets and brooms, and some slaves earned money from tips and after-hours jobs (Berlin 1998:34; Heath 2004:23; Morgan 1998:361; Nicholls 1990).

Virginia slave codes passed in the 1790s again attempted to control slaves' access to goods by prohibiting free individuals from purchasing or trading with slaves and by making it illegal for slaves to sell any "goods, wares or merchandise" (Schlotterbeck 1995:171). Neither whites nor blacks were deterred by these new laws and slaves continued to find ways to earn and spend money, with much of the activity sanctioned by their owners.

Enslaved people used their money in stores and markets and they traded and bartered with other slaves, free blacks, and their owners for items that were not part of weekly or yearly rations (Berlin 1998; Brown 1996; Genovese 1976:537; Heath 2004; Walsh 1995a, 1995b). Items that alleviated some of the harshest edges of slavery such as rum, sugar, and molasses were among the most popular items purchased by slaves. Men frequently bought tools and raw materials that may have been used to create saleable items (Heath 2004:29). Slaves also purchased fashionable buttons, buckles, ribbons, hats, textiles, thread, and ceramic tablewares (Genovese 1976:557; Heath 1999b, 2004; Martin 2008:177–178; Schlotterbeck 1995:177). Eighteenth-century account books from stores throughout Virginia indicate that textiles for clothing and household goods made up the largest percentage of slave purchases (Martin 2008:177–178). In addition to fine linens, slaves in central Virginia purchased complete garments such as shirts, vests, stockings, and hats (Heath 2004:29; Schlotterbeck 1995:177). These purchasing patterns combined with slave narratives express the importance of non-provisioned clothing and indicate that distinctive, fashionable dress was a critical tool for communication and self expression (Baumgarten 1988, 1991; Foster 1997; Fox-Genovese 1988; Perdue et al. 1976:316; Rawick 1972; Walsh 1997; White and White 1998).

Archaeological evidence from eighteenth-century slave quarter sites confirm that many slaves found ways to earn money and that they spent a portion of what they earned acquiring fashionable

consumer goods (Galle 2006; Heath 1999b, 2004). However, no historical or archaeological studies have sought to measure systematically these consumption patterns or to understand the contextual factors that influenced a slave's ability to participate in consumer activities. Why did enslaved people spend valuable energy, time, and hard-earned money pursuing fashionable imported goods? Why did they endure the physical and psychological risks associated with their acquisition?

In seeking to answer these questions, I start by building a model that is informed by signaling theory and our historical knowledge of slavery. The model is based on the contention that the sacrifices, compromises, and physical risks required for the acquisition of non-essential goods made them honest, costly signals. Through the consumption of imported goods, slaves discovered a particularly effective means of expressing personal qualities that were potentially difficult for others, especially strangers, to assess. These difficult-to-assess personal qualities might have included psychological strength in the face of slavery, social and political facility, specialized skills and artistic abilities, physical strength and prowess, a keen ability to hunt or procure subsistence resources, and esoteric knowledge.

Owning and wearing current fashions may have demonstrated an enslaved person's ability to work late into the night cultivating vegetables or making crafts that were then parlayed into money. Items purchased from far-away markets not only represented a slave's purchasing power but also symbolized mobility granted to a person by their owner. Material displays of mobility may have also been a declaration of an enslaved person's resourceful ability to travel surreptitiously (Upton 1988). The display of European goods not provided by a slave owner was also filled with potential risk, lest the items and the manner in which they were displayed be perceived as a social or economic challenge to whites (Walsh 1992:9).

Honest and effective communication of these abilities would have been crucial for success when competing for mates and allies, better food, a choice garden plot and house site, or even a warm place to sleep within a crowded quarter. Slaves who received an honest signal gained reliable knowledge about an individual and may have used it to aid in their selection of friends, mates, or cooperative household members. Merchants and other whites in the community may have relied on signals to help them decide which slaves would be reliable and discreet business partners.

A number of contextual variables in the eighteenth-century Chesapeake may have influenced a slave's ability to acquire goods as well as the payoffs for displaying costly imported goods. The arrival of thousands of enslaved Africans into the Chesapeake during the first four decades of the eighteenth century produced a region of ethnically, culturally, and linguistically diverse people whose common bond was often only their collective enslavement. By the 1760s, natural increase within the enslaved population had resulted in a community of American-born, English-speaking slaves with multigenerational connections (Kulikoff 1986; Morgan 1998). Despite an increasingly homogeneous slave population, family and residential units remained inherently unstable. Diversification of agricultural crops beginning in the 1730s was beneficial to some slaves but detrimental to many others. Slack periods in the agricultural cycle resulted not only in the sale of underused slaves, but also in the retraining and hiring-out of many others, which most frequently removed men from established families and plantation communities (Berlin 1998; Morgan 1998; Nicholls 1990; Walsh 1995a, 1995b). With each move or sale, enslaved people were forced to establish new working and social relationships with individuals who had little or no prior knowledge of their personality or skills. It is likely that the introduction of new slaves into an established community generated conflicts.

Agricultural diversification and population growth throughout the entire Chesapeake region provided slaves with more opportunities to interact with unfamiliar slaves, free blacks, and whites. The number and size of towns increased throughout the Chesapeake region during the eighteenth century. The size of most towns remained under 500 people until after the revolution, when the populations of Williamsburg, Richmond, Norfolk, Baltimore and Annapolis all rose to over 1,000 people (Walsh 2008). Variation in agricultural regimes resulted in the development of a corps of slaves with nonagricultural skills who were leased to other plantations or to business owners. Some slaves had occupations, such as wagoners, that allowed them to move relatively freely throughout the region.

Slaves with some degree of mobility interacted with larger and more varied groups of individuals with regularity. As the century progressed, towns grew and the economy diversified. Enslaved people had increasing opportunities and greater incentives for successful competitive signaling.

In addition to aiding economic transactions, successful signaling may have facilitated the exchange of information and provided the means to assess the likelihood of success in cooperating with non-kin for endeavors such marriages, runaway attempts, rebellions and the development of social and religious organizations. Early nineteenth-century South Carolina runaway advertisements suggest just how important building non-kin relationships off home plantations may have been to slaves (Johnson 1981). Advertisements placed by slave owners demonstrate that many of South Carolina's urban runaways were skilled slaves that had developed bonds with non-kin. Between 1799 and 1830, two-thirds of runway groups were composed of two unrelated individuals who may have known each other through their work (Johnson 1981:421). Although rural runaway groups were more frequently comprised of related individuals, 35 percent of rural South Carolina runaway groups contained at least one skilled tradesperson (Johnson 1981:430).

Running away and other forms of active resistance to enslavement have long been considered the essence of agency within enslaved populations. However, no archaeologist has been able to convincingly address key questions about resistance. How did slaves choose who would make good partners for these endeavors? How did they reliably establish who had the qualities necessary for entering into life-threatening actions, which, if successful, would result in the ultimate payoff: freedom? Johnson's evocative patterns suggest that nonagriculturally-based occupations provided access to, and knowledge about, a cosmopolitan world outside of the plantation, knowledge that other slaves knew would benefit their chances as a runaway. Costly displays may have played a critical role in communicating one's knowledge of the world beyond the confines of one's home plantation, knowledge that may have offered the greatest benefit to both signaling and receiving agents.

