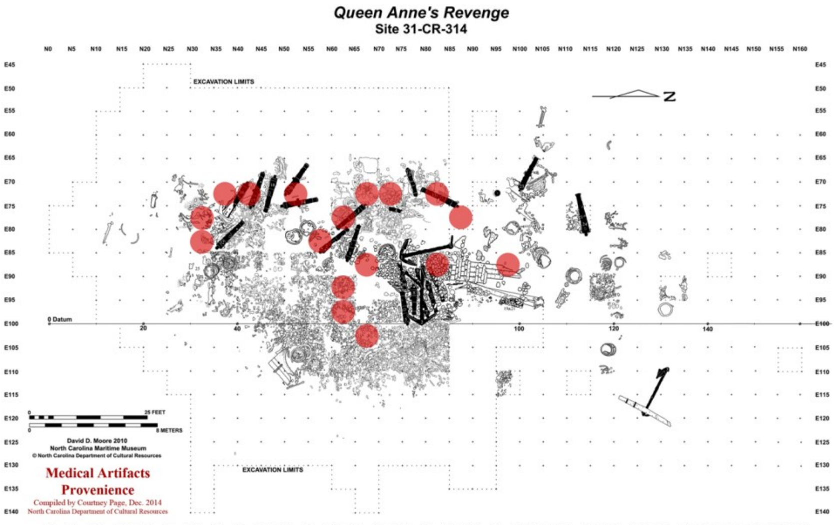
North Carolina Archaeology



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DON'T LET ETHICS GET IN THE WAY OF DOING WHAT'S RIGHT: THREE DECADES OF WORKING WITH COLLECTORS IN NORTH CAROLINA

by

I. Randolph Daniel, Jr.

Abstract

In North Carolina, collaboration between professional and avocational archaeologists remains informal, particularly with respect to those that participate in artifact collecting. Given that some private collections do have scientific value, increased collaboration between both groups is warranted. Moreover, this work can engage collectors in a way that is consistent with our discipline's ethical principles. But such work is not without its challenges. During three decades of working with collectors I've struggled with three concerns: verifying artifact proveniences, avoiding fakes, and commercialism. Nevertheless, these issues are not insurmountable, and I provide my perspective as a point of reference.

"Sounds like you don't want ethics to get in the way of doing what's right." My friend's comment, some 25 years ago, aptly summarized our conversation as I expressed ambivalence regarding the nature of my interaction with artifact collectors. In particular, I was discussing the potential ethical dilemma I sometimes felt with respect to the statewide fluted point survey I had recently begun. While I had been looking at private collections for years, my examination was done informally to satisfy my curiosity regarding what these collections might hold. Based upon what I saw and my conversations with the collectors themselves, over time I became convinced that some collections were more than groups of curios—some collections held data of scientific value.

Now I was attempting to demonstrate that value by explicitly recording and publishing information on fluted points. While there was some precedent around the region (e.g., Charles 1979; McCary 1984) for what I was doing, I still felt some uneasiness as to the nature of my collaboration. On the one hand, I was excited about potentially making a contribution to our understanding of the little-known Paleoindian period in North Carolina. On the other hand, virtually all of the points I needed to examine were in the hands of private collectors. Collaborating with artifact collectors was an activity that some colleagues viewed as troublesome if not unethical. In their minds such collaboration gave tacit approval to an activity that contributed to the destruction of the archaeological record. But many of the collections I saw were collections that were reasonably documented and the collector was willing to share that information with me. Was it preferable, then, to ignore all amateurs' collections because they were not recovered by a professional archaeologist? Or was it possible to engage collectors on a case-by-case basis to determine if some middle ground could be reached such that some scientific information could be gleaned from their work? The latter instance, I thought, was acting akin to the "spirit of the law" rather than the "letter of the law" with regard to archaeological ethics—which at that time only existed informally in the profession—and thus I was doing what was right by the discipline. And so my recording of fluted point collections began.

Today, I remain convinced that fruitful collaborations can exist between professionals and members of the artifact-collecting community. Even so, it is hard to deny that a certain stigma often clouds that association and affects professionals and collectors alike. Fortunately, there now appears to be a rapprochement of sorts that is beginning to emerge in the discipline with regard to collaborating with private collectors. Indeed, some in the profession argue that the Society for American Archaeology's (SAA) Principles of Archaeological Ethics (discussed below) obligate professionals to collaborate with responsible collectors (Pitblado and Shott 2015; Shott and Pitblado 2015). This is not to imply there is a consensus on the issue, as a level of opposition to working with collectors still exists (e.g., Goebel 2015) although this opposition appears to be articulated more in "private conversations" (Shott and Pitblado 2015:13) rather than in published form.

Thus, I offer my view as part of a "spirited but civil engagement" (Shott and Pitblado 2015:13) regarding the diverse range of opinions regarding collaboration between professional archaeologists and collectors. As such, this paper has two audiences: artifact collectors and professional archaeologists in North Carolina. For the former, I outline best practices that increase the chances of beneficial collaboration with the professional community. For the latter, I provide examples of my interactions with collectors in hopes that my experiences might mitigate some colleagues' leeriness regarding collaboration. Of course, such collaboration is not without its challenges, and I candidly discuss three such challenges I've faced. Finally, while this paper is primarily directed to a North Carolina audience, I would hope that the views expressed here might find support beyond the state's boundaries.

The Origins of Professional–Collector Collaborations in North Carolina

Collectors and professional archaeologists have long shared a mutual interest in the archaeological record (e.g., LaBelle 2003; Pitblado 2014b; Shott 2008). Over time this mutual interest has resulted in a relationship that is sometimes prickly. While the exact origins of this contentiousness are difficult to pinpoint, Bonnie Pitblado (2014b:339–341) suggests it is a relatively recent phenomenon inadvertently occurring as a result of the increased professionalism of the discipline associated with the passage of federal legislation. On the one hand, increased professionalism in the form of codes of conduct (e.g., the SAA in 1996) and laws in the form of cultural resource protection (e.g., the National Historic Preservation Act in 1966) have succeeded in their intended goal to protect archaeological resources. On the other hand, codes of conduct and laws have not always succeeded in an associated goal of fostering cooperation between the public and professionals as "some archaeologists invoke 'ethics' to justify refusing to reach out to some or all artifact collectors or even to reach back when collectors initiate contact" (Pitblado 2014a:341). Of course, refusing to work together is sometimes warranted, particularly in those cases when artifact collections have been obtained by illicit means. But in other instances the circumstances of acquiring collections may be legal and motivated by a sincere interest in the past akin to that of professionals. Under those conditions, professional–collector relationships should be collaborative rather than contentious.

Whatever its origins, I think it is important to realize that the schism has not always been present. In fact, the earliest professional work in several places in the country was a result of a cooperative relationship established with artifact collectors (e.g., LaBelle 2003:117–119; Pitblado 2014b:339–341). North Carolina is a case in point, and I think it is instructive to briefly mention two such relationships here as they can be a model for reestablishing collaborative links between archaeologists and collectors in the state.

Any discussion of the history of North Carolina archaeology must include Joffre Coe's name (Griffin 1985; Ward and Davis 1999:9–26). While long regarded as a pioneer of professional archaeology in the state, his career was greatly aided by the ties he established with two collectors: Reverend Douglas Rights and Herbert Doerschuk (Figure 1). Reverend Douglas Rights was a Moravian minister and founding member of the Archaeological Society of North Carolina in 1933. Rights

Figure 1. Members of the 1937 Town Creek Excavation Committee (from left to right): James B. Bullitt, Wallace E. Caldwell, Joffre L. Coe, Herbert M. Doerschuk, Harry T. Davis, and Douglas L. Rights. Courtesy of the Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

was elected the society's first president and authored the first book on the prehistory and history of North Carolina Indians—*The American Indian in North Carolina* (1947). In 1936, Rights was also part of a small team from the fledgling archaeological society, including a young Joffre Coe, that began excavations at the Poole site in Randolph County (Ward and Davis 1999:134–137). The site was believed to be the location of the village of Keyauwee visited by the early English explorer John Lawson around 1701. Of interest here is that Coe was the only individual with formal archaeological training and by working alongside Rights and other avocational members of the society Coe "introduced the scientific method of archaeological excavation to the Piedmont" (Ward and Davis 1999:11).

Not surprisingly, Rights was also an avid artifact collector. Between about 1915 and 1950 he acquired a collection of over 42,000 artifacts, most of which came from the western Piedmont of North Carolina. Today, the collection, along with documents that identify the locations from which the artifacts were recovered, are curated by the Research Laboratories of Archaeology (RLA) at the University of North

Carolina, Chapel Hill (http://rla.unc.edu/archives/rights/index.html). Additional artifacts from his collection are curated by the Museum of Anthropology at Wake Forest University, Winston-Salem, North Carolina. While emphasis is given to the important role Rights played in establishing the North Carolina Archaeological Society and his support of Joffre Coe (Ward and Davis 1999:119–122), less attention is given the legacy he left in the donated collection at the RLA.

Another avid collector who significantly influenced Coe's career was Herbert Doerschuk, an electrical engineer who lived in Badin, North Carolina, and collected artifacts from sites along the nearby Yadkin-Pee Dee River from 1927 to 1952 (Coe 1964:3; Ward and Davis 1999:38–39). In 1937 he pointed Coe (then a student at the University of North Carolina Chapel Hill) to two sites that remain benchmarks in North Carolina prehistory: Doerschuk and Hardaway. Subsequently, Coe (1964) conducted excavations at both sites which, along with the work at the Gaston site on the Roanoke River, would be reported in the landmark publication entitled *The Formative Cultures of the Carolina Piedmont*.[1] Suffice it to say that *Formative Cultures* was important because it provided the typological and chronological framework for much of the subsequent archaeology in North Carolina. While the significance of the relationship between Coe and Doerschuk can hardly be over emphasized, as in the case of Douglas Rights less mention is made of the artifact collection donated to the RLA by Doerschuk. In 1953, Doerschuk donated over 9,400 artifacts he had collected over a 25-year period from the Hardaway site (Coe 1964:61–62). This collection is still curated by the Research Laboratories of Archaeology and is a significant part of the Hardaway site data.

The importance of Rights' and Doerschuk's contributions to the founding of North Carolina archaeology cannot be overstated. What is more, by donating their collections—with their contextual information—both Rights and Doerschuk exemplify a model for collaboration between collectors and professional archaeologists. As such, Rights and Doerschuk were more than just artifact collectors. Rather, they might be considered as forerunners for what is termed today as "citizen-scientists" in archaeology (sensu Smith 2014).[2] Rights was one of the first to recognize the archaeological potential of North Carolina and was instrumental in laying the groundwork for its professional practice in the state (Ward and Davis 1999:8–9). Doerschuk's knowledge of the sites in the Uwharrie region and his willingness to share that knowledge and his artifact collection with Coe—and Coe's willingness to embrace

Doerschuk's efforts—was a seminal partnership in the history of North Carolina archaeology (Coe 1964:3). Likewise, by cooperating rather than ignoring Rights and Doerschuk, Coe eventually gained collections from some of the state's most important sites.

The cooperative relationship between Coe, a young professional archaeologist, and Rights and Doerschuk, two avocational archaeologists, should serve as examples of the benefits of collaboration. As I see it, in order for this collaboration to be mutually beneficial both groups must share certain responsibilities. I outline these responsibilities below, first addressing my professional colleagues, followed by my view of collector responsibilities. Moreover, I submit these responsibilities are borne out of a shared ethical view regarding the scientific goals of archaeology and archaeological standards of practice (cf. Pitblado 2014a).

Society for American Archaeology Ethics

Although the idea of archaeological ethics has a relatively long history in this country (McGimsey 1995), it is only recently that they have become a routine topic of discussion among professionals or a formal part of archaeological training (Lynott and Steponaitis 2000). As presented by the SAA (1996), their Principles of Archaeological Ethics are intended as guidelines to aid professionals in meeting the goals of their profession as practiced within the broader context of the society within which they live (Lynott 1997). Yet, there exists no reason why such principles should exclusively apply to professionals, particularly since SAA membership is open to anyone regardless of their line of work.[3] Indeed, in Article II.4 of the SAA bylaws it states that one of the objectives of the society is "to serve as a bond among those interested in American Archaeology, both professionals and nonprofessionals, and to aid in directing their efforts into scientific channels." So, while the SAA ethics principles are clearly aimed at professional archaeologists, no reason exists why collectors or any other nonprofessional could not adopt these principles as well (see also Shott and Pitblado 2015:12).[4]

As I will emphasize below, if nonprofessionals choose to surface collect, it is their responsibility to document their collections and, when warranted, find permanent repositories for that data. Likewise, it is the professional archaeologists' responsibility, when appropriate, to work with collectors to accomplish those goals. Whatever the case, the collector–professional relationship is predicated upon a set of ethical principles, as aptly detailed by Pitblado (2014b:386–391) and Shott and Pitblado (2015). Their arguments need not be repeated here except to say that the principles of stewardship (Principle 1), public education (Principle 4), the preservation of records (Principle 7), and the denunciation of commercialization (Principle 3) can all be interpreted to not only permit collaboration but compel it.

Moreover, it is good to remember that the SAA's Principles of Archaeological Ethics are proposed as ideals or goals rather than a code of conduct per se (Lynott 1997:589).[5] As such, they are designed to serve as a compass of sorts so that archaeologists might navigate their daily professional activities. But since they serve as guidelines rather than prescriptions, instances sometimes arise where the course of action is ambiguous. "It is understood that these ideals for archaeological activities might not be easily attained amid the complexities of everyday life" (Lynott 1997:593). Collaborating with collectors can be one of those "complexities" as it highlights the difficulty of negotiating a commitment to the scientific investigation of the archaeological record that includes the professional collection and curation of that record with the reality that important parts of the archaeological record are sometimes collected and curated under less-than-ideal conditions. I'll return to specific examples of how I have negotiated these issues in a moment, but first I want to address the collector community and outline what I consider to be best practices for those who pursue artifact collecting in the state.

An Ethical Collector

Archaeology is an unusual discipline in that one individual can claim it as a profession while another can claim it as an avocation. This is not true of most other professions. (Have you ever heard of an amateur lawyer?) Those nonprofessionals who pursue archaeology for pleasure are referred to by a variety of terms including avocational archaeologist, amateur archaeologist, and collector to name the most common ones. Defining those labels can be tricky as nonprofessional archaeologists exhibit a wide variety of behaviors and attitudes towards the archaeological record. For instance, surface collecting can be a casual act as in a farmer who happens across artifacts in his field and puts them on a shelf in his home. He may view them as curios and otherwise have no interest in the artifact or archaeology in general. On the other hand, there are those individuals who spend a considerable amount time surface collecting. They may have a passion—some even admitting to an obsession—for collecting artifacts. Their motives may include a keen interest in prehistory, and they may keep meticulous records of their finds that would be worthy of any professional archaeologist. To their credit, some collectors share their information with professional archaeologists. And in a few instances, as in the case of the Doerschuk and Rights collections mentioned above, individuals may even donate those collections to an institution where they will be available for future study. At the other end of the spectrum are looters motivated by personal greed who destroy the archaeological record through illicit, uncontrolled digging. Obviously, my concern here is with the former. The latter are incorrigible.

For present purposes I use the simple term *collector* as it reflects the specific behavior of collecting artifacts by someone other than a professional archaeologist.[6] Specifically, I use the term to refer to those individuals who collects artifacts *legally*. This primarily takes the form of surface collecting and does not refer to the acquisition of artifacts through illicit digging or the buying or selling of artifacts for personal profit.

If one decides to collect artifacts, it should be done ethically and that would include: (1) abiding by laws that pertain to the state's archaeological resources; (2) documenting artifact provenience; (3) making them available for professional study; and (4) if warranted, donating their collections to public repositories in or near their communities. None of these are novel suggestions but in my experience the latter three practices have not sufficiently been promoted by professionals in the state and hence are not routinely part of a collector's habits. While all of these practices should be observed by collectors, it is the last item that is seldom put into practice and which should receive greater encouragement by professionals. I outline each of these practices below.

First, it is imperative that one has an understanding of the laws pertaining to the collection of North Carolina's archaeological remains. It is against the law to collect artifacts from state or federal property without proper authorization. In North Carolina (and most anywhere else in the United States), it is legal to surface collect artifacts from privately owned lands, assuming one has permission from the land owner. It can be a trespassing violation to collect artifacts on private property without the permission of the landowner. Removing artifacts from public (i.e., state or federal) lands is illegal whether by surface collecting or by digging without proper authorization. Disturbing marked or unmarked graves or burial sites is also illegal whether on private or public property. It is also illegal to collect artifacts from the bottoms of navigable bodies of water if the artifacts are more than ten years old. Summaries of the legislation affecting archaeological resources in North Carolina can be found at: http://www.archaeology.ncdcr. gov/ncarch/resource/laws.htm.