As the eighteenth century progressed, unrelated slaves in the Chesapeake formed complex and frequently illegal relationships on individual and collective scales. From marriages and clandestine trading relationships to group activities such as religious revivals, fraternal organizations, runaway attempts and rebellions, enslaved people bonded together in dangerous activities that were mutually beneficial to individuals and the group (Brown 1996; Finkelman 1989; French 2004; Johnson 1981; Newman 2003). In these contexts, I suggest that slaves strategically used costly, nonprovisioned items to communicate effectively their abilities and achievements, attributes that made them valued social allies and mates as well as formidable competitors.

The Signaling Media: Metal Buttons and Refined Ceramics

Metal buttons and refined ceramics—vessels made of porcelain, thin-bodied stoneware, and refined earthenware—are just two artifact classes that possessed a number of attributes that made them ideal for use in signaling displays throughout the eighteenth century. Both artifact types were introduced during the "consumer revolution" and their acquisition by slaves and nonslaves incurred substantial costs and conveyed little practical benefit. They were expensive and their cost scaled with form and decoration. Finally, buttons and ceramics were displayable and their use can be linked to specifically gendered activities.

Metal Buttons. Manufactured in a wide range of materials, sizes, and decorative styles, metal buttons were popular consumer items throughout the eighteenth century. Unlike wood and bone buttons, they could not be manufactured at home. Easily displayed and sensitive to changing fashions, metal buttons were ideal signals of a person's knowledge of current styles as well as their ability to participate in the market economy (Baumgarten 2002; Heath 1999b; Hinks 1988; White 2002, 2005). Most significantly, buttons were worn primarily by men throughout the eighteenth and early nineteenth centuries, and therefore provide important clues to male social and economic strategies.[1]

Store accounts indicate that buttons ranked among the most popular items purchased by slaves in Virginia (Heath 1999b, 2004). Runaway advertisements published in Virginia newspapers between 1760 and 1790 also reveal that metal buttons were the most frequently mentioned aspect of

a male runaway's attire. Runaway ads indicate that buttons were not only prominently displayed by enslaved men but that those buttons were clearly noticed by others (Heath 1999b). Bone and wood buttons were usually provisioned or made by slaves and do not represent a significant financial investment. They have been excluded from the following analysis.

Refined Ceramic Wares. Costs linked to displayable fashions were also important determinants in the acquisition of ceramic vessels made in "refined wares." New vessel forms used in the consumption of exotic and costly beverages such as punch, tea, and coffee were introduced in the mid-eighteenth century. Around the same time, other forms such as mugs, cups, and plates replaced functional and more durable equivalents that had traditionally been made in wood, pewter, and coarse earthenware (Carson 1990; Martin 1989, 1994; Roth 1988). Together these changes represent an increase in the costs paid by ceramic consumers. Consumers not only paid more for novel vessel forms and fashionable ceramic-ware types but the beverages that filled these vessels—tea, coffee, and punch—were made with costly ingredients. Replacing traditional pewter vessels with ceramic ones increased costs because ceramics had shorter use lives and old pewter could be profitably recycled (Martin 1989; Neiman et al. 2000).

Less-expensive imported and locally made coarsewares were also readily available for use as basic tablewares as well as for cooking and storage. Despite the availability of lower-cost alternatives, refined imported ceramics dominate slave quarter assemblages, and the diversity of forms and ware-types indicate that not all were provisioned by owners. As with buttons, slaves acquired stylish refined wares in two ways: through purchases made at stores and markets or as gifts and hand-me-downs from owners (Heath 1999b:51; Martin 2008).

Refined ceramics were used by slaves in a host of ways, from everyday use to display and use in socially elite dining rituals. Evidence for dining comes from both the archaeological and documentary records. In addition to regularly purchasing refined ceramic wares in nonutilitarian forms, slaves also acquired expensive ingredients, such as tea, sugar, and rum that were used in rapidly popularizing social rituals (Genovese 1976:557; Heath 1999b, 2004; Martin 2008; Schlotterbeck 1995:177). Although enslaved individuals were not enacting the afternoon tea rituals of the elite, their use of stylish refined wares for dining and drinking costly beverages was a form of display. The analysis of refined ceramics from the Elizabeth Hemings site at Monticello demonstrates that residents of that site chose inexpensive refined teawares but invested in costly Chinese porcelain dinner wares (Neiman et al. 2000). Neiman et al. suggest that the emphasis on Chinese porcelain tablewares points to signaling through more public dining rituals while tea drinking was a private affair that likely involved only household members (2000:52).

A Note about Provisioning. It is necessary to acknowledge here that some of the imported, nonessential goods found on slave quarter sites are the result of special provisioning, defined here as gifts and hand-me-downs given for certain occasions or to a select group of slaves. Just as Thomas Jefferson gave a bed and a pot to any enslaved couple at Monticello who married (Heath 1999a), other owners gave gifts to slaves they particularly valued. Primary accounts indicate that gifts ranged from hand-me-down clothing to money (Foster 1997; Fox-Genovese 1988; Morgan 1998; Perdue 1976). Such gifts were usually not distributed uniformly throughout an enslaved community; rather, slaves working in or near the house, or those with specialized skills, were the most likely recipients of this type of provisioning.

The acquisition of goods through special provisioning does not take away from the signal value of these items. The same attributes that made individuals competitive in the market economy may have also been skills that set them apart from other members of the enslaved population. Whether enslaved people were recognized by owners for their skills or physical qualities, or whether those skills and qualities led owners to value some enslaved people more than others, the result was the same: the acquisition of material and social benefits not given to the rest of the enslaved community. An enslaved individual's value to owners meant better quality food, clothing, and housing. Gifts and hand-me-downs that signaled favor from an owner were likely not viewed positively across the entire enslaved community. However, access to objects not given to the rest of the enslaved pop-

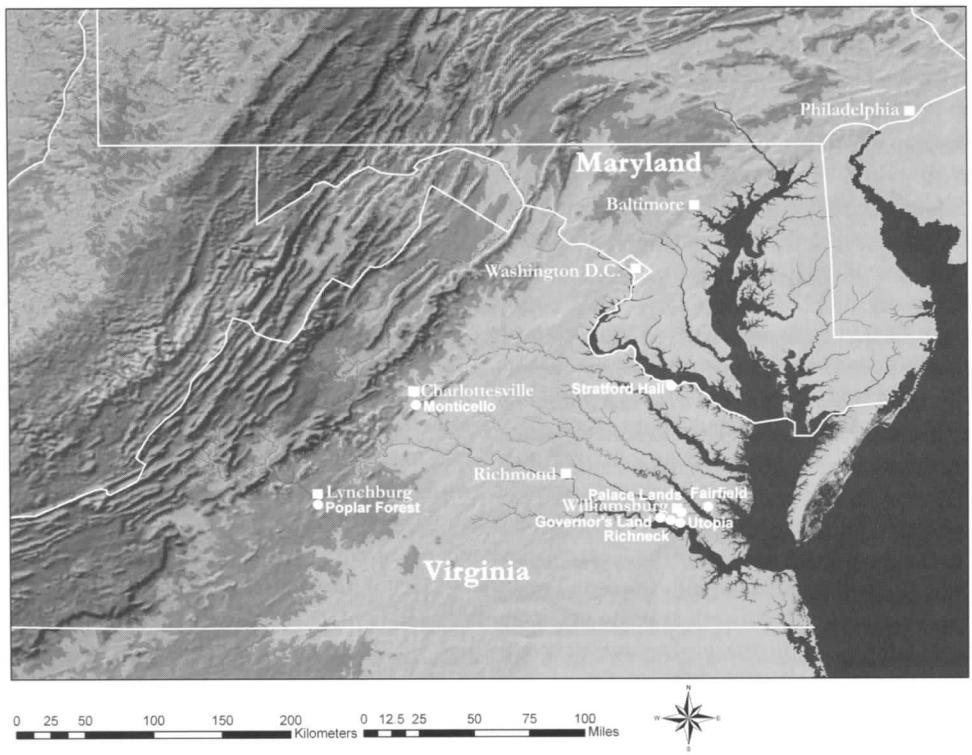


Figure 1. Map of the greater Chesapeake region of Virginia showing the location of the eight plantations that produced the 41 slave-site assemblages used in this analysis.