Second, maintaining good records of artifact collections is also essential. It is hard to over-emphasize this point. Collecting, even if legal, does diminish the archaeological record by removing artifacts from their context. If no effort is made to record contextual information then surface collecting is a destructive practice. Many collectors assert that they are preserving the past by collecting artifacts that might otherwise be destroyed by farming, construction, or other land-altering activity. This claim is minimized, however, if the information regarding the context of that artifact is not recorded. (I would be more convinced by that argument if collectors ultimately donated their collections to a museum or other archaeological repository, but more on that below.) Maintaining records and, as I discuss below, sharing that information with professionals, is what citizen-scientists do. Collecting *per se* should not be the goal. Recovering archaeological data to help further our understanding about the past is the goal.

Recording this information is as simple as marking artifact locations on an accurate map. United States Geological Survey (USGS) topographic maps are ideal for this practice because they show considerable detail. The best known USGS maps are those of the 7.5-minute, 1:24,000-scale quadrangle series. A scale of 1:24,000 is used for maps based on metric units (1 centimeter = 0.35 kilometer). Map size is about 22 x 27 inches. The area portrayed on each map ranges from about 64 to 49 square miles. All of North Carolina is covered and maps are available for purchase on the web from the USGS. Another option is *The North Carolina Atlas & Gazetteer* as it contains smaller versions of topographic maps for the entire state and it is readily available in many stores. The scale of these maps is 1:160,000 and are about one-quarter the size of the 7.5 minute sheets.

Many of the recent versions of the above maps also utilize Global Positioning System (GPS) data. GPS refers to the series of satellites developed and launched by the United States Government for navigational purposes. Used in conjunction with a GPS device, these satellites can provide accurate artifact locations. Hand-held units are relatively inexpensive and can be used by collectors to plot artifact locations on maps for future reference.

Third, and related to the above point, artifact collections should be maintained in a way that they can be related to their site location.

Minimally, artifacts from different locations should be stored separately in some type of marked container that identifies them to the location where they were found. Ideally, all artifacts should be labeled in a way that makes that identification possible. This usually involves marking a number on artifacts with indelible ink.

Fourth, I would also urge collectors to report locations from which they have collected artifacts to some professional archaeological institution. Perhaps the easiest way to do this is through the "Amateur Site Form" that can be downloaded from the Office of State Archaeology's website (http://www.archaeology.ncdcr.gov/ncarch/reporting/forms.htm). It is a short form that can be completed very easily. The site location will then be given a site number and recorded in the state archaeological site file and updated as new finds are documented. According to the Office of State Archaeology, thousands of archaeological sites in North Carolina have been reported by nonprofessional archaeologists.

Finally, I would urge collectors to consider donating their collections to some archaeological institution (e.g., Childs 2015). In my experience, this last point is the one I get the most pushback from collectors. They often ask why should they give away what they have spent considerable time and effort acquiring? My response is why *wouldn't* a collector consider insuring a collection's long-term care by donating it to a suitable repository? Donating a well-documented collection to an institution that can preserve it for future research is an act of stewardship and provides a legacy for the collector. It is the right thing to do as a citizen-scientist.

This will be a radical change in thinking for some collectors—a mindset shift from collecting to conservation, from ownership to stewardship. Stewardship requires collectors to think in the long term with respect to their collections. By long term I'm speaking about what happens to the collection after the owner dies.[7] My experience is that most collectors have made no plans for the disposition of their collections at their death. This is unfortunate since I've heard several accounts of nice collections that at the death of their owner have been divided among family members (who often don't share the same passion for the collection as their deceased relative) or sold to dealers that are only interested in selling the artifacts for profit. The ethical act is to include one's collection in an estate plan (either formally or informally) as they would any other personal belongings. Criteria for accepting artifact collections will likely vary between institutions but a well-documented collection increases its scientific value and the chance that it will be accepted for curation.

Private Collections and the Professional

Recent literature advocating professional–collector collaborations have either emphasized the scientific value of private collections (e.g., LaBelle 2003; Pike et al. 2006; Pitblado 2014a; Shott 2008) or the ethical imperative of responsibly engaging with artifact collectors (Pitblado 2014a, 2014b). I won't belabor either point except to say that in my mind the scientific value of private collections in North Carolina can be measured in part by their contributions to our understanding of Paleoindian archaeology in the state (Anderson et al. 2010; Daniel 2000, 2005; Daniel and Goodyear 2015; Daniel et al. 2007). Moreover, I believe this work has engaged collectors in a way that is consistent with the discipline's ethical principles.

While I firmly believe that our understanding of the past can be advanced by working with collectors, such work is not without its challenges. These challenges represent the "complexities of everyday life" mentioned above. In particular, I've struggled with three issues: verifying artifact proveniences, avoiding fakes, and commercialism. These concerns, of course, are not unknown to other professionals and are sometimes used as justifications for ignoring private collections. While I acknowledge the reality of these issues, I have not found them to be insurmountable to my research, and I provide my perspective as a point of reference.

Provenience

Obviously, for collections to be of value to archaeologists those collections need to have provenience. In the absence of recovering the artifacts themselves, professionals have to rely on collectors for that information. The degree to which provenience information is kept by collectors varies widely. Ideally, collections include some written documentation that associates artifacts with the location where they were recovered. When I see some written record that associates an artifact or artifacts with their provenience, I have high confidence in the reliability of that collection. In many, if not most cases, however, artifacts are stored in bags or boxes without any accompanying provenience data other than what their owner may claim to remember. In these cases, I proceed more cautiously, engaging in a conversation with the collector something akin to an ethnographic interview enquiring about their collecting habits. I pay particular attention to collectors' stories about how and where they collect. This is a feeling-out period (for both of us) as we try to establish a mutual level of trust. To their credit, most collectors freely share this information, although I sometimes need to reassure some that my intent is not to collect on their sites or disclose specific site locations such that other collectors might visit them. In any case, the nature of our conversation provides me with the information I need to judge the reliability of the context of their collections. Fluted points, for example, are rare finds that leave distinct impressions that collectors like to recount with much enthusiasm and in vivid detail. Such details include the date the point was recovered and even the spot in a field where the point was located. Additional details regarding the discovery can include if the collector was accompanied by a friend or family member and the reaction of the companion to that find. In the absence of detailed written records, this "oral history" provides some measure of reliability regarding artifact provenience.

Of course, human memory is not infallible and I emphasize to the collector that if he or she is uncertain about the find spot then I would prefer that admission rather than risk assigning a mistaken provenience to an artifact. But even in those instances it is often possible to provide a general vicinity of artifact recovery since individuals commonly collect within a limited area, thus providing at least a general level of provenience. Even at the scale of a county, artifact locations can provide important distributional information at a regional scale in North Carolina (e.g., Daniel 2000; Daniel and Goodyear 2015; McReynolds 2005).

Fakes

While determining the reliability of provenience information is an issue that professionals face in using private collections, perhaps a more insidious problem is the potential presence of fake artifacts in those assemblages. Unfortunately, artifact forgeries are not new in North Carolina. The earliest record of fake artifacts in the state date to the 1880s when a Virginian, Mann S. Valentine, and his sons became interested in Native American artifacts to be displayed in the Valentine Museum in Richmond (Ward and Davis 1999:6–7). Western North Carolina proved to be fertile ground for obtaining artifacts, as the Valentine's dug into several ancestral Cherokee earthen mounds located there. Not content with those artifacts, the Valentine's also purchased artifacts from the collections of local farmers. Unfortunately, some unscrupulous individuals created artifacts of their own which they sold to the unknowing Valentines. Using soft soapstone that occurred naturally in the region, the locals carved small figurines of various exotic animals

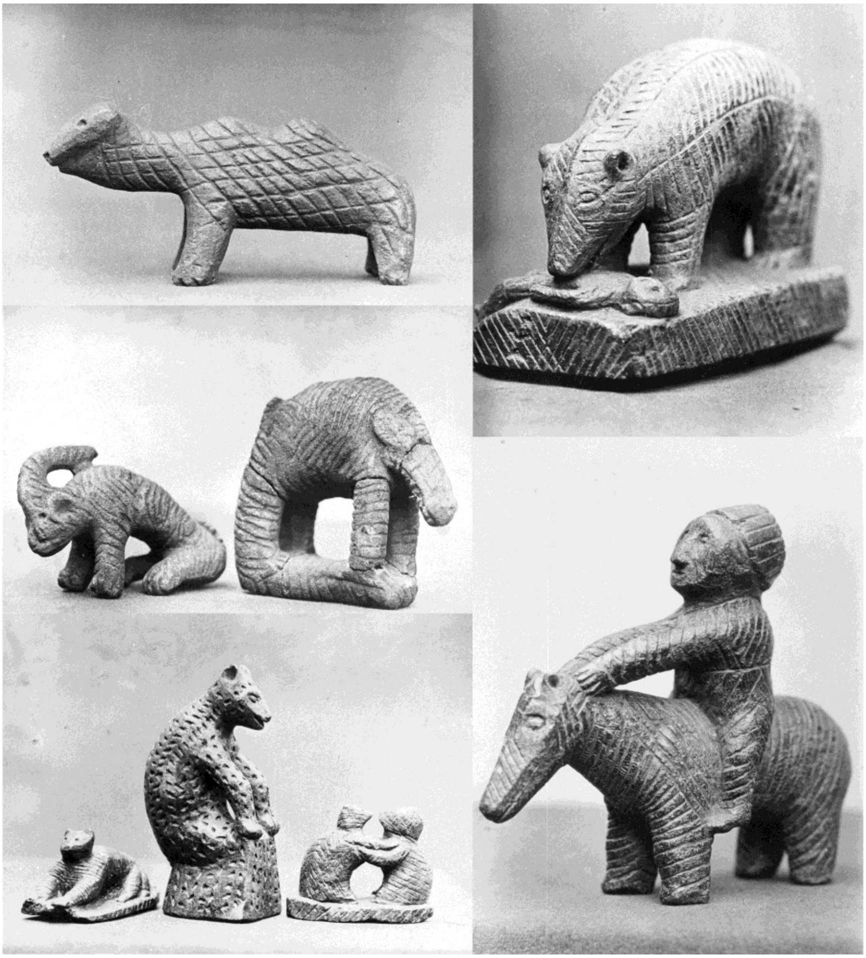

Figure 2. Artifact forgeries from the Valentine Collection. Courtesy of the Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

like a camel and rhinoceros (Figure 2). Looking at the specimens today, they would be readily identified as fakes by anyone with a rudimentary knowledge of North Carolina archaeology. But given that so little was known about the state's prehistory over a century ago, it is understandable how they could pass as genuine artifacts. In any event, the Valentines initially believed these items were authentic and produced by an ancient mound-building race—an idea popular at the time (Squier and Davis 1998)—unrelated to the Cherokee and their ancestors. Eventually, however, the hoax was exposed and the chagrined Valentine's interest in archaeology waned (Coe 1983:162–164; Ward and Davis 1999:6–7). Today, many of these items reside in the special collections of the University of North Carolina at Chapel Hill Libraries and serve as a reminder that vigilance is necessary if privately recorded collections are to be used as archaeological data.

Over a century later, unscrupulous individuals are still creating fake artifacts in North Carolina. But instead of figurines, these fakes include stone points that are skilled reproductions of genuine artifacts. As such they are much more difficult to identify as forgeries than the Valentine specimens. Not all replicas, of course, are made as forgeries (Shea 2015; Whittaker 2004:249–282). The interest in replicating stone points arose in the mid-twentieth century both in the form of experimental archaeology by professional archaeologists who were interested in understanding the process by which ancient stone tools were made and used, and by nonprofessionals who were interested in replicating artifacts for fun and for the commercial market (Whittaker 2004:59–71). Fueled by the many individuals who desire to own a tangible part of the past and the fact that genuine artifacts can sell for considerably more than a modern copy, a market emerged for selling replicas as ancient artifacts. Today, selling forgeries as authentic artifacts is perhaps as big as the commercial market for antiquities themselves (Brodie and Gill 2003; Bruhns 2000; Preston 1999; Whittaker and Stafford 1999).

Of course, commercialism and fakes are two sides of the same coin when it comes to dealing with private collections. And, I believe each issue has to be responded to in its own way. More on the problem of commercialism in a moment but with respect to fakes, it is my opinion that while caution is warranted, it is an overreaction to write off private collectors completely simply because the *potential* exists to include data from fake artifacts in archaeological analyses. In fact, the degree to which this is a problem in North Carolina is difficult to say. My experience has been that collectors are extremely concerned about the authenticity of their collections and thus are as wary of fake artifacts as professional archaeologists (see Whittaker and Stafford 1999). To the best of my knowledge, I have never had a collector intentionally try to deceive me by passing off a fraudulent artifact as genuine. With respect to recording fluted points, I've only encountered what I believe to be fakes in two instances. In both cases, the specimens in question were purchased with the buyers assuming their purchases were artifacts of genuine antiquity. Moreover, the owners were forthright about their acquisition and wanted to know my opinion about their purchase. In my mind, this experience reinforces the need to establish a rapport with collectors that I mentioned above. Knowing that a specimen may have a questionable provenience, prompts me to give it a second look.[8]

In part, I suspect the rarity of my encounters is due to the fact that the majority of fluted points in the state are made of metavolcanic stone—a type of stone from which fluted points are not easily replicated. Broadly speaking, North Carolina fluted points can be grouped into three raw material categories: metavolcanic stone (ca. 54%), chert (31%), and a residual category I refer to as *other* (mostly quartz) (14%) (Daniel 2000; Daniel and Goodyear 2006). In North Carolina, metavolcanic stone sources are present in the Carolina Slate Belt in the eastern Piedmont and from the Uwharrie Mountains in particular (Daniel and Butler 1991, 1996; Steponaitis et al. 2006). Several locations in the Uwharries were quarried extensively during prehistory. Indeed, metavolcanic stone was the predominant stone type used throughout North Carolina prehistory (McReynolds 2005:22–25). Given the virtual absence of knappable chert sources in the state, it is highly likely that any chert artifacts that exist had their origins outside the region.

Any modern knapper will tell you that flaking metavolcanic stone is more difficult than flaking chert and, in my opinion, the greater skill needed to knap metavolcanic stone results in fewer fake fluted points in North Carolina than might be the case elsewhere in the Southeast where chert sources are common. Around the Southeastern United States most prehistoric points were made of some type of chert because of the stone's high flaking quality (Goodyear 1979), and contemporary knappers heavily utilize various cherts available in the region. Generically referred to as "rhyolite" in the knapping community, metavolcanic stone is a more dense stone than chert and to that extent the quality of the conchoidal fracture is somewhat lower. My sense is that the time and effort needed to learn how to flake rhyolite is greater than chert and that only the most skilled knappers have the ability to make a replica of a rhyolite fluted point that passes as authentic. The upshot is that the rarity of that skill results in fewer fake metavolcanic fluted points being produced.

On a related note, metavolcanic stone is also not as easily "antiqued" as chert. Antiquing is a term used by flintknappers to refer to the process of making modern points appear older by giving them a weathered appearance (Whittaker 2004:249–250). Antiquing removes the "fresh" appearance of a newly made point that is often necessary to pass it off as a genuine artifact. Among other methods, staining the surface of points with furniture polish and abrading the exterior surface provides fake points with a weathered appearance that resembles the exterior surfaces on ancient points acquired over millennia by exposure to nature. In many instances, a skillfully knapped point that is artificially weathered can be difficult to identify as a fake (Whittaker and Stafford 1999).

It would appear that the glossy texture and light colors of most cherts are conducive to artificial weathering. To the best of my knowledge, however, artificial weathering on metavolcanic stone cannot be so easily reproduced. This is not surprising given that chert and metavolcanic stone are fundamentally different in the nature of their constituent minerals as well as the manner and conditions under which they were formed. While several varieties of metavolcanic (and metasedimentary stone) were used prehistorically to make tools, most were dark colored and lacked the extremely fine-grained texture and glossy surface of chert. Weathered metavolcanic stone in North Carolina tends to exhibit a white chalky surface that sometimes reveals a distinct flow banding (Daniel 1998:38–48; Daniel and Butler 1996). In short, the presence of a weathered surface on a specimen of metavolcanic stone is a good sign of authenticity in my opinion. Of course, the degree of weathering on artifacts varies greatly and not all genuine artifacts are markedly weathered. Why this is the case is hard to know and further research regarding the nature of the weathering process on metavolcanic stone would certainly be useful.

But even if replicated specimens are not made with the intent to defraud, their very existence makes that possible. There is no guarantee that those specimens that are given away or sold as modern replicas will not at some point end up marketed as real artifacts.