Measuring Signal Variation

Defining the Unit of Analysis. Two significant challenges confront archaeologists undertaking regional comparative studies. First is the availability of standardized artifact data from multiple sites. The second is the development of analytical methods that acknowledge that each assemblage was excavated from sites with different depositional and excavation histories. As a result, most archaeological studies of slavery either focus on a single site or compare sites from a single plantation that were excavated by the same principal investigator using similar methods (Armstrong 1990; Fesler 2004a, 2004b; Heath 1999a; Higman 1998; Thomas 1998). This study is possible due to the availability of fine-grained standardized artifact data available through the Digital Archaeological Archive of Comparative Slavery (DAACS), a Web-based initiative that currently provides quantitative artifact, context, and spatial data from over 40 excavated slave quarter sites located in the Chesapeake, Carolinas, and Caribbean.

Data from 22 excavated slave quarter sites located on eight plantations are used in the following analysis. These sites were occupied from the late-seventeenth through early-nineteenth centuries and are scattered across the Coastal Plain and Piedmont regions of Virginia (Figure 1). A number of these sites have distinct occupational phases that most likely represent different households. Correspondence analysis (CA) was used to identify discrete temporal occupations within each site and Best Linear Unbiased Estimated Mean Ceramic Dates (BLUE MCDs) were used to calculate the mean date for each occupation phase.[2] As a result, a total of 41 phased assemblages, each representing different household occupations, contribute to this analysis.[3] This study is the largest comparative archaeological study of slavery in the New World to date.

Despite the availability of detailed and comparable artifact data for these assemblages, a number of significant methodological concerns shaped this analysis. They included variation in excavation methods and postdepositional processes. For example, 17 of the 41 assemblages are derived from

Table 1. Assemblages Used in Plowzone Analysis.

Plantation	Site Name	Occupation Phase	BLUE MCD	Region
Utopia	Utopia III	House 40	1749	Coastal Plain
Utopia	Utopia III	House 50	1764	Coastal Plain
Monticello	Site 8	House 1	1778	Piedmont
Monticello	Building o	Phase 2	1785	Piedmont
Stratford Hall	ST116		1787	Coastal Plain
Monticello	Site 7	Phase 3	1788	Piedmont
Palace Lands	Palace Lands Quarter		1790	Coastal Plain
Monticello	Site 8	Phase 3b	1790	Piedmont
Monticello	Building o	Phase 3	1791	Piedmont
Poplar Forest	Quarter Site		1795	Piedmont
Poplar Forest	North Hill		1796	Piedmont
Monticello	Building r	Early Period (Phases 1-2)	1796	Piedmont
Monticello	Building l	Middle Period (Phases 3-5)	1796	Piedmont
Monticello	Site 8	Phase 3a	1797	Piedmont
Monticello	Building s	Phase 1	1798	Piedmont
Monticello	Elizabeth Hemings		1799	Piedmont
Monticello	Building s	Phase 2	1803	Piedmont

either plowzone samples or from stratified deposits that were so substantially altered by modern intrusions and poor excavation techniques that their sediments are treated here as plowzone. Twenty-four assemblages were excavated from subfloor pit features, subterranean storage areas built by slaves within their quarters. Eleven of the 24 subfloor pit assemblages come from sites where the plowzone was mechanically removed and discarded without sampling.

In an attempt to reduce the error introduced by a range of depositional histories and excavation strategies, the artifact assemblages from plowzone and subfloor pit contexts were analyzed separately. Of the 41 dated assemblages, 17 are from plowzone contexts at 13 different household sites (Table 1). Twenty-four are from subfloor pit contexts at 18 household sites (Table 2).

The Abundance Index. An abundance index was used to estimate the discard rates of metal buttons and refined ceramics at each household relative to an artifact class that serves as a baseline discard rate (e.g., the number of discarded buttons in relation to the total number of discarded wine bottle sherds). Here the term "discard" characterizes the variety of ways artifacts enter the archaeological record, from accidental loss to intentional discard due to breakage or a desire to keep up with changing fashions. An abundance index assumes that the base discard rate of the denominator class either does not change or, if the base discard rate does change, it does so in a predictable manner. Here the abundance index (*AI*) is estimated as

$$AI = (Artifact\ Type\ 1) / [(Artifact\ Type\ 1) + (Artifact\ Type\ 2)]$$

where *Type 1* is the artifact group whose variation in discard we are interested in measuring and *Type 2* represents the base discard rate. Unlike relative frequencies, the abundance index works by using a single artifact class as the *Artifact Type 2* denominator value. By reducing the denominator value to a single artifact class, one only has to be concerned with correlated discard rate variation in a single denominator class, not many artifact classes.

This method for estimating discard rates was derived from large and small mammal measures used in optimal foraging applications (Ugan and Bright 2001). Recently, abundance indexes have been developed for use on historic-period sites to estimate artifact discard on late eighteenth-century slave quarter sites at Monticello (Galle and Neiman 2003; Neiman et al. 2000), early-to-mid-nineteenth century sites at the Hermitage (Galle 2004), and slave sites in Jamaica (Galle 2011). The challenge in using an abundance index is identifying the denominator class (*Artifact Type 2*) that has a discard rate that is either relatively constant across sites or that has a discard rate that varies predictably over time. For this study, wine bottle glass was found to have a relatively constant discard rate at all sites

Table 2. Assemblages Used in Subfloor Pit Analysis.

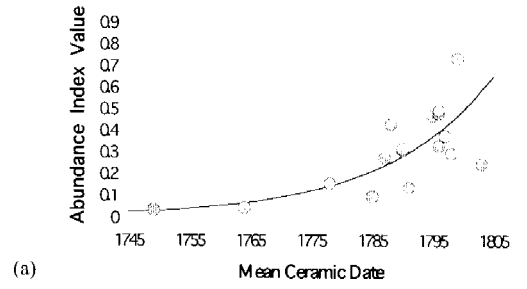
Plantation	Site Name	Occupation Phase	BLUE MCD	Region
Governor's Land	44JC298		1700	Coastal Plain
Fairfield Plantation	House 2		1727	Coastal Plain
Fairfield Plantation	House 1	Phase A	1728	Coastal Plain
Fairfield Plantation	House 1	Phase B	1732	Coastal Plain
Utopia	Utopia II	House 1	1732	Coastal Plain
Utopia	Utopia II	House 20	1734	Coastal Plain
Utopia	Utopia IV	House 160	1737	Coastal Plain
Richneck	Richneck 68AP		1739	Coastal Plain
Utopia	Utopia II	House 10	1741	Coastal Plain
Monticello	Site 8	House 3	1746	Piedmont
Utopia	Utopia IV	House 140-D2	1749	Coastal Plain
Utopia	Utopia IV	House 140-D1	1750	Coastal Plain
Monticello	Site 8	House 1	1751	Piedmont
Richneck	Richneck Quarter	Phase B	1754	Coastal Plain
Richneck	Richneck Quarter	Phase A	1760	Coastal Plain
Utopia	Utopia III	House 40	1761	Coastal Plain
Palace Lands	Palace Lands Quarter		1765	Coastal Plain
Monticello	Site 8	House 2	1765	Piedmont
Utopia	Utopia III	House 50	1767	Coastal Plain
Monticello	Building o	Phase 2	1785	Piedmont
Monticello	Building o		1792	Piedmont
Poplar Forest	North Hill		1793	Piedmont
Monticello	Building s		1799	Piedmont
Poplar Forest	Quarter Site		1802	Piedmont

used in this analysis (Galle 2006:7–15). An abundance index for each assemblage was calculated using the total number of wine bottle sherds from the assemblage as the *Artifact Type 2* denominator class (Galle 2006).