> [A]lthough the majority of points made by the hobby knappers…may not immediately enter the market, eventually many of them will, through death or an abandonment of knapping as a hobby. The points made by archaeologists learning to knap, performing experiments, or just enjoying a craft may (or may not) be carefully labeled and uncirculated now, but in the end, they too may be disconnected from their origins and pass into the confusing archaeological record. [Whittaker and Stafford 1999:210–211]

How big a problem is this? Based on their knowledge of the contemporary knapping world, Whittaker and Stafford (1999:210) “do not consider any non-archaeological collection made after the 1930s to be surely uncontaminated.” This is a sobering thought to say the least, but my feeling is that Whittaker’s experience is relatively confined to that of the Midwest and Texas. In my opinion the problem of North Carolina collections being tainted with fakes has not reached that level of

Figure 3. Clovis replica sold as a genuine artifact. Note the differences in flute lengths on the two faces. The purchaser of the replica was refunded his money once he confronted the seller, who eventually admitted the specimen was not authentic.

worry. Still, Whittaker and Stafford's concerns are paramount in my mind when looking at collections. Given the estimate of 100–150 knappers in North Carolina (Steve Watts, personal communication), and the presumably vast number of points they are capable of producing per year, compounded by the cumulative increase in numbers annually, common sense would suggest that prudence is warranted regarding the potential for encountering fakes in private collections.[9]

I contend with the problem of fake artifacts in two imperfect ways. First, I rely on my experience. Based upon several decades of handling tens of thousands of artifacts, I believe I've developed an "eye" towards recognizing a genuine artifact versus a fake.[10] I write this with all humility. Indeed, this is a skill that most all professionals have developed and I make no claim to having better skills than my colleagues in this regard (Figure 3). Rather, my point is that in those cases where I feel like something isn't quite right about a specimen (as in the two cases above) I err on the side of caution and discount the artifact as real. In my mind it is better to overlook a genuine artifact than include a fake one in my database.

Knowing that my judgment is not infallible brings me to the second and perhaps more reliable way to deal with the problem of encountering potential fakes in collections. I partially rely on the veracity of the collector's story regarding a specimen's provenience. I simply ask the collector if he or she buys or trades artifacts and, if so, are any of the artifacts I'm interested in among the ones that have been purchased or traded. If so, I proceed with extra caution, asking what the nature of the transaction was with regard to the purchase or trade. For example, did the buyer know the seller? Did the seller provide any details regarding how he or she acquired the artifact? In other words, what is the history of ownership of the artifact? If this history is murky I'm more inclined to take a harder look at the artifact in terms of evaluating its authenticity. This conversation, of course, is part and parcel of the discussion I mentioned above in terms of establishing a rapport with the collector.

Clearly, this evaluation is as much about building a relationship with the collector as it is my opinion about the artifact. Do I trust him or her enough to believe their story? Likewise, does the collector trust me enough to speak candidly? In the end, working with private collections is as much a human endeavor as it is an archaeological one.

Commercialism

Of course, many colleagues would rightfully point out that the problem of fakes is inextricably tied to the problem of commercialism. After all, fakes are produced to be sold as antiquities. And the market for antiquities seems insatiable (Chase and Topsey 1996; Early 1989; Harrington 1996; Preston 1999; Whittaker and Stafford 1999:208–209). Principle 3 of the SAA's Principles of Archaeological Ethics condemns commercialism, stating that archaeologists should avoid any activities that contribute to the commercialization of the archaeological record. Hence, some professionals would see this principle as justification for eschewing collectors altogether given their penchant for buying and selling artifacts; however, I would argue that response is an overreaction.

If one works with collectors long enough one is bound to encounter instances of artifacts that have been bought. To their credit many collectors avoid buying artifacts, claiming they are only interested in owning those that they have found. Other individuals, though, look to supplement their collections by purchasing artifacts from other collectors. All archaeologists wish this practice didn't exist but the commodification of the archaeological record is an unfortunate reality in today's world. Indeed, virtually all serious collectors (and archaeologists) are aware of publications like *Overstreet's Indian Arrowheads Identification and Price Guide* where dollar values are placed on projectile points and other Native American artifacts.

But what I want to tease apart here is the difference between the practice of buying and selling looted material from the practice of buying and selling surface collected material—particularly if the latter has reliable provenience. In the latter instance, I submit that it is preferable to work with collectors rather than condemn them. In essence, this is an instance of the "salvage principle" (Wylie 1996:171–172) in that archeologists should salvage what information they can from data that has not been professionally collected insofar as it retains scientific value and insofar as that collaboration does not increase the threat to further commercial exploitation of the archaeological record. While most of my colleagues might stipulate the first point, I suspect they might argue that I'm guilty of the second. That is, my willingness to work with collectors gives tacit approval to the buying and selling of artifacts and encourages further commercialization of the archaeological record which is in violation of Principle 3. But I submit that the commercialism issue here is outweighed by the intellectual gains made by the artifact's being part of my study. Indeed, the market for fluted points—presumably based on rarity, age, and craftsmanship—was established long before I began my study, and I submit that, in any case, it is highly questionable what role my research plays in setting the market value of fluted points. Let me provide a personal example.

Years ago I encountered a collector who purchased a portion of a collection, including a fluted point, from the widow of a friend who was a fellow collector. The widow had no interest in keeping the collection, and the collector was willing to purchase the fluted point along with other artifacts. Indeed, he had firsthand knowledge of many of the artifacts' recovery as he spent time on collecting trips with his friend. In my mind, the fact that the fluted point was now owned by a different collector—and the fact that money changed hands between the widow and the collector—was largely irrelevant to the fact that it was a surface-collected artifact with good provenience. Given that the buyer had direct knowledge of the artifacts' discovery and wanted to maintain the records of their context, I felt his was a responsible act and much preferable to someone else buying the collection who might not be interested in maintaining its integrity (or working with me). Therefore, under the circumstances of the artifact's recovery as a surface find and knowing that find had scientific value, was it really preferable to refuse to collaborate than to salvage the information that might otherwise be lost?

Of course, one might rightly ask if my work increased the market value of the specific points that I included in my study. I have no evidence that this is the case, but even if such evidence came to light, I hardly think it is justification for discontinuing my work. For, if the argument for refusing to record fluted point data in private collections is that such work by archaeologists enhances their market value, such an argument would effectively cease all Paleoindian research in the country since scholarly publications are routinely used to place a market value on artifacts (e.g., Overstreet 2015). Surely, no one seriously entertains this idea. At least in this case, then, isn't the profession better served by the analysis and publication of these collections, and let the market be damned?

Moreover, in addition to the scientific knowledge that resulted in my collaboration, I suggest the public education and outreach (Principle 4) that results from this work overshadows any perceived breach of Principle 3.[11] In essence, this example highlights the ambiguity that can be found in the SAA principles. That is, the principles do not specify how exactly archaeologists should realize the ideals they propose. "It is not the case, for instance, that archaeologists disagree about the ethics of stewardship or commercialization, rather it is the disagreement about the extent to which specific interactions between archaeologists and collectors may violate some principle or even highlight their apparent contradictions" (Wylie 1996).[12] In the example above, and likely in a myriad others akin to it, I see more benefits than liabilities to collaborating with individuals who have purchased artifacts. While the call to discourage commercialism is rooted in the awareness of the connection between the antiquities market and the looting of the archaeological record, there are gray areas between scholarly archaeology and commercial interests that the principles do not provide useful guidance on (Wylie 1996, 1999). As in the example above, I have tried to find a balance between them that serves the scientific goals of archaeology, conservation, and public interests.

Conclusion

I think it is worth remembering that in North Carolina the discipline of archaeology got its start based on the cooperative efforts of professionals and amateurs alike. And while those efforts spawned the

North Carolina Archaeological Society, today the interactions between professionals and those with avocational interests remain informal. Particularly with respect to those who participate in artifact collecting, I think the attitude of most professionals has been one of mild tolerance to indifference. With respect to collectors, I sense their attitude toward professionals is one of wariness borne out of an uncertainty regarding a professional's motivations for working with collectors. Nevertheless, I think a good case can be made for increased interaction between professional archaeologists and collectors because some private collections do have scientific value. As this paper goes to press, a task force created by the SAA is completing work on guidelines "to define appropriate relationships among professional archaeologists, avocational archaeologists, and responsible artifact collectors" that are consistent with SAA ethics principles and legal statutes. My feeling is that this represents a positive step and that collaborative interactions between professionals and collectors will increase significantly in the years to come.

In this paper I have outlined some ways in which collectors can increase the scientific value of their collections. Responsible collectors can engage in surface collecting of sites and contribute to our knowledge of the past. I emphasized that collectors who avoid collaborating with professional archaeologists miss an opportunity to leave a legacy of their work. In particular, the scientific value of some collections may warrant consideration of their being donated to an institution where they can be properly curated. Likewise, I noted that professional archeologists who ignore working with collectors do so at the risk of overlooking potentially rich databases. Nevertheless, challenges do exist in establishing professional–collector relationships. Establishing the provenience of artifacts is an ever-present concern but not an insurmountable one. The problem of fake artifacts also exists, but it can be minimized with some diligence on the part of the professional. With regard to ethical dilemmas, commercialism is the most nuanced problem to deal with. Fortunately, I believe there is an open-endedness in the SAA ethics principles that does not completely preclude the use of artifacts acquired on the market for scholarly research. As such, I believe the principles were written in recognition of those instances when we don't want to let ethics get in the way of doing what's right.

Notes

[1] Since its appearance over 40 years ago, this volume has been reprinted seven times. Indeed, *Formative Cultures* is a rare example of an archaeological report that is as popular with the general public as it is with professional archaeologists. For the former

group, it was the abundant and clear artifact illustrations that were of interest. For the latter, it was the fact that the artifact types had chronological significance that was paramount.

[2] Citizen scientists is a term that has been applied to nonprofessionals who volunteer to gather data on a wide range of research projects such as those that study native bees, water quality, birds, and even earthquakes (e.g., Allen 2012; Bhattacharjee 2005; Bonney et al. 2014).

[3] Article IV, Section 1 of the SAA bylaws states that "membership is open to any person who subscribes to the objectives of the Society, without regard to sex, race, religion, nationality, age, sexual orientation, disability, marital or veteran status."

[4] Of course, several amateur societies around the country have adopted their own code of ethics. Many of these are associated with "certification" programs that are connected to state-sponsored archaeological programs that train amateurs to serve as potential volunteers on professionally run projects. While North Carolina does have an archaeological society that includes both professional archaeologists and nonprofessional members, the society has no code of ethics *per se*, though the society "strives to maintain the highest standards of responsible archaeological inquiry" (http://www.rla.unc.edu/ncas/WhoWeAre/index.html).

[5] A professional code of conduct for archaeologists can be found in The Registry of Professional Archaeologists (www.rpanet.org/index.cfm). This registry was established to meet a need of the archaeological community to identify standards of professional conduct and to identify the qualifications necessary to be recognized as a professional archaeologist. The RPA code of conduct (co-sponsored by the SAA) specifies what a professional archaeologist "shall" and "shall not" do with respect to their responsibilities to the public, colleagues, employees, students, employers, and clients.

[6] Ambiguity exists with respect to how non-professionals refer to themselves and how they are referred to by professional archaeologists. This ambiguity only serves to highlight the uncertainty that exists within and between the two communities with regard to their interactions (e.g., Pitblado and Shott 2015:36).

[7] In the short term I would expect a collector and professional to develop a collaborative relationship sharing knowledge and information. Cultivating such a partnership is often a prelude to an offer to donate collections.

[8] I still record these specimens in case they surface again in the future as "artifacts."

[9] A sobering reminder of this fact is the infamous Woody Blackwell affair. Blackwell managed to replicate several Clovis points and pass them off as authentic that at least for a period of time fooled a number of professional archaeologists (Preston 1999:253–261; Whittaker 2004).

[10] "Restoring" artifacts is a related phenomenon I've encountered in some collections. This entails, for example, broken points that have been reworked by a modern knapper to flake a new tip, or using epoxy or similar material to mold a tip that is then glued to a broken blade.

[11] Indeed, a few individuals have either donated portions or all of their collections for curation at least partially based on my encouragement.

[12] Perhaps no better example of such ambiguity in interpreting the SAA principles exists than in the recent debate (Pitblado 2014a; Sassaman 2014) regarding the ethical dilemma created by the professional authentication and subsequent private sale of a bone engraving of an apparent Ice Age mammoth found in Vero Beach, Florida (Purdy et al. 2011).

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MARINERS' MALADIES: EXAMINING MEDICAL EQUIPAGE FROM THE *QUEEN ANNE'S REVENGE* SHIPWRECK

by

Linda F. Carnes-McNaughton

Abstract

Treating the sick and injured of a sea-bound community on shipboard was challenging in the best of times. Chronic and periodic illnesses, wounds, amputations, toothaches, burns, and other indescribable maladies of the crew, captain, and enslaved cargo had to be treated. Evidence of the tools used to heal the sick and wounded has been recovered from shipwreck 31CR314, identified as Blackbeard's *Queen Anne's Revenge* (formerly *La Concorde*, a French slaver). Excavations by North Carolina Department of Natural and Cultural Resources (NCDNCR) have been on-going since the wreck was located in 1996. The medical equipage found so far includes galley pots, syringes, clysters, a blood porringer, a mortar and pestle, and apothecary weight sets. Traveling the inter-continental boundaries of the Atlantic Ocean, sources and uses of these unique artifacts are examined along with the patients, doctors, and shipboard medicine of the seventeenth and early eighteenth century's Golden Age of Piracy.

Medical treatment for the sick and injured on board a pirate ship was challenging in the best of times. Ship's surgeons and physicians administered to chronic and periodic illnesses, wounds, amputations, toothaches, burns, and other indescribable maladies. The primary person in charge of treatment (and requisite supplies and tools) was the ship's chief surgeon who may have been aided by a second and third surgeon, or aides (recruited from the ship's crew). Their patients were officers, crewmembers, and in the case of slave-ships, the cargo of enslaved Africans. The number of surgeons contracted for a ship depended upon the number of persons to treat and the duration of the voyage. Protocols for treatment were the property of the surgeon as well as the capital tools he employed to do the job. The medical chest, stocked with drugs, ointments, medicaments, and materials, was often purchased and provided by the ship's owner or captain prior to embarking on a voyage, under the supervision of the chief surgeon and an apothecary (according to the *Seaman's Vade Mecum 1707*). Specific responsibilities and duties were expected of the surgeon and his team, as contracted by the ship's owner or captain.

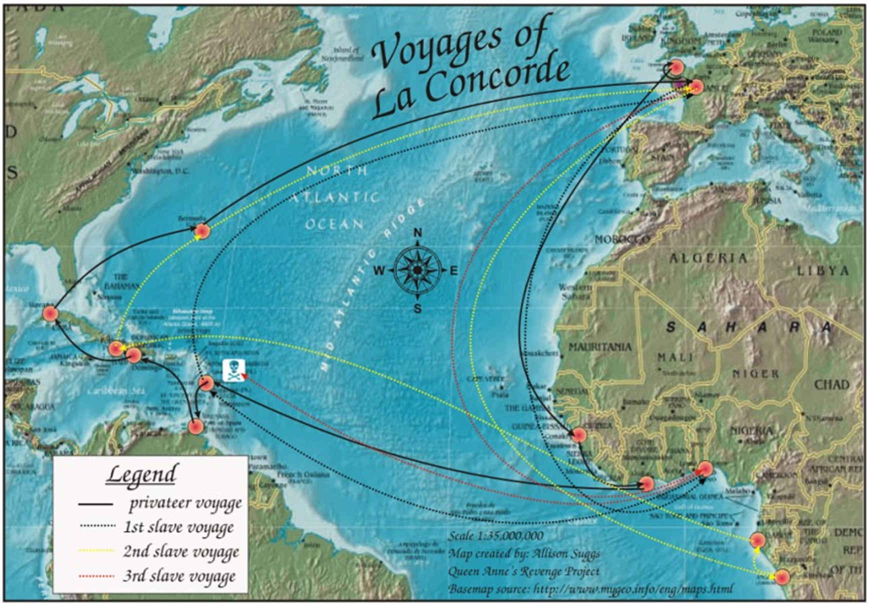

Figure 1. Composite Map of La Concorde transatlantic voyages, adapted from Allison Suggs base map. Note location where Blackbeard took the prize, on the ship's third cycle.

Background History

This brief study focuses on one particular and well-known pirate ship, the *Queen Anne's Revenge (*hence *QAR)*, known better as the flagship of Edward Thatch, or Blackbeard. As a brief background, Thatch and his crew of pirates captured the *QAR* on 28 November 1717 as it performed its third Middle Passage, transporting slaves from Africa to the Americas (Figure 1). Originally known as the *La Concorde de Nantes*, this French slave-ship captained by Pierre Dosset carried a crew of 75, including three surgeons (ranked major, second, and third) and a cargo of 516 slaves (according to manifest records of the 1717 voyage, see Ducoin 2001). Once Blackbeard captured the vessel, he off-loaded most of the slaves and crew, but retained (kidnapped) 10 Frenchmen he felt were critical to continuing his mission of piracy in the Atlantic (Dosset 1718; Ernaut 1718; Moore 2006; Wilde-Ramsing 2009). After six months of pirating, the ship was grounded on a sandbar in Topsail Inlet (today's Beaufort Inlet) about 10 June 1718 during what has been documented as a "slow-wrecking" event which allowed the crew and conscripted passengers to remove whatever portable items could be extracted prior to abandonment (Wilde-Ramsing 2009). Blackbeard and some of his loyal crew fled the scene in a second support vessel, only later to be apprehended at Ocracoke Island by British naval forces commanded by Lieutenant Robert Maynard, sent by Governor Alexander Spotswood of Virginia. Some of the men with him were captured and tried for piracy in Virginia. Others, such as Stede Bonnet, were later caught and put on trial in South Carolina. Court records, eye-witness accounts, and newspaper articles reporting the activities of the *QAR* provide valuable historical data from which to better understand shipboard life. Additionally, original Muster Rolls of 1717 for the *La Concorde* provided names, origins, and duties of the crew members (see Ducoin 2001; Moore 2006). The principal focus of this study addresses life onboard this ship, formerly as a slave-vessel and then as a pirate ship, both for the crew and passengers. Put simply, what were their maladies and how were they treated and by whom?

Since the *QAR*'s discovery on 22 November 1996 in the shallow waters of Beaufort Inlet, the North Carolina Department of Natural and Cultural Resources, in partnership with various other state and national agencies, have completed continuous excavations on about 60% of the site, primarily the stern and mid-ship areas (Wilde-Ramsing 2009; Wilde-Ramsing and Ewen 2012). The artifacts described here as medical equipment and materials are available for study after careful excavation and subsequent conservation of all items from the wreck, done primarily at the QAR Shipwreck Conservation Laboratory, located at East Carolina University's West Campus. During field recovery most large items were piece-plotted *in situ* within their excavation units while smaller items (e.g., mercury droplets and small weights) were subsequently found during field and laboratory processing of each unit's dredge spoil (Figure 2). Before discussing these specialized artifacts, it is beneficial to review the common maladies suffered by pirates and slaves of the early eighteenth century and the documented duties of the ship's surgeons.

Medicine and Diseases of the Day

Medicine in the early eighteenth century was more art than science (Hall 1983:150–151; Moss 1999:20–21; Williams 1986). The dawn of germ theory was unrealized. Diagnosis was often difficult, if not impossible, as the outward expression of symptoms for any given disease would widely vary among different cases. Successive stages of a disorder would also likely be considered separate diseases, as was the case with syphilis (Vallar 2007:6–7; Williams 1986:127–136). In general, symptoms were treated rather than the underlying causes since they were more apparent, while causes were frequently shrouded in mystery. Various disorders were commonly described as "a violet

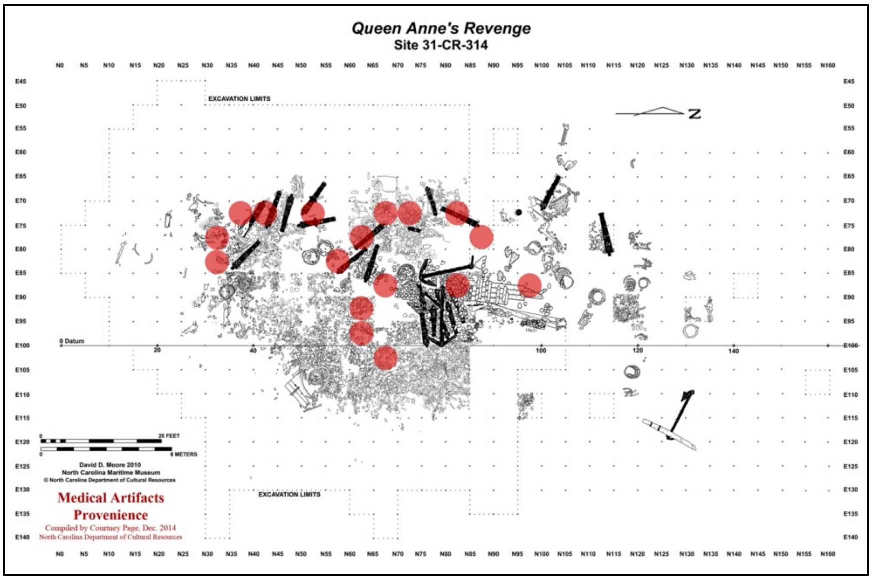

Figure 2. Site plan of *QAR* shipwreck showing key features and location of medical artifacts recovered so far (dots). Adapted from map by David Moore, 2010.

bilious fever", "a grievous pain in the bowels", a "putrid sore throat", or a "gross and flegmatic constitution" (Moss 1999).

Medical philosophy of the day considered that when the body was diseased, it was said to have reached an imbalance in the Four Humors of natural elements—air, water, fire and earth—as indicated by the body's dry, moist, hot, or cold condition, respectively. Such symptoms were considered an imbalance of the humors. The Humors were related to the natural fluids of the body—sanguine (blood), phlegmatic (phlegm), choleric (yellow bile), and melancholic (black bile)—and seated in the heart, brain, liver, and spleen (derived from Claudius Galen's Theory of Humorism, ca. AD 200). Thus the common cures for imbalance were often geared toward "bleed, sweat, vomit, and purge" methods to return the body to balance (Williams 1986; Moss 1999:27–48; Pirates Surgeon n.d.:4). While these traditional practices continued into the eighteenth century, important new advances were occurring which ushered in the Age of Enlightenment (Hall 1983; Kirkup 2006; Moss 1999:222–225). French, German, and British medical practitioners, through experimentation and exploration, raised surgery from a mechanical skill to a science. Early physicians were considered medical philosophers, while surgeons and apothecaries performed the requisite medical tasks.

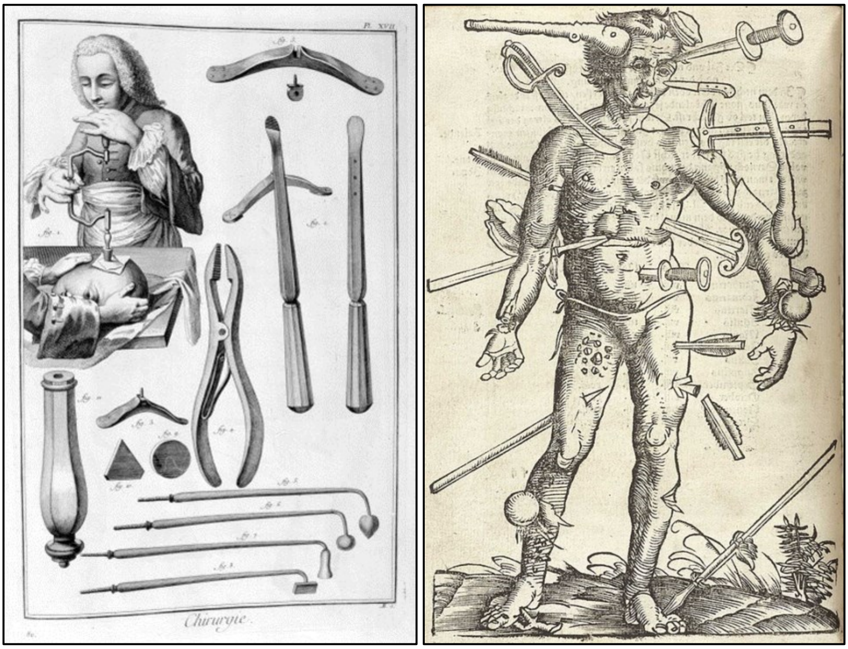

Figure 3. Woodcut illustrations of medical charts and tools: French Surgeon performing trepanation, from *Encyclopédie ou Dictionnaire Raisonné des Sciences des Arts et des Métiers*, by Denis Diderot and Jean le Rond d'Alembert, 1751–1777 (left); and the Wound Man, by Hanz Von Gerdorff, 1517 (right).

Put simply, during the early eighteenth century physicians doctored while surgeons cut (Figure 3).

For the ancient and not-so-ancient mariners, acute diseases such as fevers (e.g., tropical diseases like malaria, yellow fever, and influenza), contagions (e.g., smallpox, diphtheria, strep throat, measles, consumption, and syphilis), fluxes (diarrhea) and dysentery were most common. Bloody flux, commonly known as amoebic dysentery, was a wasting disease. If left untreated, the body became acutely dehydrated. Scurvy, an avitaminosis disease which occurred on most ships, impacted mariners as well as the enslaved Africans on the ships. During this era, the problem with habitually bad health started with poor provisions on board, where maintenance of fresh foods and clean drinking water proved difficult. Most foods were dried and reconstituted, sometimes without fresh water. Scurvy caused the body to rot, creating lethargy and poor blood flow (Figure 4). Lt. Francoise Ernaut (former officer of *La Concorde*) testified (27 April 1718) that Blackbeard was easily able to take their ship because it was understaffed, having lost “16 men to

Figure 4. Illustration of sailor suffering effects of scurvy. By makeup artist Alice Hopkins.

disease and another 36 sick with scurvy and the bloody flux, so that only 21 men remained active to maneuver the vessel." For German sailors and even Captain James Cook, scurvy proved less a problem because they stored and ate pickled sauerkraut which provided critical vitamins in the daily diet. For the other Europeans, it was not until the early 1750s that Scottish doctor James Lind's final experiments discovered the use of citrus fluids to stem the impact of scurvy on long voyages.

The high incident of syphilis (and other sexually transmitted venereal diseases) among pirates and the enslaved Africans has been well-documented through numerous historical accounts. Called The Foul Disease by some, it was called the French Disease by the British and the Italian Disease by the French. At the time, medical practitioners believed that gonorrhea and syphilis were the same illness, with the former being an early state for the latter (Moss 1999:98, 130–132; Pirate Surgeon's Journal n.d.; Pirates of the Caribbean n.d.; Vallar 2007:5–7; Williams 1986:127–129). Regardless, the Foul Disease was a very real life threat to pirate crews, for which the only treatment (not cure) was mercury injected into the male urethra (Figure 5). The refrain "a night with Venus, a lifetime with Mercury" became well known during this

Figure 5. Woodcut, ca. 1497, showing patients with advanced syphilitic pox, and *QAR* syringe and droplets of mercury. Courtesy of NCDNCR QAR Conservation Lab.

period. It may have been the prevalence of this one disease among Blackbeard's crew that prompted him to kidnap and hold for ransom members of Charleston's important families, while he blockaded the port and demanded a medical chest and supplies (22 May 1718). It may also be the primary reason he chose to "retain" the three French surgeons from the captured *La Concorde*. Syphilis, sometimes called "the great imitator", can present itself in four different stages: primary, secondary, latent, and tertiary (Figure 6). First, chancers form on the skin, which may heal leaving pox marks, then six or eight weeks later, the victim would develop flu-like symptoms and a skin rash. After treatment, the symptoms abated and became dormant. The final stage of the disease attacks all bodily systems, causing lameness, blindness, madness, and eventually death (Vallar 2007:6). Among many who chronicled the spread of the disease was La Salle's early journalist, Henri Joutel, who in 1684 described the disease in the Caribbean this way… "the air was bad, the fruit the same, and there are a great many women worse than the air or the fruit" (Bruseth and Turner 2005:7). Visits to the west coast of Africa and the Caribbean kept the disease active throughout the seventeenth, eighteenth, and nineteenth centuries. Another common side-effect of syphilis is urinary tract blockage. Special equipment called a catheter was used to open the channel and remove (if possible) any stones or gravel. While no such implement has yet been found on the *QAR* shipwreck, Bruseth and Turner (2005:103) describe the remains of

Figure 6. Illustrations of advanced effects of syphilis: stages of lesions on legs from wax museum (Germany 1910–1920), and medical illustration of facial pustule crustaceous lesions by Christopher D'Alton, 1855.

a silver catheter (4 ½ inches long) found on La Salle's shipwreck *La Belle*, along with a hollow pewter rod believed to be used as a surgical irrigator or siphon. Other medical elements found on *La Belle* will be considered later.

Finally, part of every pirate's milieu were the periodic wounds (from guns and bladed weapons), burns, splinters, bone breaks, and concussions which resulted from warfare on the water. Cleaning wounds first required styptics to stop the bleeding, followed by cleansing solutions, and then more medicaments to ward off "mortification" (gangrene) or infection. A tenaculum was used to pierce and draw together arteries for tying off. Suturing required a scalpel or sharp knife to first remove damaged tissues, then a retractor for separation. Finally, a threaded needle (typically made of silver, brass, or later steel) and scissors were used to sew up the wound. Extractors were used to remove lead shot from the wound. Pliers (and later tweezers) were used to remove sharp objects like wooden splinters or nails and spikes contained in langrage cannon shot. In the case of a severe wound, amputation was practiced in an effort to save the victim's life. Breaks were set with splints and plaster compounds. Burns were treated with unguents and salves.

Medical Practitioners on Pirate Ship and Slavers

It has been stated that "Privateering vessels were many, but physicians and surgeons were few" (Wilbur 1984:78–79). If no surgeon was on-board, the captain or one of the officers was responsible for

Figure 7. Example of an eighteenth-century medical chest with compartments and equipment. Perishable items (e.g., compounds, fabrics, liquids) are not shown.

administering to the wounded or sick. Given that most medicine chests contained recipe books and vials of chemicals numbered in order to follow a recipe, anyone who could read was pressed into service to aid the afflicted (Figure 7). During battle¸ the surgeon and his aides would prepare a place (often a table made of planks) near the aft hold to perform triage and later surgeries for the injured. The surgeon would lay out his capital instruments and supplies as the battle began. Buckets of clean water would also be located nearby. Compresses, needles, ligatures, and splints were required for bodily repairs, along with wine, brandy, vinegar, grog, and punch to dull the patients' pain. After battle, the surgeon would inform the captain on casualties and the nature of wounds, and report on those able to report for duty and their medical status. The surgeon was also required to report any potential contagions on board so the captain could minimize exposure to others.

Slave-ships were required to have a surgeon on board to inspect and protect the enslaved cargo as well as provide treatment for the crew and officers. Records from *The Seaman's Vade Mecum of 1707* (1996 translation by Lars Bruzelius) outlines the duties of the captain, the surgeon and his aides, as well as who was responsible for medical equipment and supplies:

1. To practice the art of healing by manual operations; treat wounds, fractures, deformities or and disorders by surgical means.
2. The Chief Surgeon must be found capable by two Master Surgeons before boarding ship.
3. The Shipowner must provide the (Surgeons') medical chest, stocked with drugs, ointments, medicaments and other supplies used to treat the sick persons during a voyage. The Surgeon must provide Instruments of his Profession.
4. The Medical Chest must be inspected by Master Surgeon & the Apothecary three days prior to departure, *or be fined 30 Livres and Damages of Demurage.*
5. The Ship Master must verify the Surgeon's certificate (Copy of Attestions) and approve contents of his Medical Chest, *or be fined 50 Livres.*
6. The Surgeon of the ship is to inform Ship Master of any contagions on board in order to take Measures accordingly.
7. The Surgeons are not to receive payment or favors from sick or wounded Mariners in Service to the Ship, *or they will be fined.*
8. The Surgeon is NOT TO LEAVE [emphasis author's] the Vessel in which he engaged before the voyage is completed, or *pay a fine of 100 Livres and Damages to Master.*

Contract provision #8 is an important one to consider and may shed new light on the "retention" or "kidnapping" aspect of the three French surgeons who remained on board the *La Concorde* after Blackbeard and his crew commandeered it.

Two major historical sources provide important information about the identity and origin of the *La Concorde* surgeons and aides. The first is the official 1717 Muster Roll prior to departure from Nantes, and the second is a court deposition by the former Lt. Ernaut, taken several months after his successful return to France in April 1718. As Moore (personnel communication 2014) has pointed out, there are discrepancies between the two documents beyond the spelling of their names (Dubou vs. Dubois, and Ernaud vs. Ernaut). What is equally important is the amount paid to each of these specialists. In Ernaut's post-capture testimony, no mention is made of Nicholas Gautrain, the Surgeon's Aide (or Third Surgeon), though historical records reveal he did make it back to France. Instead, Ernaut recalls the Third Surgeon as Claude Deshayes, who is shown on the 1717 Muster as a gunsmith. It may be that he was pressed into service as a medical attendant when many others of the crew fell sick (which could also imply that he was literate and could read instructions or medical recipes); or, Ernaut may have simply misremembered who did what at the time of capture and suffered a little PTSD from the capture and journey back home. Ernaut's testimony, recorded in the 1717 Muster Roll, is as follows:

1. Surgeon Major: Jean Dubou (or Dubois) from St. Etienne, paid 50 livres.
2. Second Surgeon: Marc Bourgneuf of La Rochelle, paid 30 livres.
3. Third Surgeon: Claude Deshayes, shown as a gunsmith on the muster, paid 22 livres.
4. Surgeon's aid: Nicholas Gautrain, listed on Muster, not mentioned in court records by Ernaud, 12 livres.