Generalized Linear Models: Negative Binomial Regression. For each assemblage, the abundance index was first used to estimate variation in the discard of all metal buttons and all refined ceramics, regardless of decoration, ware type, or form.[4] The results were fit with a generalized linear model (GLM), a form of regression that handles non-Gaussian errors and nonlinear relationships. Introduced in the early 1970s, and most fully developed by McCullagh and Nelder (1989), GLMs subsume traditional approaches to multiple regression, analysis of variance and analysis of covariance while also including relatively new methods such as logistic, Poisson, and negative binomial regression. A GLM that uses the log link function and negative binomial error distribution was used here with the abundance index scores (y) and mean ceramic date (x) for each assemblage. The Pearson Goodness-of-Fit statistics for the negative binomial GLM were all close to 1, indicating that the negative binomial models account for overdispersion in the artifact samples used in this study (for additional details on these regression models, see Galle [2006]).[5]

Results

GLMs demonstrate that metal buttons and refined ceramics excavated from both plowzone and subfloor pit assemblages had a significant positive correlation with time (Figures 2a–3b).[6] For both artifact types, there is a clear spike in discard after the American Revolution, when population and town size increases dramatically. This spike is also linked to labor changes accompanying the expansion of wheat production that coincided with the sharp increase in wheat prices at the time of the Napoleonic Wars. These three factors resulted in economic benefits for many slaves. Among the subfloor pit assemblages, we see rising consumption levels beginning shortly after the start of widespread agricultural diversification in 1730. As plantations gradually diversified, populations increased, and venues for interaction expanded. Many slaves had more incentives and opportunities to display costly or difficult-to-obtain objects as the social and economic environment within the Chesapeake



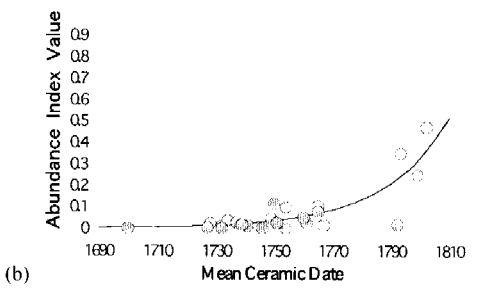
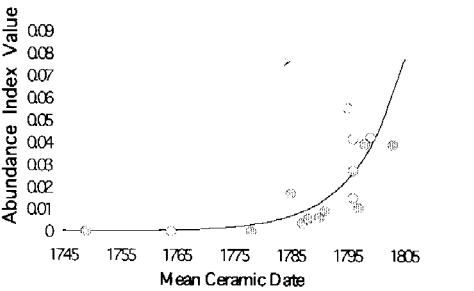


Figure 2. Abundance indices for metal buttons plotted against mean ceramic dates. (a) Plowzone assemblages (*b = .11; p = <.0001*) (b). Subfloor pit assemblages (*b = .04; p = <.0001*).



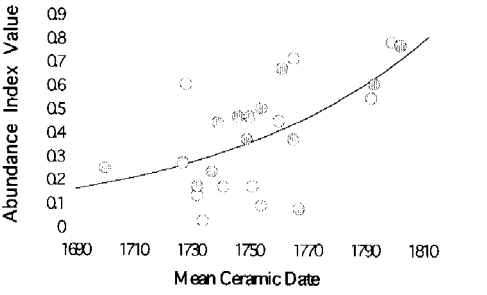


Figure 3. Abundance indices for refined ceramics plotted against mean ceramic dates. (a) Plowzone assemblages (*b = .05; p = <.0001*). (b) Subfloor pit assemblages (*b = .01; b = .0092*).

became more competitive. Enslaved men and women were apparently responding to the changing social and economic environment, characteristic of the last half of the eighteenth century, in ways predicted by the costly signaling model.

While the introduction of increasingly inexpensive items during the last half of the eighteenth century no doubt increased discard rates, the rapid spike in the consumption of costly items such as refined ceramics and metal buttons moved much faster, and occurred earlier, than the decrease in prices. For example, George Miller's price index indicates that prices for refined ceramic wares only began to drop substantially in the early nineteenth century (1988, 1990). Based on the temporal regressions, it is clear that slaves living in Virginia were acquiring and discarding costly items at rates that were well ahead of falling consumer prices.

While the consumption of both classes of artifacts spiked during the last decades of the eighteenth century, Pearson's and Kendall's tau correlation coefficient tests that use residuals from these models indicate that the discard rates of refined ceramics and metal buttons from plowzone and subfloor pit assemblages are not correlated (Table 3). In other words, households that acquired and discarded refined ceramics in quantities greater than anticipated by the temporal model were not discarding large quantities of buttons. This suggests that individuals and households may have chosen to or have only been able to invest in one type of costly and fashionable object. This further suggests that availability was not the driving force in the increase of non-essential consumer goods on these sites. If increased discard of costly goods was simply the result of decreased cost and increased availability, one would expect the residual discard of buttons and refined ceramics to be positively correlated.

A negative binomial model was also used to test the correlation between the discard of buttons and ceramics and a slave dwelling's proximity to a main house. The argument here is that slaves living in houses within a 1/4 mile radius of a plantation's

Table 3. Results Showing Lack of Correlation between the Consumption of All Metal Buttons and All Refined Ceramics from Both Plowzone and Subfloor Pit Contexts.

Plowzone Assemblages	*r*	*p*
Kendall's tau	.01471	.9343
Pearson's	-.0719	.7626
Subfloor Pit Assemblages	*r*	*p*
Kendall's tau	.22	.12
Pearson's	.297	.15

main house may have worked in the house or surrounding dependencies (x_1 = MCD, x_2 = Proximity to Main house, $y = AI$). When holding time constant, there was no correlation between an enslaved household's ability to consume costly goods and their proximity to the main house (metal buttons from plowzone $b = .4$; $p = .24$; refined ceramics from plowzone $b = -.2$; $p = .2$).[7] That a structure's distance from the main house has neither a positive nor negative influence on consumption counters the long-standing assumption that slaves working in or around their owner's house were likely to have more imported, costly goods than field slaves. Although some highly valued slaves, either working in the house or in nearby dependencies, surely received hand-me-downs and gifts that others did not, it is likely that slaves not in the position to receive such goods had sufficient motivation and skill to also acquire a host of nonessential consumer goods through their own efforts. Here the model reveals that individual consumption strategies were more complex and nuanced than previously identified.

Contextual factors other than the increased availability and declining costs of goods or a slave's location on the plantation clearly influenced slave's consumer choices. Here again ST can help identify those other factors. ST anticipates that signalers at a given level should be anxious to acquire novel forms of material culture, such as new ceramic patterns or new button styles, as soon as increased availability or lower costs makes them affordable. However, an individual should quickly abandon those same goods when further decreases in cost make the once novel styles affordable for those farther down the scale. Artifact patterns that acknowledge an attention to changing fashions should indicate higher-quality signalers that were intent on maintaining honest costly signals by keeping up with the rapidly changing market. Individuals who maintained their signaling level were also more likely to be in contact with signal receivers who actively established parameters and set the "requirements," or standards, for the signal.