Not much else is known at this time about these men and their lives before or after the encounter with Blackbeard. Research by Moore (2006) and others indicate that all four men made it back to France and were not tried because they had been "forced by pirates" to stay onboard as described in their subsequent court depositions.

Medical Equipment

Given the makers' marks on most of the medical equipment thus far found on the *QAR* shipwreck, it is likely that these items represent the "capital equipment" or property of the French Surgeon Major and his aides, and not what Blackbeard stole from Charleston or other prizes (Figure 8). Among the essential tools of a surgeon (or apothecary) was a mortar and pestle used to grind ingredients and prepare compounds for treatment of the sick or wounded. This cast-brass tool set with no discernible marks was found in the mid-ship area of the *QAR* wreck. The mortar measures 4 ½ inches in height and 5 inches in diameter.

Ceramic galley pots, represented by these faience sherds, were filled with unguents, salves, balms, and potions, and kept onboard (Figure 9). The overall pinkish paste and general shape of this pot suggests a French origin, ca 1700–1750. Galley pots with a "greasy paste" and a "foul odor" were also recovered from the excavations of *La Belle* shipwreck, as reported by Bruseth and Turner (2005:99). Galley pots, also called apothecary jars, were made with flat bases for stability and were often covered with cloth, secured to the rim with a string.

Early in the *QAR* excavations, a pewter urethral syringe was found and the maker's mark identified as a Paris trademark (Lusardi 2006) (Figure 10). The particular angled funnel or nozzle on this syringe identifies it as a urethral type. The distinct maker's mark on the plunger points to St. Laurent Chatelain (a martyred saint who was grilled, thus

Figure 8. The *QAR* mortar and pestle (courtesy of NCDNCR) and a seventeenth-century painting of a Spanish apothecary at work with mortar and pestle. From the Wellcome Collection.

Figure 9. Example of whole galley pot from the Museum of London Collection, ca. 1680s-1750s and sherds of galley pot from the *QAR* shipwreck. Courtesy of NCDNCR QAR Conservation Lab.

the grate icon). The date of manufacture is 1707 with a letter P (for Paris) (Phillipe Boucard, personal communication 2010). After conservation, chemical analysis of the inside of this syringe yielded traces of mercury, which was the popular treatment for syphilis at the time among sailors, pirates, and enslaved Africans. Mercury could also be applied topically in ointment forms to chancres and exposed sores or

Figure 10. Close up of *QAR* urethral syringe and maker's mark; drawings of marks by Phillipe Boucard (2010). Artifact photos courtesy of NCDNCR QAR Conservation Lab.

blisters. Mercury did not, however, provide a cure. In the end it caused lead-poisoning.

To measure out compounds for medicines, weights were commonly found in a surgeon's medical kit, and they also were used by merchants to measure precious metals Figure 11). Two sets of nesting weights have been recovered from *QAR* excavations. The basic principal behind these weight sets was the compact assemblage of graduated cups that fitted tightly together into each other, with the largest "master cup" forming the outer base and often having a hinged lid to keep other smaller cups intact. The weight of the largest cup was equal to the sum of all the smaller cups, and the second largest cup weighed the total sum of all

Figure 11. Group and individual photos of *QAR* nesting weight set with maker's marks. Photos courtesy of NCDNCR QAR Conservation Lab.

smaller cups, etc. The graduated weight system continues down to the final weight which was a solid disc. Historian Diana Crawford-Higgins (from the *Mary Rose* shipwreck project) commented on one *QAR* set's fleur-de-lis marks as possible French in origin. The numbers 1, 2, 4 and 8 appeared stamped on the interior base of these cups, along with multiple fleur-de-lis stamps. Though the fleur-de-lis symbol became the nationalistic cultural symbol for France (since the thirteenth century), its origin dates to the Middle Ages and early Christianity. Finally, the touchmark on the master cup (a rectangular cartouche of initials N and C, separated by a dot) has been further identified as the town of Montpelier, France, the place of manufacture (Kisch1965:155–159).

After 1717 the ship's surgery would also have included a screw tourniquet invented by French surgeon Jean Louis Petit, used to stem the bleeding during amputations (Figure 12). Two pairs of brass set screws have been recovered from the *QAR* shipwreck and may have served such a purpose. The set screws may also be part of a navigational table used to secure maps to a flat surface. Research continues on these special fasteners. Additionally, the woven cloth cinch and padding of a tourniquet likely would not survive 300 years of sea water. To date, no amputation saws have been identified from the *QAR* shipwreck assemblage. If made of iron, they may not have survived the saline conditions of the ocean floor.

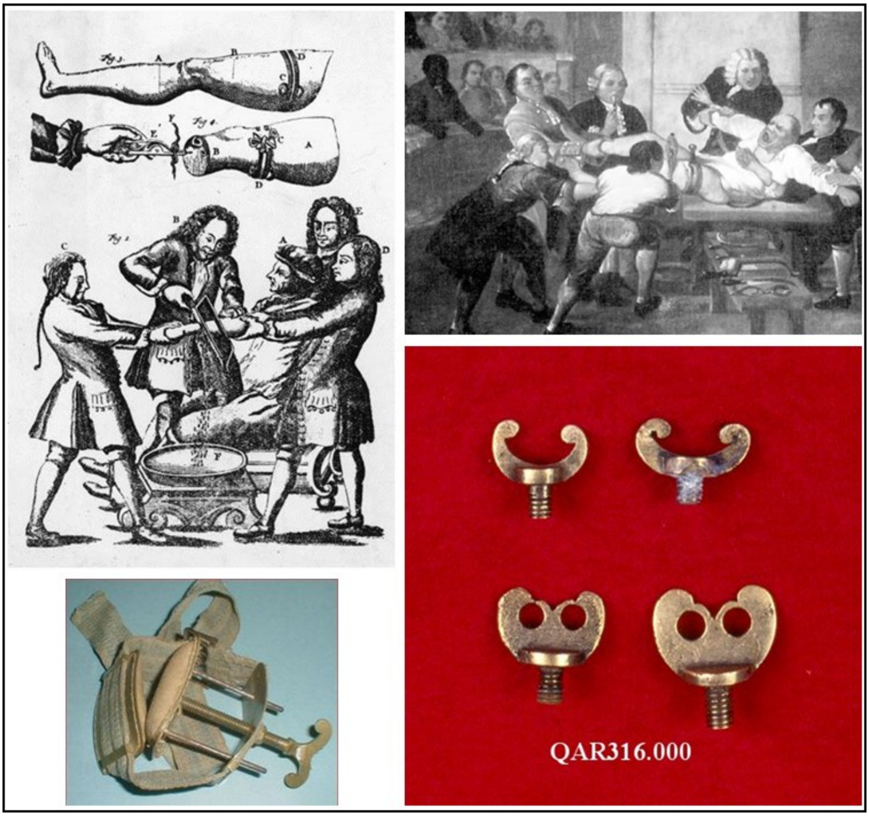

Figure 12. Period illustrations of amputations procedures (1750 Hulton Archives/Getty Images) and an intact example of an eighteenth-century French tourniquet, beside brass set screws found on the *QAR*. Artifact photos courtesy of NCDNCR QAR Conservation Lab.

A universally common treatment for fluxes, fevers, syphilis, and intestinal disorders (such as constipation and colic) was the use of a pump clyster (Moss 1999:21, 34–35, 73–76; Kirkup 2006:14, illustration of 1617 clyster, 228–229). This specialized device was used to deliver medical enemas to the afflicted, in order to remove blockage, relieve ailments, cleanse the colon and inject medicines for quick absorptions. Depending on the nature of the ailment (e.g., fevers, fluxes, constipation, colic, and syphilis), various compounds and concoctions were mixed and administered via clystering. This medical procedure has been documented in use for many centuries, as seen in a fifteenth-century woodcut of an enema in process (Figure 13). The remains of three pewter clysters were found in the stern region of the *QAR* shipwreck. The first is represented by parts that include a cylindrical chamber with a threaded

Figure 13. Fifteenth-century painted wooden tableau, from Brugges Museum, of a patient receiving a medical enema using a pump clyster. Note privacy cubicle and access window.

top, a pump-handled plunger at one end, and a tapered nozzle at the other end (Figure 14 shows the *QAR* example with a complete nineteenth-century clyster provided by Boucard 2011). A second pewter clyster, shown in Figure 15, was identified by its maker's mark as being made in Rouen, in the year 1698 (Phillipe Boucard, personal communication 2011). A second mark on this piece represents a duck and is symbolic of the CANU family of pewterers, who operated between1659–1701 (CANU or cane is the French word for duck).

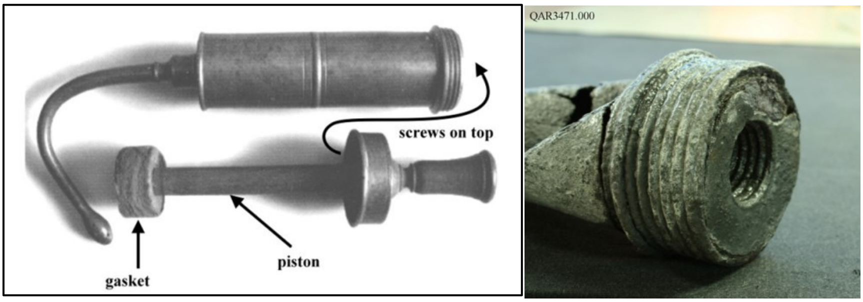

Figure 14. Close up of *QAR* pump clyster piece (courtesy of NCDNCR QAR Conservation Lab) and photo of a nineteenth-century complete clyster with parts labeled.

Figure 15. Close up of second *QAR* pump clyster cylinder with maker's mark and close up illustrations of marks by Philipe Boucard. Courtesy of NCDNCR QAR Conservation Lab.

Bloodletting was a common practice to restore the body to balance of the humors and dates back to ancient Greece, Egypt, and eventually into Europe; it persisted well into the early twentieth century. This practice was accomplished by the application of live leeches (also known as sanguine suckers) to the patient's skin, allowing the critter to engorge on the blood and then removing it to be stored until next time. Or, the

Figure 16. Crushed pewter porringer from the *QAR* shipwreck, possibly used as a bleeding basin by surgeons, along with period woodcut of bloodletting underway.

blood could be "let" by venesection, the practice of slicing into a vein or artery to allow blood to flow, often into a container of some type. Specially designed lancets and scarificators were created to slice into the vein. Though it was thought to release blood pressure (by reducing blood volume), in most cases the historical use of bloodletting was harmful (if not fatal) to the patient. Early paintings and woodcuts often show the patient reclined or seated and the surgeon standing as the blood from an arm or leg gushes into a container (Figure 16). A crushed pewter porringer recovered during *QAR* excavations may have served various purposes, including a basin for bleeding. Once bowl-shaped, the object had been purposefully crushed over a round cylindrical object exactly five inches in diameter, suggesting the porringer's final use as a cover or lid of a food canister (as evidenced by the rat gnaw marks on its rim). Once cleaned and conserved, a maker's mark and owner's initial were discovered on this double-handled bowl. The maker's mark on the handle is an I M separated by a fleur-de-lis set within a cartouche. On the exterior base, the initials D V appeared (double stamped). French pewter specialist Boucaud (personal communication 2011) identified the porringer as similar to types found in southern France with scrolled doubled handles and touchmarks, dating ca. 1675 to 1700. The cable-like motif visible on the footring and rim were identified as recurrent features of porringers made in the town of Metz, France since about 1600.

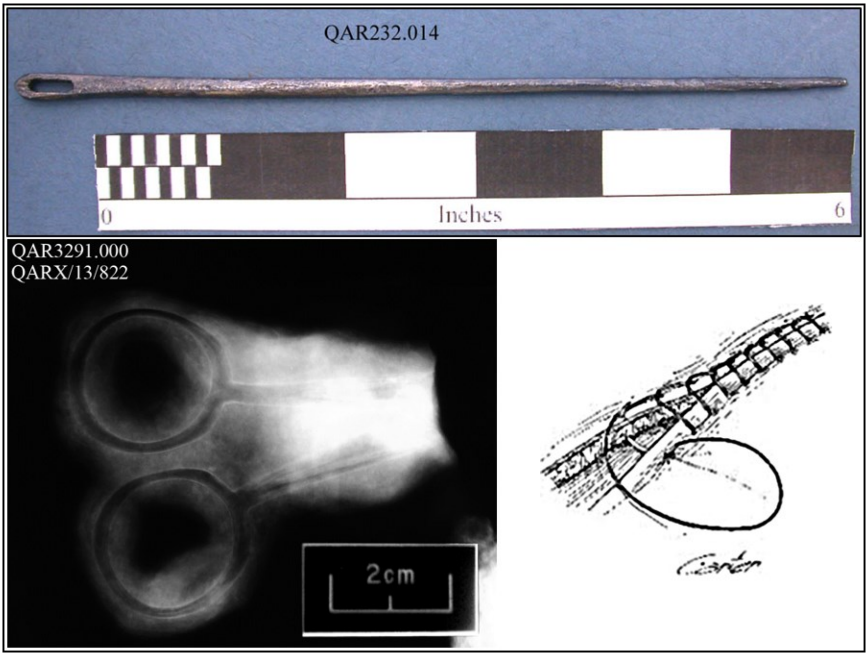

Figure 17. Photograph of silver sail/suture needle and X-ray image of iron scissors (courtesy of NCDNCR QAR Conservation Lab), and illustration showing standard suture pattern.

After venesection or bloodletting, and for most open wounds and amputations, a threaded needle and scissors were required to close the wound or suture. Ligatures or waxed shoemaker's thread was used to compress the wound and suture the opening. Topical ointment and salve would be used to dress the wound before bandaging if possible. Suturing needles came in a variety of shapes and sizes (Kirkup 2006:175–181). Early needles were made of thorns and animal quills or small bones (such as the baculum of a small mammal and fish spines). A silver needle (Figure 17) found on the *QAR*, measures five and one-half inches long and may have been part of a surgeon's kit or used as part of a sailmaker's kit. Its composition of precious metal suggests the former while its overall length suggests the latter use. Whether surgeon or sailor, a silver needle would not rust or corrode while in the marine environment. In addition, the eyelet handles of a pair of iron scissors were found in concretion and may have belonged to either sailmaker or surgeon as well, used to snip loose threads or cut away sections of cloth.

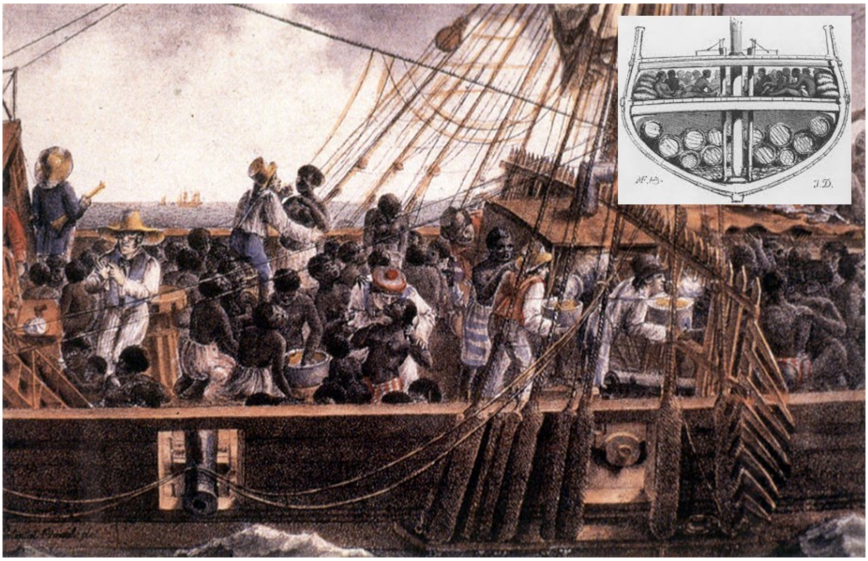

Figure 18. Nineteenth-century painting of Top Deck of French Slave Ship, during Middle Passage, showing crowded conditions and various activities of crew and slaves.

Mortality Trends of Crews and Slaves

Before its capture, *La Concorde* left the African coast on Oct 2, 1717, headed for the Antilles. On board it carried 516 slaves for sell in the Caribbean. The enslaved Africans were alternately kept in the lower decks, tightly packed on pallets or racks, often chained or shackled, with minimal food, fresh water, or air (Figure 18). Men and women were separated by partitions or bulkheads. On occasion, slaves would be brought on deck to perform tasking, receive punishment, for entertainment, or for inspection. Given the abysmal conditions, mortality rates of the slaves were significantly high. The ship's surgeons were also charged with routine inspections of the slaves, as the 1717 letter of William Baillie testifies: "our surgeons examined them well in all kinds, to see that they were sound wind and limb, making them jump, stretch out their arms swiftly, looking in to their mouths to access tooth decay and judge age." Before final sale, the slaves were shaved close and "sleeked with palm oil." Surgeons would inspect the slaves for any lesions, wounds, or signs of syphilis or other contagions, and were often forced to examine the "privates of both men and women." Surgeons were also forced to brand the slaves with the ship's logo as property (see Moore 2006 for more discussion on branding of slaves), often marking them on the shoulder or thigh with a mark or lettering, apparently women

Table 1. Comparative Mortality Rates of Enslaved Africans and Crew Members during the Three Voyages of the *La Concorde* (extracted from various historical records, court testimonies, and ship's manifests).

Year	Enslaved Africans	Officers and Crew
1713	14% (55 of 418)	8% (5 of 63)
1715	10% (31 of 331)	13% (9 of 67)
1717	8.8% (455 of 516)[1]	21% (16 of 75)[2]

[1] 61 slaves died in transit, Blackbeard took 60, Dosset transported 374 to Martinique, and others he reclaimed by their "ship's mark" or brand.

[2] Some members of the crew were taken by pirates, while others made it back to France.

not "burnt too hard." The court testimony of the former captain Pierre Dosset (1718) seems to confirm this routine practice, as he mentions later reclaiming some slaves from the island of Martinique where they were dropped off by Blackbeard, by "recognizing their ship's mark"…likely an LC for *La Concorde* (as Moore 2006 speculates).

Eye-witness accounts of Blackbeard's capture of the *La Concorde* and subsequent court records of the crew provide some interesting statistics on the mortality rates of the enslaved Africans and crew members during the three recorded voyages of this slave ship. The ship's muster records provide data on the number of officers and crew who set sail out of Nante on each trip (Table 1). And on the final 1717 voyage, testimony indicated that numerous crew members died and many others were severely ill, leaving the ship understaffed which made them easy prey for pirates (Ernaut 1718). As for the slaves, Blackbeard is said to have retained 60 of them, while he allowed Dosset to transport 374 to Martinique to off-load or sell. That would total 434 slaves of the original 516 who left from Africa, or a mortality rate of 8.5%, much less than that of the crew, at 21%. Additional in-depth studies of the mortality rates of slaves and crew on the final voyage of this ship are underway and should provide more details.

Another follow-up study to this initial research on medical equipment on board the *Queen Anne's Revenge* will be to compare the ship's assemblage with other shipwrecks of the period (merchants ship, slave ships, naval ships, etc.). Figure 19 provides a summary comparison of medical equipment from the *QAR* with those of *The Whydah* shipwreck of 1717 (lost in a hurricane near Cape Cod) and the French Navy vessel *The Machault* (lost ca. 1757). As work continues on the *QAR* shipwreck, excavation of the remainder of the vessel from mid-

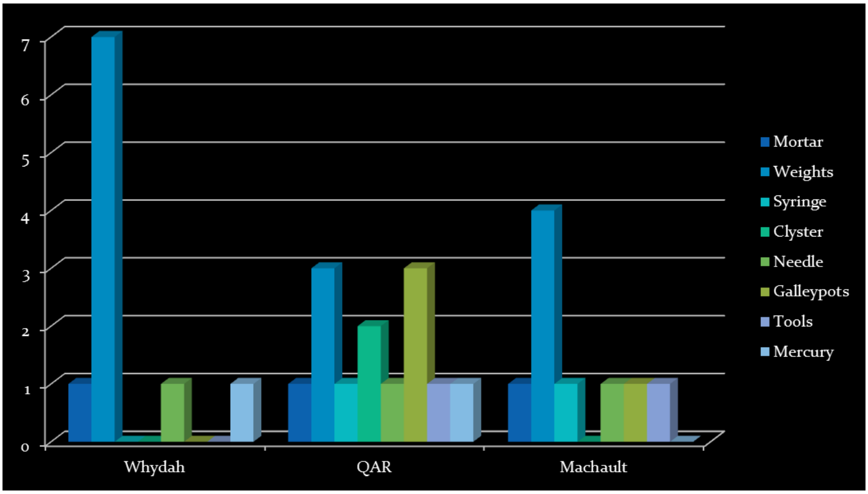

Figure 19. Summary chart of medical equipment found on the *QAR (1718)*, the *Whydah* (1717), and the *Machault* (1760) shipwrecks.

ship towards the bow will be concluded, along with laboratory processing of the concretions off the site; these in tandem should increase the known assemblage of medical equipment and provide more answers to life and death on the *QAR*.

Notes

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ARCHIVAL EXCAVATIONS FROM DUSTY FILE CABINETS, PART I: UNPUBLISHED ARTIFACT PATTERN DATA OF COLONIAL PERIOD HOUSEHOLDS, DEPENDENCY BUILDINGS, AND PUBLIC STRUCTURES FROM COLONIAL BRUNSWICK TOWN

by

Thomas E. Beaman, Jr.

Abstract

There is a wealth of potentially useful data from excavations conducted during the 1950s, 1960s, and 1970s at eighteenth- and nineteenth-century non-native historic sites in North Carolina. Artifacts from many of these excavations were either never cataloged, were cataloged but never tallied, or were reported in either abbreviated or limited form in technical reports. This study, divided into separate parts due to its length, endeavors to bring this data out of the archival files and present quantitative artifact profiles from these early excavations. It is hoped that these profiles will provide comparative data for new excavations and will be used in larger regional studies of households, dependency buildings, and public structures. This first part of the overall study focuses on the artifacts from eighteenth-century structures at Colonial Brunswick Town, excavated by Stanley South between 1958 and 1968.

Beginning in late 1995, my new job with the North Carolina Department of Transportation afforded me the opportunity to return to my native state and investigate the geographic diversity of historic period sites from various time periods and cultural groups. The one thing I quickly noticed about the sites and collections was that despite a wealth of non-native historical archaeology conducted in North Carolina during the 1950s, 1960s, and 1970s, very little, if any, comparative artifact data existed. Technical reports of that era largely dealt with traditional history and excavation details with barely a mention of artifacts. Only a few exceptions occurred when the artifacts were extremely unusual, such as bone Mahjong tiles or a brass penknife embossed with the Islamic *Shahadah*; yet these were treated more as unique finds, and garnered little contextual or cultural interpretation. One notable exception to this paucity of artifact use was Stanley South, who analyzed ceramics and pipe stem bore diameters to calculate mean dates for the occupation periods of Brunswick Town. This is not to say that archaeologists were unaware of the importance of documenting artifact assemblages, but they apparently did not rely heavily on them for interpretation or inclusion in reports, as modern practice and, in some cases, regulation requires.

An archival search for more information about such unpublished collections led me to dusty file folders in rarely accessed file cabinets. These were primarily the files of the former Historic Sites Section Archaeology Branch, which was incorporated into the Office of State Archaeology (OSA) in 2001. These cabinets contained the complete artifact catalogs for many of these early investigations, but often without quantitative totals. I was given permission to copy these artifact catalogs with my intent to produce artifacts tallies where possible for use as comparative data. My first success was using tallied artifacts from the excavation of Russellborough, the governors' house ruin at colonial Brunswick Town, for high-status comparison to the assemblage excavated from 1952–1954 at Tryon Palace, a contemporary governors' residence in New Bern (Beaman 2001). Having had some success here, I continued this practice with other ruins from Brunswick Town, and then with other colonial towns and sites.

To craft these comparative artifact profiles, I chose the Carolina Artifact Pattern format, a method of pattern recognition and comparison involving functional groups and classes of artifacts devised by Stanley South (1977). There are several methodological strengths that led to choosing this format. First, it provides a standardized template by which to conduct comparative analyses of sites. As intended by South, this standardization allows comparisons to be made with other British Colonial sites analyzed by the same method. Another strength is that it can be modified or expanded, depending on researchers' questions or time period of a material assemblage. While most sites in this study are from eighteenth-century contexts, some also contain nineteenth-century components, from which the temporal diversity of material culture required slight modifications or categorical additions to the Carolina Pattern format. Some researchers may reclassify categories into different groups as well, such as the Colonoware (or "Colono-Indian Ware") and Stub-Stemmed Pipes classes into the Ceramics and Tobacco Pipe groups, respectively, instead of their original placement within the Activities Group. Obviously, the more modifications that are made to the basic pattern, the more a data set will become less comparable to other sites presented in the original Carolina Artifact Pattern format. A third strength is that the Carolina Artifact Pattern does not rely on stringent contextual information. The lack of specific contextual information of excavated artifacts makes comparison, hypothesis testing, and potential explanations for pattern irregularities still possible on an intersite level. This is especially helpful when excavations records are not totally clear, are incomplete, or are missing altogether, as is the case with some sites presented in this study.

In many cases, some of the artifacts recovered would not fit into the groups and classes, or they had been sampled and not completely retained during the excavation; these were not included in these profiles. Such artifacts include common building materials, such as bricks whole and fragmentary, ballast stones, mortar and wood fragments, plaster, charcoal, unidentified artifacts (such as melted glass), and prehistoric materials not attributed to historic-period collecting behavior. Modern artifacts (post ca. 1950) were omitted as well. Artifacts not included in the Carolina Artifact Pattern format are specified in the description of each structure accompanying their artifact profile, so their presence is accounted for and may be incorporated by archaeologists with more specific research questions that would involve such materials. The collections for these artifacts, largely housed in the Office of State Archaeology Research Center in Raleigh, were regularly consulted for questionable identifications and totals of specific artifacts.

Most importantly, the conversion of these artifact assemblages into Carolina Artifact Pattern profiles was done to make previously unavailable or limited reported data more accessible to the archaeological community, and not to question or challenge any previously reported site-specific interpretation(s) or to single out any archaeologist or their work from which artifact data was not reported.

Brunswick Town

The specific data sets that are the focus of this study are from Stanley South's excavations at Brunswick Town between 1958 and 1968. What can be said about the late Stanley South that hasn't been said before, either by himself or others? My students would likely use the term "rock star" to describe him as an archaeologist; I prefer to think of him more as a modern Diogenes whose nomothetic lantern of science has guided the theoretical development of our discipline for decades. As observed by Julia King (2002:xiv), "South's work put the archaeology of the Colonial South on the map, although more archaeologists were interested in South's methodology than in Brunswick Town's past." King's observation remains true today, as his work on pattern analysis is still required reading in most graduate programs.

Table 1. Brunswick Town Architectural Features Excavated by Stanley South.

Year	South Identification Number (1962)	Site Number With Lot and Lot Component Number	Name of Excavated Feature
1958	N7	31Bw376**78*1	Courthouse
	S10	31Bw376**29*1	Nath Moore's Front
1959	N1	31Bw376**120*1	Jones-Price House
	N4	31Bw376**77*1	Newman Kitchen
	N22	31Bw376**8	"Gaol" (Jail)
	S2	31Bw376**75*1	Roger Moore House
	S7	31Bw376**71*2	Hepburn-Reonalds House
	S15	31Bw376**28*3	Judge Maurice Moore's Kitchen
	S18	31Bw376**71*3	McCorkall-Fergus House
1960	S25	31Bw376**27*3	Public House and Tailor Shop
1961	N41	31Bw376**77*2	Newman-Taylor House
1962-1963	S11	31Bw376**28*1	Judge Maurice Moore House
	S20	31Bw376**28*4	Judge Maurice Moore's Smokehouse
1966	N50	31Bw556**1	Russellborough House
	N51	31Bw556**2	Russellborough Kitchen
	S1	31Bw376**1	Saint Philip's Church
1968	N14	31Bw376**40*1	Richard Quince House
	N15	31Bw376**40*2	Quince Kitchen
	S8	31Bw376**31*2	James Espy House
	S9	31Bw376**30*1	Leach-Jobson House
	S28	31Bw376**29*2	Edward Scott House

That said, what about the past of Brunswick Town? As shown in Table 1, during his decade as Site Manager/Archaeologist for Brunswick Town, South intermittently excavated: 12 colonial household ruins and their surrounding yards, some of which doubled as taverns or stores; five dependency buildings, including four kitchens and one smokehouse; two public structures of the "gaol" and courthouse ruins; and the interior of St. Philip's Church. The locations of these areas of excavation are illustrated on the 1769 Sauthier map of Brunswick Town shown as Figure 1. The history of excavations from the colonial town site have been well documented by Beaman et al. (1998) and by South (2005, 2010) himself. However, the results of these investigations are less known and largely unreported. Combined, South's investigations of these residences, ancillary structures, and public buildings produced a total of 230,286 individually quantifiable artifacts. An additional 3,593 artifacts were not included in the counts, such as bulk fragments of brick, ballast stone, roofing slate, Native American prehistoric ceramics, and unidentifiable pieces of metal (usually iron). These figures do not