Metal buttons possessed a number of measurable attributes closely tied to cost and fashion that make them particularly useful for identifying male signaling strategies across time and space. Buttons with a silvery appearance were most fashionable, and most costly, during the first three-quarters of the eighteenth century. By the fourth-quarter of the eighteenth century, gold-colored buttons replaced silvery fashions. Unplated copper alloy buttons or white metal buttons covered in gold or gilt plating would have expressed a man's ability to keep current with changing fashions (Baumgarten 2002; Heath 1999b; White 2005).

Button size also scaled with cost and a button's size provides clues to the type of garment on which it was worn. Highly visible large buttons (>18 mm in diameter) not only fastened overcoats and jackets, they were also used as nonfunctional decoration sewn opposite false buttonholes. Small and medium-sized buttons (<18 mm in diameter) were attached to vests and breeches. Despite being less visible, these buttons could also be quite expensive (Baumgarten 2002; White 2005).

The sharp rise in the popularity of ceramics in the mid-eighteenth century, and their rapidly changing ware-types, forms and decorative designs, also represent an increase in the costs paid by consumers during the eighteenth century. This analysis considers changing discard rates of five refined ceramic ware types: delftware, white salt glaze stoneware, Chinese porcelain, creamware, and pearlware. Introduced in the early-seventeenth century, delftware and Chinese porcelain were so costly that they only became affordable to most elites by the mid-eighteenth century. While Chinese porcelain remained fashionable and costly throughout the entire eighteenth century, delftware and white salt glaze peaked in popularity by mid-century and both fell out of favor by the 1770s. They were replaced in popularity by Josiah Wedgwood's introduction of creamware in 1762 and pearlware in 1775. Manufacturers regularly and subtly changed these ware types to provide the market with new vessel forms and decorative patterns in a range of costs (McKendrick et al. 1982). The popularity of creamware

Table 4. Negative Binomial Regression Estimates for Time Where y = Abundance Index Scores and x = MCD From Plowzone Assemblages.

Artifact Type	Estimate	*p*
Large Yellow Buttons	.12	.11
Small Yellow Buttons	.19	.02
Large White Buttons	.10	.003
Small White Buttons	.05	.10
Creamware	.11	<.0001
Pearlware	.14	<.0001
Chinese Porcelain	.06	.001
White Salt Glaze MCD*MCD	-.001	.25
Delft MCD*MCD	-.002	.05

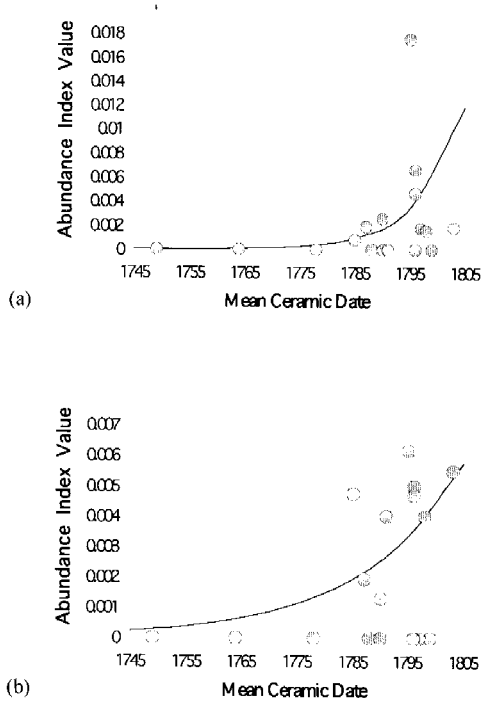


Figure 4. Abundance indices for (a) large yellow (*b* = *.12; p* = *.11*) and (b) small white buttons (*b* = *.05; p* = *.10*) plotted against mean ceramic dates from plowzone assemblages.

and pearlware was due in large part to the many decorative styles and forms whose cost scaled with their novelty.

Identifying Signaling Strategies

Abundance indexes were calculated for large and small white buttons and large and small yellow buttons from the 17 plowzone assemblages. Indexes were also calculated for the five refined ceramic ware types: white salt glaze, delftware, Chinese Porcelain, creamware, and pearlware. The temporal regression models demonstrate that the discard of most of these button and ceramic types have significant positive relationships with time (Table 4). Although large yellow and small white buttons are the only two types of costly goods from plowzone assemblage whose discard is not positively correlated with time, the abundance indices still display strong temporal trends (Figures 4a and b). For all button types, the 1770s remained the decade after which the use and discard of these non-essential goods dramatically increased.

There was no significant temporal relationship with the use and discard of delftware or white salt glaze vessels in plowzone assemblages. This is most likely due to the rise and fall in the popularity of these ware types during the mid-eighteenth century. A temporal regression using the quadratic mean ceramic date ($y = AI$, x_1 = MCD and x_2 = MCD*MCD) for delftware and white salt glaze confirms that consumption does decrease dramatically after 1780 (Figures 5a and b). As some of the earliest refined ceramics, delftware and white salt glaze vessels whetted the appetite for novel ceramic forms and decorations but were quickly replaced by more stylish and innovative refined earthenwares such as creamware and pearlware.

Principal component analysis that uses the Pearson residuals from the plowzone models for specific button and ceramic ware types identify three different signaling strategies used by slaves in Virginia (Figure 6a).[8] The biplot represents both objects (in this case, ceramic and button types represented by black diamonds) and variables (archaeological assemblages represented by gray circles). The variable coordinates are connected to the origin (0/0) by vectors that emphasize patterns of interelement correlation. Small angles between vectors that connect objects to the origin indicate high positive correlation. Angles near 90 degrees demonstrate a lack of correlation and angles near 180 degrees indicate negative correlation. Figure 6a demonstrates that variables representing sites dominated by the earliest refined ceramics, delftware and white salt glaze, cluster together while sites dominated by later, more costly refined ceramics such as creamware, pearlware, and Chinese porcelain form a second group. Sites with greater than expected quantities of buttons form a third group.

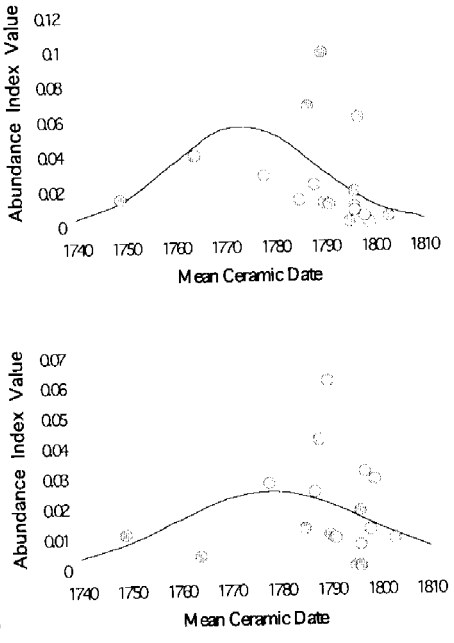


Figure 5. A GLM using the quadratic mean ceramic date ($y = AI$, $x_1 = MCD$ and $x_2 = MCD*MCD$) for (a) delftware and (b) white salt glaze confirms that the consumption of these ceramic ware types increased during the first half of the eighteenth century and declined sharply after 1780.

Each cluster represents goods whose consumption is positively correlated.