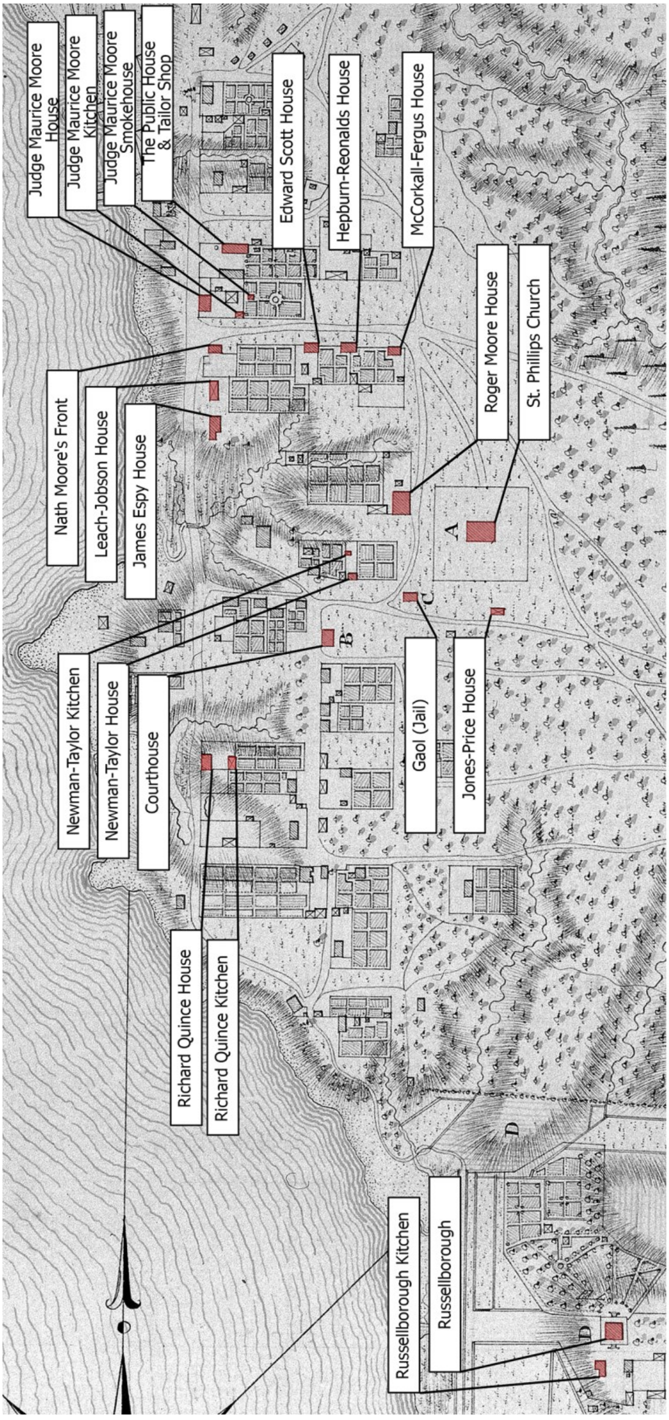


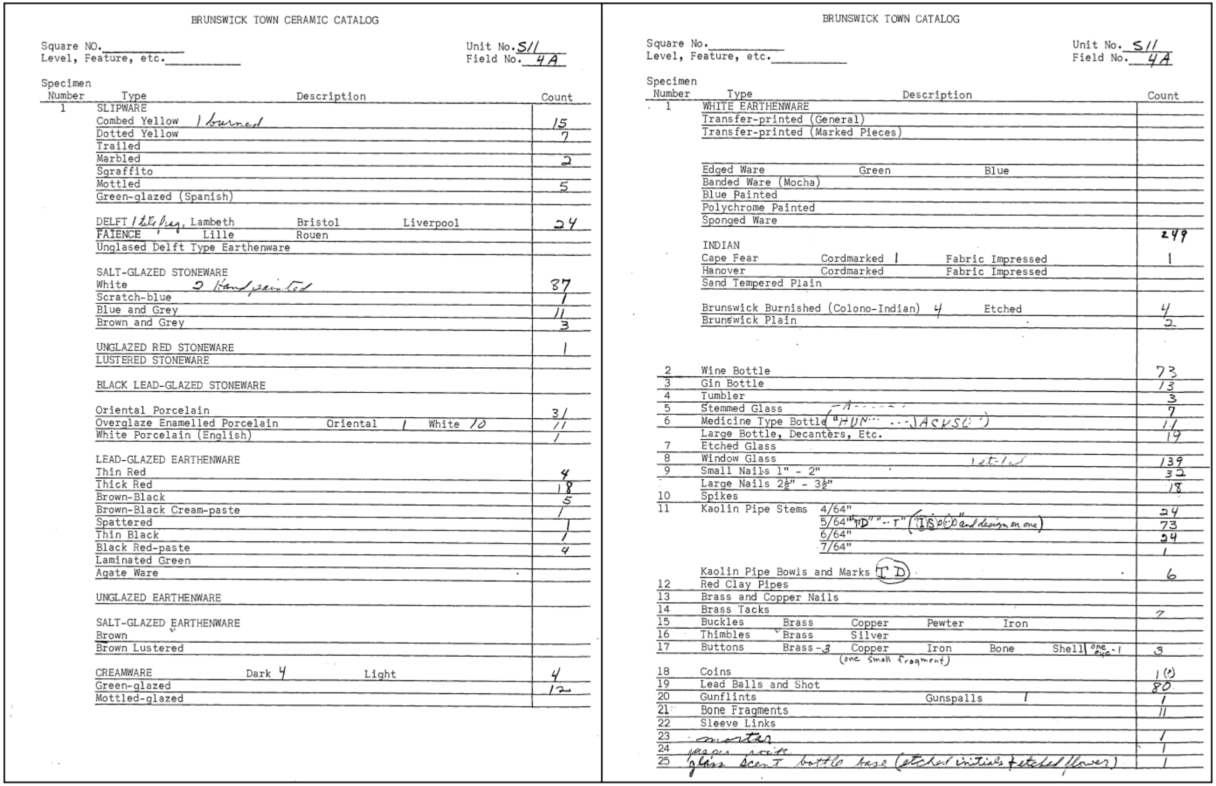
Figure 1. Excerpt of the 1769 map of Brunswick Town by Claude Joseph Sauthier that shows the households, dependency buildings, and public structures excavated by Stanley South between 1958–1968.

include the many other locations around Brunswick Town and accompanying Fort Anderson in which he conducted small test investigations, the bake oven at Prospect Hall, or the two colonial wells at the Judge Maurice Moore and Leach-Jobson residences. Also not included are the George Moore House and Wooten-Marnan House assemblages, the two most recent colonial households defined and excavated by the William Peace University archaeological field schools, which are covered in other studies (Gabriel 2012a, 2012b, 2013; Beaman and Melomo 2016).

Despite being recognized later for artifact pattern analysis, South conducted these investigations for public site development in the pre-CRM era, largely in isolation with a limited, archaeologically trained crew of seasonal shad fishermen paid by the hour. His excavation reports did not include any artifact tallies, though some contained limited discussion of select artifacts. Even in his most recent, final work on Brunswick Town, South (2010) included many artifact images with some description, but as it was designed for the public, compilations of artifact tallies were not relevant to the historical and excavation stories being told. Still, he produced tallies and published results for three selected households at Brunswick Town in his seminal tome *Method and Theory in Historical Archaeology* (1977). These were for Nath Moore's Front and the Public House and Tailor Shop, two of the sites that formed the basis of the Carolina Artifact Pattern, and the Hepburn-Reonalds House, one of the sites used to evaluate it.

Process and Problems: The Artifacts versus The Artifact Catalog

With the assistance of his wife Jewell, Ellen Demy, and his crew, South completed catalog forms for many of his earlier investigations at Brunswick Town. An example of the standardized catalog form used, with quantitative totals and some qualitative descriptions, is shown as Figure 2. However, fully quantitative artifact inventories for areas excavated after 1962 were not completed until 1971, after he had moved to South Carolina for work. Prior to this move, the use of archaeology for development of the historic park had been fully realized, and South and his crew moved to extensive investigations toward the development of Fort Fisher and Bethabara as historic parks, and other state-owned and non-state owned historic sites. As such, excavations at Brunswick Town tapered off after 1961, and the investigations elsewhere took priority over the quantitative documentation of the recovered artifacts on the standardized catalog sheets.



BRUNSWICK TOWN CERAMIC CATALOG

Square NO.______ Unit No. S11
Level, Feature, etc.______ Field No. 4A

Specimen Number	Type	Description			Count
1	SLIPWARE				
	Combed Yellow	1 burned			15
	Dotted Yellow				7
	Trailed				
	Marbled				2
	Sgraffito				
	Mottled				5
	Green-glazed (Spanish)				
	DELFT 1 etching, Lambeth	Bristol	Liverpool		24
	FAIENCE " " Lille	Rouen			
	Unglased Delft Type Earthenware				
	SALT-GLAZED STONEWARE				
	White	2 handpainted			87
	Scratch-blue				1
	Blue and Grey				11
	Brown and Grey				3
	UNGLAZED RED STONEWARE				1
	LUSTERED STONEWARE				
	BLACK LEAD-GLAZED STONEWARE				
	Oriental Porcelain				31
	Overglaze Enamelled Porcelain	Oriental 1	White 10		11
	White Porcelain (English)				1
	LEAD-GLAZED EARTHENWARE				
	Thin Red				4
	Thick Red				18
	Brown-Black				5
	Brown-Black Cream-paste				1
	Spattered				1
	Thin Black				1
	Black Red-paste				4
	Laminated Green				
	Agate Ware				
	UNGLAZED EARTHENWARE				
	SALT-GLAZED EARTHENWARE				
	Brown				
	Brown Lustered				
	CREAMWARE	Dark 4	Light		4
	Green-glazed				12
	Mottled-glazed				

BRUNSWICK TOWN CATALOG

Square No.______ Unit No. S11
Level, Feature, etc.______ Field No. 4A

Specimen Number	Type	Description					Count
1	WHITE EARTHENWARE						
	Transfer-printed (General)						
	Transfer-printed (Marked Pieces)						
	Edged Ware	Green	Blue				
	Banded Ware (Mocha)						
	Blue Painted						
	Polychrome Painted						
	Sponged Ware						249
	INDIAN						
	Cape Fear	Cordmarked 1	Fabric Impressed				1
	Hanover	Cordmarked	Fabric Impressed				
	Sand Tempered Plain						
	Brunswick Burnished (Colono-Indian) 4	Etched					4
	Brunswick Plain						2
2	Wine Bottle						73
3	Gin Bottle						13
4	Tumbler						3
5	Stemmed Glass						7
6	Medicine Type Bottle ("HUN... JACKSO")						11
	Large Bottle, Decanters, Etc.						19
7	Etched Glass						
8	Window Glass	etched					139
9	Small Nails 1" - 2"						32
	Large Nails 2½" - 3½"						18
10	Spikes						
11	Kaolin Pipe Stems	4/64"					24
		5/64" "TD" - "T" ("IS(?)D" and design on one)					73
		6/64"					24
		7/64"					1
	Kaolin Pipe Bowls and Marks (TD)						6
12	Red Clay Pipes						
13	Brass and Copper Nails						
14	Brass Tacks						7
15	Buckles	Brass	Copper	Pewter	Iron		
16	Thimbles	Brass	Silver				
17	Buttons	Brass - 3	Copper (one small fragment)	Iron	Bone	Shell (one eye - 1)	3
18	Coins						1 (?)
19	Lead Balls and Shot						80
20	Gunflints	Gunspalls 1					1
21	Bone Fragments						11
22	Sleeve Links						
23	mortar						1
24	[illegible]						1
25	glass scent bottle base (etched initials & etched flower)						1

Figure 2. Example of the standardized artifact catalog form developed and used first by Stanley South, as well as by Stuart Schwartz and volunteers for the collections from Brunswick Town not inventoried by South. This form is from the Judge Maurice Moore House (S11), unit 4, level A.

Following the excavation of each household or feature ruin, under the direction of Stanley and Jewell South the artifacts were washed, sorted, and cataloged by provenience, and when necessary, conserved (South n.d.). Artifacts from each provenience were placed in a paper bag (a standard for the period) and were stored in cardboard banana boxes on-site in a single-wide trailer referred to as the "Archaeological Laboratory." The location of this trailer is noted on South's original base map of the town.

It was several years after South left North Carolina that other archaeologists took up the work on historic sites. Under the direction of Stuart Schwartz, archaeologist of the then North Carolina Department of Art, Culture, and History, were assistant archaeologists Andrea Upchurch, Merrikay Everett, Margaret Bailey, and two women noted only as Frances S. and Becky W. These individuals cataloged the artifacts from ruins of residences and features from Brunswick Town investigated by South after 1962 (including the Judge Maurice Moore House, Russellborough House and Kitchen, St. Philip's Church, Richard Quince House and Kitchen, James Espy House, Edward Scott House, and the Leach-Jobson House and well). A similar cataloging and packaging procedure was used for these artifacts not cataloged by South, except the cataloging was done in Raleigh (at the OSA laboratory). The artifacts were then returned to the site and stored in the trailer along with the earlier collections. All of the artifacts were stored in paper bags and cardboard banana boxes in a non-climate controlled, less-than-secure environment until 1988. It is crucial to note at this point that while these practices seemed neglectful of the collections, this was better care than some pre-1979 collections received prior to the 36CFR79 NEPA protocols.

In 1988, under the direction of Historic Sites staff archaeologist Jack Wilson, an effort was made to upgrade the collection and move all Historic Sites Section collections into a central repository at the newly acquired Charlotte Hawkins Brown State Historic Site, specifically in the Boys Dormitory building. This building provided ample room and lockable separate rooms for artifact collections from different State Historic Sites. Bob Noel and Bill Jurgelski, two contractors with archaeological backgrounds, were hired to remove the collection from the now-leaking trailer and to repackage the collection. Many of the older, paper artifact bags exhibited damage and some provenience information was compromised. In some cases, spillage of artifacts from the bags into the banana boxes was noted. These paper bags were replaced with non-archival plastic bags (purchased locally) and the boxes replaced with archival quality boxes. Some of the artifacts were regrouped into boxes based on common material, such as all wine bottle glass being grouped into sequential box numbers; other boxes contained mixed artifact types from a single excavated ruin. Following the merger of the Historic Sites archaeology program into OSA in 2003, all of the Historic Sites archeological collections (including the approximately 300 archival boxes that contain the Brunswick Town artifacts) were moved to the Office of State Archaeology Research Center, where it remains today, awaiting another round of stabilization.

The collections practices, repackaging, and move of these collections have created inconsistencies in the overall counts of the recovered artifacts. More recent studies of artifacts from the original Brunswick Town collections conducted in the 1990s, such as Gray (1989, 1997), Beaman (1997, 2005), Mintz and Beaman (1997), Moss-Brown (2002), and Johnson (2016) could not duplicate (or replicate) the original totals presented on the artifact catalog sheets. The totals in each of these studies found in unpublished M.A. theses and journal artifacts now supersede the original totals in available archaeological literature, and caution may be warranted that the artifact counts do not fully represent all that the collection contains. One observation garnered from these studies is that the number of artifacts presented from the earlier ruins and contexts, excavated from 1958 to ca. 1962, tended to be less accurate than reported on the original catalog sheets. The artifacts within the collections from later excavations, post ca. 1962, appear to be much closer to what is recorded in the artifact catalogs.

While some differences in artifact counts might be expected, other discrepancies may be more difficult to fully explain. Reconstructing the numbers of artifacts documented on each form versus those recovered from each ruin within the Brunswick Town artifact collections is potentially problematic in three different ways. First, although working on a standardized form designed by South, the personal biases introduced by these later individuals in the cataloging process may have compromised the artifact catalog sheets between the two phases of processing. For example, the method for arriving at the artifact counts on each catalog sheet is not entirely clear and may have been different for each cataloging team (e.g., as ceramics and glass vessels were reconstructed from this assemblage, it is not known if each sherd was counted individually or if the mended vessel was counted as one artifact). Also, forms from each excavated feature may not be consistent in how an artifact was identified and then cataloged (e.g., a fragment of a pipe bowl with a portion of stem could be classified as either a bowl or stem fragment by different catalogers).

Second, when the artifact collection was consulted to verify a count or to examine an artifact in an attempt to clarify identification, the counts on the sheet could not be reconciled. As observed by the author for his quantitative study of white clay smoking pipes from Brunswick Town, artifacts were either missing or had lower counts, or the counts were more than what was captured on the catalog forms. The differences seen in totals of this collection could also be a factor of changes in curation and repositories, which is almost as interesting as the assortment of artifacts contained within it.

Another factor for consideration of mismatched artifact counts could be due to subsequent breakage, as seen in the white clay pipe study, where loose and unprovenienced pieces were found in the storage boxes. The non-archival plastic bags used in the 1988 repackaging lacked sealable tops, and more recent handling of the artifact boxes could have separated individual artifacts from their context. It is likely in the history of this collection that additional breakage of fragile items has resulted in unmarked artifacts. It may also be possible that previous site employees removed and carelessly replaced artifacts in rummaging around, or in the search for exhibit-able items, thereby mixing proveniences. On numerous occasions, Deputy State Archaeologist John Mintz has shared his reminiscences of his elementary school visit to Brunswick Town in the late 1960s, where the students were shown artifacts out of paper bags in the "Archaeological Laboratory" trailer by their tour guides. Such a practice allows for potential mingling of artifacts, as well as being a near disaster scenario for collections management!

In an attempt to reconcile all artifacts taken (on loan or for permanent use elsewhere), a few locations and uses of artifacts were discovered and have now been documented. In 1968, South established a field type collection of historic ceramics still housed at the Office of State Archaeology Research Center, and by 1971 a number of artifacts had been put on display in the Brunswick Town Visitors Center. It is not clear if any of these hand-selected items for comparison and exhibits were captured in the later overall artifact inventories prior to be removed; if not, it could result in the reflected discrepancies in total counts. Theft also may have been a factor, as South (2005:129–131) complained about the original exhibits as too "touchy-feely" for the visitors and having lax security precautions. Also, artifacts may have been removed to other institutions to establish type collections without documentation. For example, Silas Hurry of Historic Saint Mary's City noted that a number of artifacts from Brunswick Town, specifically ceramics, were still in their collections, as South had donated them to start a type collection for their excavations (personal communication, 1999). The Cape Fear Museum in Wilmington, as well as the McDonalds restaurant on Highway 133, also exhibit small displays of provenienced artifacts from Brunswick Town. No paperwork exists for any of these donations. In fact, even within the secure walls of the Office of State Archaeology Research Center, deceptions can occur, as a traveling historic type collection full of Brunswick Town artifacts has just been found. Only a few select staff, now retired, had seen this travelling collection of artifacts; previously, its existence was not known or revealed to researchers, curators, nor exhibits people.

It is easy to place blame on poor collection management, and the chaos that it creates, on the previous archaeologists who have been in charge of the collection, but decisions were made at the time that were either felt best or were controlled by budgetary concerns. A reassessment of the Brunswick Town collection is a good case in point of how previous curation practices, or a lack of them, can impact future research, when artifact counts, locations, proveniences, and conditions become compromised. It is a hard lesson learned at times. Curation standards employed today are to provide consistent care and safe-guard against such confusions of compromised data, as well as generally allow for ease of ability to retrieve artifacts in storage.

The artifact collection from Brunswick Town, though spread out in storage, study collections, and on exhibit, is still a very valuable collection from which much can still be learned. Unfortunately, inconsistencies in the reported totals on the standardized catalog sheets, likely due to the problems described above, limit the ability to easily retrieve individual specimens or groups of artifacts without having to search through each and every box of the collection. The standardized artifact catalog sheets do contain some qualitative descriptions, such as specific details on types of buttons, coins, shot, or unique decorations of ceramics that the collection should contain, and in previous studies, such qualitative descriptions have provided a guide for what the collection may contain.