The residual discard of the most costly button type during the late-eighteenth century, large yellow buttons, is not correlated with the consumption of the most costly refined ceramic type, Chinese porcelain. Creamware is also not correlated with large and small white metal buttons, arguably the most fashionable ceramic and button types during the third-quarter of the eighteenth century. The lack of correlation between expensive button and ceramic types suggest that many households either invested in the most expensive ceramic wares or the most fashionable metal button type; they did not acquire large quantities of both at the same time.

In addition, small yellow and white buttons and large white buttons are either not correlated or have only weak positive correlations with refined ceramics. This is in contrast to the strong positive correlations among the most popular refined ceramics during the last half of the eighteenth century, creamware, pearlware, and Chinese porcelain and the positive correlations among the four button types. These correlations again suggest that many slaves chose to or could only afford to maintain one type of costly signaling strategy: either an investment in the most fashionable buttons or the most current and costly refined ceramics. Once invested in a particular strategy, households attempted to maintain signal strength by acquiring the latest style within that artifact type. This is an extraordinary result with most sites neatly adopting one signaling strategy.

Male Signaling Strategies. The PCA also reveals clues to three types of slave consumers, two of which adopted costly signaling strategies. The first consumer strategy is characterized by the consumption of buttons in quantities greater than expected by the temporal model. This group is comprised of the Poplar Forest Quarter and North Hill sites and the middle phase of Building 1 at Monticello (Figure 6b). Residents at these sites consumed more metal buttons than any other household in this study. Based on a thorough review of documents related to structures along Monticello's Mulberry Row, Building 1 may have been occupied by enslaved teenage boys who labored in the adjacent nailery at Thomas Jefferson's Monticello (Hill 2003). At an age when they were becoming socially and economically competitive, these young men may have used extra money they earned in the nailery to acquire fancy metal buttons that were then worn to social gatherings both on and off the plantation.

Although sample sizes for most sites in this analysis were not large enough to conduct tests for stylistic turnover, a logistic regression model demonstrates that any given button found at the Poplar Forest Quarter site was 88 percent more likely to be complete when it was made from white metal than when it is made from yellow metal ($r = 1.882$, $p = .08$). This supports Heath's suggestion that enslaved men at Poplar Forest may have consciously discarded usable but out-dated white metal buttons in favor of more expensive large yellow metal buttons that would have been clearly displayed on overcoats and frocks (1999b). The maintenance of signal strength through the replacement of outmoded buttons with more current and costly styles suggests that men at Poplar Forest had incentives to maintain high-quality signals.

Two of these incentives may have been the sites' proximity to local markets and the nearly

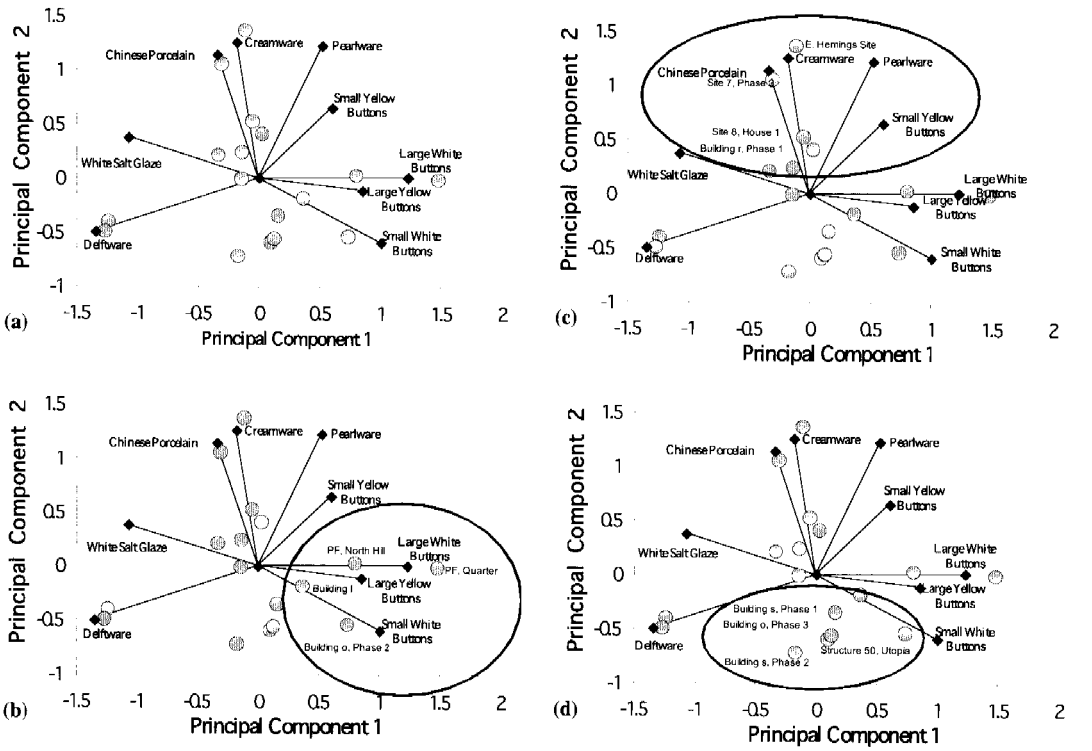


Figure 6. Principal component analysis using artifact residuals from metal button and refined ceramic types GLMs from plowzone contexts where x = MCD and y = AI. (a) PCA without groups indicated; (b) Group 1 represents male signaling strategies focused on high metal button consumption; (c) Group 2 represents female and/or successful, cooperative household signaling strategies focused on high refined ceramic consumption; (d) Group 3 represents low-level signalers characterized by the under-consumption of metal buttons and refined ceramics.

even male-to-female ratio at Poplar Forest in the late-eighteenth and early-nineteenth centuries. Poplar Forest was an agriculturally diversified plantation located within a two hour walk to the market centers of Lynchburg and New London. Although primary sources do not indicate who lived in these houses, we do know that around 15 unmarried men and 19 unmarried women between the ages of 15 and 25 lived at Poplar Forest during the early 1790s and 1800s (Heath 2005). Although this sex-ratio suggests that young men living at Poplar Forest could have chosen a mate from the female population at Poplar Forest, competition among males may have provided incentives for investing in stylish clothing as part of a signaling system that appealed to women living both on and off the plantation.

The institution of North American slavery created a society in which partners were frequently and forcibly separated through sale or violent death. In addition, enslaved men were stripped of their ability to help provide for their partners and children, with that role being assumed by the owner. As suggested by the Draper and Harpending model (1982), male mating competition that focuses on multiple partners and minimal investment in offspring is expected where economic conditions minimize the role of males in providing for females and their offspring (Draper and Harpending 1982; Harpending et al. 1987:145). Sustained signaling with fashionable buttons at Poplar Forest and other sites may highlight this type of mating competition and point to men in established relationships who developed mating strategies that extended beyond their wife or partner.

In 1823, well after the abandonment of the North Hill site, four unrelated enslaved men between the ages of 19 and 29 were convicted of insurrection and assault relating to the attack of an overseer at Poplar Forest. They were subsequently sold south to slave markets in New Orleans (Heath 1999a). The collective action taken by these young men

raises the possibility that signals that communicated independence and a willingness to take physical and emotional risks were crucial means for organizing different types of resistance. Costly and highly visible items such as buttons may have communicated a slave's mobility, ingenuity, and motivation to circumvent an owner's or overseer's direct control, attributes that may have been valued when seeking partners for rebellious forms for collective action.

Cooperative Household Signaling. The second signaling strategy is exemplified by sites with greater than expected quantities of pearlware and Chinese porcelain, the most costly and fashionable refined ceramics in the last quarter of the eighteenth century (Figure 6c). Several were located either within sight of Thomas Jefferson's house at Monticello and were occupied by members of the Hemings family, a large and extended family of skilled slaves who held prominent positions in Jefferson's house and craft workshops (Stanton 1996, 2000). The most famous was Sally Hemings, with whom Jefferson fathered at least one and most likely five children (Neiman 2000; Stanton 2000). Jefferson gave a number of Hemings's men, as well as other skilled male slaves, substantial amounts of mobility. Jefferson allowed Martin and James Hemings to hire themselves out to other people while he was in France, and to keep the wages they earned (Stanton 2000:104). Robert Hemings, Jefferson's body servant, accompanied Jefferson to Philadelphia and Washington and both James and Sally Hemings attended Jefferson and his daughters during their two years in Paris. Elizabeth Hemings was the matriarch of the family and she lived alone during her final years at Monticello. Documents suggest, however, that she may have been charged with caring for her daughter's and Jefferson's children.

People living in the Mulberry Row households and at the Elizabeth Hemings site consumed ceramics almost to the exclusion of metal buttons. Located in close proximity to each other, signaling among individuals at these sites may have taken on a more intimate form of costly display through small group dining and tea rituals. This fits with the hypothesis that these kin-based households were anchored by women who held prominent positions in the main house or surrounding dependencies, jobs that at times rewarded their skills and provided them with access to goods not usually available to other slaves. These households also included successful men who, with their partners, worked extraordinarily hard to establish a foothold in a culture and economic system that sought to exclude them in almost every way.

Low-level signalers. The final consumer category is comprised of households that discarded fewer ceramics and buttons than expected by the temporal model (Figure 6d). This group includes the Home Farm Quarter at Monticello, an area of the plantation that was occupied during the peak years of tobacco production in the late-eighteenth century. Here slaves used outdated delftware and white salt glaze ceramics while under-consuming more current refined ceramic and metal button styles.

Two sites in this third signaling category have specific attributes that, when combined with their low signaling strength, evocatively point to specific household arrangements. The first, Structure 50 at Utopia, had low consumption rates but large numbers of subfloor pits. Multiple pits, many of which cut each other, indicate that slaves moved frequently in and out of Structure 50. In this unstable social environment, people may have had difficulty establishing successful cooperative personal relationships (Neiman 2008). Documents indicate that Structure 50 was occupied during a period of relative instability at Utopia. A 1745 dowry and family ledgers kept by the Brays, owners of the Utopia Plantation, suggest that many enslaved families were separated during this period (Fesler 2004a:120–129). It is possible that the building was occupied by small families or single mothers with children who were required to live with other unrelated individuals.

Assemblages from phases 1 and 2 at Building s are the only assemblages located along Monticello's Mulberry Row to fall into the low-level signaling category. Although the Building s assemblages do not lack fashionable and costly goods, slaves living there consumed fewer buttons and ceramics than anticipated by the temporal model. Slaves living at Building s consumed fewer costly goods than most slaves in the region, and certainly much less than other slaves living along Mulberry Row. What is particularly surprising about this result is that Sally Hemings most likely lived in Building s during the late-eighteenth and early-

nineteenth centuries (Stanton 1996). If Sally Hemings occupied the structure, she did so beginning in the mid 1790s, shortly after her return from France. Her first male child who survived to adulthood, Beverly, was born in 1798. Madison and Eston were born in 1805 and 1808 respectively. These boys, fathered by Thomas Jefferson (Neiman 2000; Stanton 2000), would have been too young to wear masculine garments adorned with metal buttons. The relative lack of metal buttons, along with the presence of an almost intact French faience drug jar, which has been suggestively linked to Sally Heming's time in France, may well point to a female-headed household that had few men living in it.

The under-consumption of refined ceramics at Building s during the 1790s and early 1800s also suggests that the structure's occupants dined elsewhere. If Sally Hemings did occupy Building s during this period, the low discard rates of fashionable ceramics may suggest she dined in the Monticello mansion, the main kitchen, or with her mother Elizabeth Hemings, whose house site had among the highest discard rates of the costliest refined ceramics. Regardless of who occupied Building s, the lack of large quantities of buttons and refined ceramics at this structure along Mulberry Row may well reflect a household with few men whose members spent much of their time away from their main residence.

Conclusion

Signaling theory provides a model that identifies the contextual factors that triggered the increased use of costly goods among many enslaved households throughout the eighteenth-century Chesapeake. As agricultural diversification, demographic expansion, and the growth of urban centers impacted social and economic life, enslaved women and men responded with a series of consumer choices based on their specific circumstances. Many seized newly available opportunities to acquire skills or to work at task-based positions that provided mobility and cash. As they tested their physical and psychological ability to move outside their home plantation, the men and women who were successful found themselves in expansive and unknown social and economic territories. Exposure to new people in cosmopolitan settings combined with growing access to novel, costly, and attractive goods resulted in the increased payoffs for successful communication.

The model presented here, when combined with rich archaeological data, does not simply demonstrate that context and gender "matter." By paying close attention to contextual variables and the nuances of material forms and usage, the model reveals the actions of enslaved women and men, both individually and as members of households, as they made decisions regarding the allocation of their very limited time, physical energy, and financial resources.

Enslaved women and men did not simply express their identity through their participation in local and regional markets. Many strategically and successfully selected goods to help create and navigate complex relationships in an increasingly competitive social and economic environment. Successful enslaved signalers in eighteenth-century Virginia adopted two different strategies depending on their gender, age, and marital status. Households that consumed metal buttons in excess of the temporal model may represent dwellings comprised of men who were either unmarried or married to a woman on another plantation. Unattached young men, or men with marriages abroad, may have invested in costly buttons and stylish clothing that displayed not only their personalities but also their skills in acquiring such goods. They often had some degree of mobility that allowed them to interact with unfamiliar people in venues where they received greater payoffs for their signaling, payoffs that encouraged them to sustain strong costly signals over time.

Households with large quantities of refined ceramics may point to kin-based households anchored by successful enslaved women who worked extraordinarily hard to achieve and maintain an economic position that allowed them to move outside the bounds of their owner's provisioning system. These households may have included few or no children, thereby enabling its members to more easily translate their labor into imported consumables.

Finally, households that consumed fewer than expected buttons and refined ceramics may represent individuals at a point in their life when they were unable to participate in the market economy. Our historical understanding of these sites suggests

that they may have been inhabited by groups of women and their children who had been separated from their husbands or large households that required all of its resources for day-to-day survival.

Membership in these signaling groups was fluid. An individual's desire and ability to participate in the market economy certainly changed as children were born, as people aged, and as spouses or children died, were sold, or ran away. It is precisely through the melding of explanatory theoretical models and data-rich comparative archaeological analyses that the presence of such women and men, and their fluid personal states, can be most fully identified and understood.

Acknowledgments. This article has benefited greatly from discussions with Fraser Neiman, as well as from his close reading and statistical guidance. I also thank James Boone, Adria LaViolette, Louis Nelson, Stephen Plog, Lorena Walsh, Aaron Wunsch, and three anonymous reviewers for their comments on earlier versions of this paper. This research was made possible by fellowship funding from the John D. Rockefeller, Jr. Library at the Colonial Williamsburg Foundation and by a research leave from the Thomas Jefferson Foundation. Beatrix Arendt, Leslie Cooper, and Jesse Sawyer, archaeological analysts for DAACS, generated the tremendous amount of high-quality data used in this study. Derek Wheeler graciously provided the base map used in Figure 1. Finally, I want to express my appreciation to the archaeologists who have generously shared their data with The Digital Archaeological Archive of Comparative Slavery (www.daacs.org). Without their contributions, large-scale comparative archaeological studies of slavery would not be possible.

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Notes

1. Buttons were not used on women's clothing until the second quarter of the nineteenth-century. Prior to the 1830s, women's bodices and gowns were closed with hooks and eyes, lacings, and straight pins (Ashelford 1996; Baumgarten 2002; White 2005). The one exception was eighteenth-century riding habits, which were worn by women. While it is possible that enslaved women may have appropriated metal buttons for use as jewelry or some other adornment, documents suggest that enslaved women focused on purchasing material items that reflected female fashions, such as ribbons, buckles, and stylish fabrics (Heath 1999b, 2004; Martin 2008). It is therefore likely that metal buttons were most effective as male signaling devices.

2. Following Neiman and Smith (2005), Best Linear Unbiased Estimator was used to calculate mean ceramic dates for each occupation phase. BLUE MCDS are calculated using

$$MCD_{BLUE} = \sum m_j p_j \left(\frac{1}{s_j/6} \right)^2$$

where m_j is the manufacturing midpoint of the j'th type, p_j is its relative frequency, and s_j is its manufacturing span. BLUE MCDs give less influence to ceramic types with long manufacturing spans. In doing so, it assumes that type frequencies are Gaussian over time, with standard deviations set to 1/6th the documented span. The BLUE MCDs used in this analysis were calculated using the MCD-Types posted on the DAACS website (http://www.daacs.org/aboutDatabase/MCDTypes.html). Additional information on the use of correspondence analysis for phasing, see http://www.daacs.org.

3. Refined ceramic assemblages range from 9 to 1,135 sherds per site. Metal button assemblages range from 0 to 76 metal buttons per site. Wine bottle assemblages range from 68 to 1,287 per site. Complete data sets used in this article can be found at www.daacs.org/research.

4. Kendall's tau correlation coefficients for artifact densities and abundance indexes were calculated for seven artifact classes by time, in this case represented by each site's mean ceramic date. The seven artifact classes included buckles, buttons, coins, refined ceramics, coarse ceramics, tobacco pipes, and wine bottle glass. The discard of wine bottle sherds had no correlation with time in Virginia. Every other artifact class had either strong positive or negative correlations with time, with the exception of coarse ceramic wares, which had only a subtle negative correlation with time. Coarseware discard estimates decreased slightly throughout the eighteenth century but they did so in a predictable manner. Coarsewares could have also be used as the denominator class; however, the predictable decrease in discard throughout the eighteenth century would have been reflected in slightly elevated slopes for all artifact classes when index scores are generated using a Coarseware Index relative to abundance scores resulting from the Wine Bottle Index used here. For more information on using abundance indexes on historic-period sites, see Galle (2006).

5. Generalized linear models (GLMs) have two key properties that allow them to handle both linear and nonlinear relationships as well as a number of different variable types and error distributions (Crawley 1993:167–168; Gill 2001). First, GLMs allow researchers to define the error structure contained within the dependent response variables being analyzed. Archaeologists work with a variety of data types, each with its own error distribution. Continuous data, such as sherd thicknesses, rim diameters, and tobacco pipe bore diameters, can be modeled effectively using normal Gaussian distributions. Count data, such as the number of ceramic sherds in a sample, and proportional data, such as an abundance index score, have non-normal distributions. GLMs allow researcher to specify the error distributions that are appropriate to those data being modeled.

Second, GLMs use link functions to model nonlinear relationships between a set of linear predictors and the predicted or mean value of the dependent variable. Link functions are used to correctly identify the functional form of the relationship between the dependent (x) and independent (y) variables and different link functions help distinguish one member of the GLM family from another (Crawley 1993; Liao 1994:4). The type of link function used is reliant on the distribution of the dependent data (Liao 1994:5).

Traditional linear regression techniques most frequently used by archaeologists, which include analysis of variance and analysis of covariance (Shennan 1988), require a continuous dependent variable and assume that the error distribution is normal or Gaussian (Liao 1994:1). As noted above, continuous variables with assumed normal distributions include those such as sherd size and sherd thickness. For continuous data, GLMs provide an identity link function that connects the dependent y variables to the linear predictor (_). With the identity link function, the independent x variables are used to predict the mean of y, where _= _ where _= the predicted mean value of y given a particular x value. The identity link is functionally inappropriate for proportional or count data like those used in this analysis. When the identity

link is used with count or proportional data, there is nothing in the model to prevent the results from producing negative counts or proportions that are greater than one or less than zero.

Fortunately, GLMs have link functions that allow us to use non-continuous and dichotomous data such as counts and proportions. The logit link is one link function that works well with proportional data. It produces a logistic regression that forces the predictions to fall between 0 and 1. Logistic regression transforms nonlinear relationships into linear ones. It is particularly effective for describing the relationship between dichotomous, or binary, variables and a group of independent "predictor" variables (Menard 2002; Pampel 2000). Unfortunately, the logit link assumes that the data have a binomial error distribution. A binomial error distribution assumes that each artifact within a sample was sampled randomly and independently of other artifacts. This is a problematic assumption to make with archaeological data. Most artifacts are portions of objects, such as pots. It is likely that pots were broken or discarded in a localized area. Contexts with several sherds of creamware, for example, are likely to have many more sherds of creamware, thereby creating a non-independent sample. Non-independent samples are easily remembered as "contagion" samples, where the likelihood of catching the flu is not independent since catching the flu relies on others in the sample having the same bug. Data that are not independently sampled likely contain what is known as extra-binomial variation, which means that the variance (χ^2) of the real error distribution is much larger that the assumed binomial error.

GLMs have a log link function and error distributions that can better accommodate assemblage count data. The log link function predicts the log of the artifact count (for example, the log of the number of refined ceramic sherds). Hence negative predictions are impossible. Poisson error distributions can be applied to count data that refer to knowable cases, such as the number of sherds in a context or the number of flu cases, but that have no information on how many times something did not happen. A binomial model, on the other hand, requires knowing both the number of times an incident occurs and the number of times it did not occur (Crawley 1993:227). Poisson distributions are, however, constrained in that they also assume independence within samples. The assumed Poisson error variance (χ^2) is equal to the mean of the dependent variable which does not allow for much variation in a sample.

The negative binomial error distribution has more forgiving requirements about variation. Unlike the Poisson error distribution, the negative binomial variance can be greater than the mean and it can be as large as necessary to account for lack of independence and the resulting extra-binomial variation within samples.

6. The criteria for goodness-of-fit indicate that each of these models have appropriate fits.

7. The b is the slope coefficient from the regression of abundance (y) on mean ceramic date (x). The p-value is a test of the null hypothesis that the regression coefficient is zero.

8. This PCA uses the correlation matrix of the residuals from the GLMs. The first principal component accounts for the greatest amount of variation, the second principal component accounts for the next greatest amount of variation, and so forth. In the PCA for plowzone assemblages, Principal Component 1 accounts for 38 percent of the variation, PC2 accounts from 25 percent of the variation, and PC3 accounts for 14 percent of the variation in the dataset. These percentages meet the thresholds for each principal component as established by the broken stick rule (Legendre and Legendre 1998). Four principle components percentage of variation that did not meet the broken stick thresholds accounted for variation among the subfloor pit assemblages. This indicates that the subfloor pit data are highly unstructured. As a result, only the plowzone PCA receives consideration in this article.

Revised September 24, 2009; Accepted October 3, 2009.