For future quantitative studies, the standardized catalog sheets for each ruin and feature should be considered the authority by which the counts are measured. The potential biases in these forms, noted above, are presently outweighed by the inconsistency found within the artifact collections. These catalog forms should now be viewed as much as primary documentation as the excavation notes and drawings, and should always be considered and consulted when any future quantitative study is undertaken of any previously excavated material from Brunswick Town.

Artifact Profiles of Excavated Households

Each excavated household is briefly described, with an associated table containing its artifact profile. Specific details regarding ownership as well as various functions a structure may have served beyond a residence, such as a tavern or store, are primarily drawn from the Historic Sites Section files at the Office of State Archaeology Research Center, as well as from South's *Archaeology at Colonial Brunswick* (2010). Additional artifacts that are not included in each ruin's profile are noted as well.

Russellborough. Designated ruin N50, Russellborough was the main household of a small plantation directly north of the urban core of Brunswick. Initially begun by maritime Captain John Russell in 1751, it was completed and later occupied by Royal governors Arthur Dobbs and William Tryon. After 1770, Customs Collector William Dry was the final occupant prior to the house being burned by British soldiers and local Tory sympathizers during the American War for Independence. A prior analysis of this ruin proved it to be one of the more elite households associated with Brunswick Town (Beaman 2001).

Table 2 illustrates the artifacts recovered from Russellborough in Carolina Artifact Pattern format. Artifacts recovered during the excavation but not included in this table include fragments of slate (n=143), marine shells (n=40), unidentifiable iron (n=353), and a prehistoric flake.

Newman-Taylor House. Located underneath Battery B of Fort Anderson, the Newman-Taylor House, designated N41, is unique among the households of Brunswick. The earliest record of its occupation was in 1775 by Stephen Parker Newman. Following the general abandonment and destruction of most of the remaining households, the property was sold to Nehimah Taylor in 1785. Fragments of pearlware recovered within the household context indicated the house was occupied after the war for a time, possibly by Taylor. It was, however, eventually abandoned, presumably before the town site was reintegrated into Orton Plantation in 1845.

Table 2. Artifact Assemblage from Russellborough House (N50) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%
I. Kitchen Group	**9872**	**52.5**
1. Ceramics	3000	15.9
2. Wine Bottle	4692	24.9
3. Case Bottle	873	4.6
4. Tumbler	26	0.1
5. Pharmaceutical Bottle	120	0.6
6. Glassware	1133	6.0
7. Tableware	22	0.1
8. Kitchenware	6	< 0.1
II. Bone Group	**576**	**n/a**
9. Bone Fragments	576	n/a
III. Architectural Group	**8446**	**44.9**
10. Window Glass	695	3.7
11. Nails	5222	27.8
12. Spikes	93	0.5
13. Construction Hardware	2404	12.8
14. Door Lock Parts	32	0.2
IV. Furniture Group	**310**	**1.6**
15. Furniture Hardware	310	1.6
V. Arms Group	**25**	**0.1**
16. Musket Balls, Shot	4	< 0.1
17. Gunflints, Gunspalls	8	< 0.1
18. Gun Parts	13	0.1
VI. Clothing Group	**49**	**0.3**
19. Buckles	7	< 0.1
20. Thimbles	0	0.0
21. Buttons	1	< 0.1
22. Scissors	0	0.0
23. Straight Pins	1	< 0.1
24. Hook & Eye Fasteners	39	0.2
25. Bale Seals	0	0.0
26. Glass Beads	1	< 0.1
VII. Personal Group	**17**	**0.1**
27. Coins	2	< 0.1
28. Keys	6	< 0.1
29. Personal Items	9	< 0.1
VIII. Tobacco Pipe Group	**59**	**0.3**
30. Tobacco Pipes	59	0.3
IX. Activities Group	**35**	**0.2**
31. Construction Tools	11	0.1
32. Farm Tools	2	< 0.1
33. Toys	5	< 0.1
34. Fishing Gear	0	0.0
35. Stub-Stemmed Pipes	0	0.0
36. Colonoware	2	< 0.1
37. Storage Items	2	< 0.1
38. Ethnobotanical	1	< 0.1
39. Stable and Barn	1	< 0.1
40. Misc. Hardware	7	< 0.1
41. Other	4	< 0.1
42. Military Objects	0	0.0
Total (minus Bone Group)	**18,813**	**100.0**

The artifact profile for the Newman-Taylor house is presented in Table 3. Artifacts not counted as part of this profile include fragments of slate (*n*=4), marine shells (*n*=11), prehistoric ceramics (*n*=4), and unidentifiables (*n*=57).

Richard Quince House. Of the two lots historically owned by merchant Richard Quince, his second household—this ruin, designated N14—was located on lot 40. Historical records indicate that he lived in, or possibly rented, this structure from 1769 until 1775. This structure and its associated kitchen were among the last locations investigated by South at Brunswick Town.

Table 3. Artifact Assemblage from Newman-Taylor House (N41) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**1710**	**57.4**	20. Thimbles	0	0.0
1. Ceramics	1239	41.6	21. Buttons	18	0.6
2. Wine Bottle	191	6.4	22. Scissors	1	< 0.1
3. Case Bottle	77	2.6	23. Straight Pins	33	1.1
4. Tumbler	70	2.4	24. Hook & Eye Fasteners	1	< 0.1
5. Pharmaceutical Bottle	46	1.5	25. Bale Seals	1	< 0.1
6. Glassware	75	2.5	26. Glass Beads	0	0.0
7. Tableware	8	0.3			
8. Kitchenware	4	0.1	**VII. Personal Group**	**14**	**0.5**
			27. Coins	5	0.2
II. Bone Group	**133**	**n/a**	28. Keys	2	0.1
9. Bone Fragments	133	n/a	29. Personal Items	7	0.2
III. Architectural Group	**1062**	**35.7**	**VIII. Tobacco Pipe Group**	**68**	**2.3**
10. Window Glass	324	10.9	30. Tobacco Pipes	68	2.3
11. Nails	690	23.2			
12. Spikes	35	1.2	**IX. Activities Group**	**29**	**1.0**
13. Construction Hardware	11	0.4	31. Construction Tools	6	0.2
14. Door Lock Parts	2	0.1	32. Farm Tools	0	0.0
			33. Toys	1	< 0.1
IV. Furniture Group	**8**	**0.3**	34. Fishing Gear	0	0.0
15. Furniture Hardware	8	0.3	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	3	0.1
V. Arms Group	**22**	**0.7**	37. Storage Items	6	0.2
16. Musket Balls, Shot	17	0.6	38. Ethnobotanical	12	0.4
17. Gunflints, Gunspalls	5	0.2	39. Stable and Barn	0	0.0
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	1	< 0.1
VI. Clothing Group	**64**	**2.1**	42. Military Objects	0	0.0
19. Buckles	10	0.3			
			Total (minus Bone Group)	**2977**	**100.0**

This is one of the two ruins excavated that had no artifacts associated with it. As written by South in his field notes from Friday, April 26, 1968, “Completed exterior area of ruin and found nothing to speak of…some plaster, no nails or china, apparently a bare ruin inside and out.” With no evidence of fire noted, this could easily be interpreted as abandonment. There are no records of an artifact catalog, nor could any artifact within the collection to be specifically linked to N14. As such, there is no artifact profile for this ruin.

Jones-Price Ruin. What became known as the Jones-Price Ruin was first discovered by Lawrence Lee in 1958 as a pile of brick bats just north of St. Philip’s Church. Despite its meager size and location on lot

120, it has the longest chain of ownership of any residence or structure at Brunswick Town (South 2010:163). First built and occupied in 1731, the last transaction of this lot to an individual was in 1819. Excavations by South revealed the brick bats comprised a D-shaped floor of approximately 12 ft in diameter, but no evidence of post holes or structural walls were found associated with it. Unfortunately, the ruin was bulldozed in the late 1950s or early 1960s for the construction of a parking area, and later regraded for landscaping in 1978 (Faulk 1978). Given its close proximity and paucity of artifacts, this structure may have temporarily served as a glebe house for St. Philip's Church.

The artifact profile of the excavated Jones-Price ruin is illustrated in Table 4. Nine fragments of slate and one unidentifiable artifact are not included in this table.

Roger Moore House. Roger Moore, brother to town founder Maurice Moore and owner of neighboring Orton Plantation, also owned a house in Brunswick. Purchased in 1736, it was located on lot 75. The house constructed on this lot was very different from many of the other Brunswick households, as it sat on mortared stone-and-brick footings, with no subsurface floor. South's excavation of this lot in 1959 also revealed a pit measuring approximately 5 ft by 6.5 ft in diameter and 1 ft in depth, which was apparently filled in before the house was constructed. Containing artifacts, ash, brick bats, and a metal griddle, South termed this feature "a roasting pit" (South 2010:155). He also identified 19 intrusive holes dug by relic hunters. This house was eventually destroyed by fire in 1776.

Table 5 illustrates the artifacts recovered from the Roger Moore House in Carolina Pattern format. Not included in this profile are fragments of plaster (n=54), mortar (n=13), unglazed terra cotta tiles like the ones from St. Philip's Church (n=12), slate (n=7), ballast stones (n=3), prehistoric ceramics (n=3), a prehistoric flake (n=1), unidentifiable iron (n=19), a marine shell (n=1), and coal (n=1).

Hepburn-Reonalds House. The central ruin on lot 71 is identified as the Hepburn-Reonalds House, named for its original owners, merchants Charles Hepburn and George Reonalds. They purchased this lot in 1734 and constructed a residence with a ballast stone foundation measuring 21.5 ft by 29 ft. It had a brick patio on the north side of the structure and a solid partition wall that separated the basement into two rooms. A sunken entranceway off of Cross Street led to the east room, which had a cobblestone floor. South interpreted this room as the shop of the merchants. The west room was accessed by an entrance from the brick

Table 4. Artifact Assemblage from the Jones-Price House (N1) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**384**	**77.7**	20. Thimbles	0	0.0
1. Ceramics	307	62.1	21. Buttons	1	0.2
2. Wine Bottle	62	12.6	22. Scissors	0	0.0
3. Case Bottle	10	2.0	23. Straight Pins	0	0.0
4. Tumbler	3	0.6	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	0	0.0	25. Bale Seals	0	0.0
6. Glassware	2	0.4	26. Glass Beads	0	0.0
7. Tableware	0	0.0			
8. Kitchenware	0	0.0	**VII. Personal Group**	**0**	**0.0**
			27. Coins	0	0.0
II. Bone Group	**4**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	4	n/a	29. Personal Items	0	0.0
III. Architectural Group	**96**	**19.4**	**VIII. Tobacco Pipe Group**	**9**	**1.8**
10. Window Glass	2	0.4	30. Tobacco Pipes	9	1.8
11. Nails	94	19.0			
12. Spikes	0	0.0	**IX. Activities Group**	**4**	**0.8**
13. Construction Hardware	0	0.0	31. Construction Tools	0	0.0
14. Door Lock Parts	0	0.0	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**0**	**0.0**	34. Fishing Gear	0	0.0
15. Furniture Hardware	0	0.0	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**0**	**0.0**	37. Storage Items	0	0.0
16. Musket Balls, Shot	0	0.0	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	0	0.0	39. Stable and Barn	0	0.0
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	0	0.0
VI. Clothing Group	**1**	**0.2**	42. Military Objects	4	0.8
19. Buckles	0	0.0			
			Total (minus Bone Group)	**494**	**100.0**

patio and had a burned wooden floor. He interpreted the west room as a kitchen for the household occupants. The structure was burned in 1776 along with many other structures in the town.

Designated as S7, the artifact profile for the Hepburn-Reonalds House calculated by South (1977:126–127) is presented in Table 6. This is one of the Brunswick ruins that served as a test evaluation of his Carolina Artifact Pattern.

James Espy House. Located immediately north of the Leach-Jobson residence and store, the first transaction for lot 31was in 1731 to James Espy. A structure with a stone foundation was constructed upon it, the remnants of which South designed S8. In the basement, the foundation

Table 5. Artifact Assemblage from Roger Moore's House (S2) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**2065**	**63.8**	20. Thimbles	1	< 0.1
1. Ceramics	1231	38.0	21. Buttons	9	0.3
2. Wine Bottle	679	21.0	22. Scissors	0	0.0
3. Case Bottle	18	0.6	23. Straight Pins	0	0.0
4. Tumbler	60	1.9	24. Hook & Eye Fasteners	1	< 0.1
5. Pharmaceutical Bottle	21	0.6	25. Bale Seals	0	0.0
6. Glassware	42	1.3	26. Glass Beads	0	0.0
7. Tableware	4	0.1			
8. Kitchenware	10	0.3	**VII. Personal Group**	**9**	**0.3**
			27. Coins	6	0.2
II. Bone Group	**321**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	321	n/a	29. Personal Items	3	0.1
III. Architectural Group	**851**	**26.3**	**VIII. Tobacco Pipe Group**	**264**	**8.2**
10. Window Glass	198	6.1	30. Tobacco Pipes	264	8.2
11. Nails	637	19.7			
12. Spikes	8	0.2	**IX. Activities Group**	**17**	**0.5**
13. Construction Hardware	6	0.2	31. Construction Tools	5	0.2
14. Door Lock Parts	2	0.1	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**7**	**0.2**	34. Fishing Gear	0	0.0
15. Furniture Hardware	7	0.2	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**5**	**0.2**	37. Storage Items	4	0.1
16. Musket Balls, Shot	2	0.1	38. Ethnobotanical	1	< 0.1
17. Gunflints, Gunspalls	2	0.1	39. Stable and Barn	1	< 0.1
18. Gun Parts	1	< 0.1	40. Misc. Hardware	1	< 0.1
			41. Other	0	0.0
VI. Clothing Group	**18**	**0.6**	42. Military Objects	5	0.2
19. Buckles	7	0.2			
			Total (minus Bone Group)	**3236**	**100.0**

was divided by a solid stone partition wall. A large quantity of wine bottle fragments was found in the north room, which South suggested was used as a wine cellar. It had a burned wooden floor from the time it was destroyed by fire, likely in 1776, that covered an earlier burned floor. The south room had a brick floor, but contained few artifacts, suggesting the house was abandoned prior to its destruction. The western wall of south room also contained a doorway that opened to the rear of the house that had been sealed. Exterior brick stairs that led to that door also had been filled in with soil.

The artifact profile for the James Espy House is presented in Table 7. Not included are marine shells (n=204), fragments of slate (n=119),

Table 6. Artifact Assemblage from Hepburn-Reonalds House (S7) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**3702**	**45.2**	20. Thimbles	0	0.0
1. Ceramics	2521	30.8	21. Buttons	7	0.1
2. Wine Bottle	841	10.3	22. Scissors	1	< 0.1
3. Case Bottle	56	0.7	23. Straight Pins	0	0.0
4. Tumbler	190	2.3	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	35	0.4	25. Bale Seals	0	0.0
6. Glassware	38	0.5	26. Glass Beads	2	< 0.1
7. Tableware	11	0.1			
8. Kitchenware	10	0.1	**VII. Personal Group**	**4**	**< 0.1**
			27. Coins	3	< 0.1
II. Bone Group	**222**	**n/a**	28. Keys	1	< 0.1
9. Bone Fragments	222	n/a	29. Personal Items	0	0.0
III. Architectural Group	**3953**	**48.3**	**VIII. Tobacco Pipe Group**	**374**	**4.6**
10. Window Glass	1396	17.1	30. Tobacco Pipes	374	4.6
11. Nails	2466	30.1			
12. Spikes	50	0.6	**IX. Activities Group**	**96**	**1.2**
13. Construction Hardware	35	0.4	31. Construction Tools	8	0.1
14. Door Lock Parts	6	0.1	32. Farm Tools	0	0.0
			33. Toys	1	< 0.1
IV. Furniture Group	**18**	**0.2**	34. Fishing Gear	1	< 0.1
15. Furniture Hardware	18	0.2	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	12	0.1
V. Arms Group	**12**	**0.1**	37. Storage Items	53	0.6
16. Musket Balls, Shot	11	0.1	38. Ethnobotanical	4	< 0.1
17. Gunflints, Gunspalls	1	< 0.1	39. Stable and Barn	2	< 0.1
18. Gun Parts	0	0.0	40. Misc. Hardware	15	0.2
			41. Other	0	0.0
VI. Clothing Group	**24**	**0.3**	42. Military Objects	0	0.0
19. Buckles	14	0.2			
			Total (minus Bone Group)	**8183**	**100.0**

prehistoric ceramics (n=82), prehistoric lithics (n=4), and unidentified artifacts (n=275).

Leach-Jobson House. The ballast stone foundation on lot 30, designated S9, is located along Front Street immediately to the north of Nath Moore's Front. It is referred to as the Leach-Jobson residence, named for its first two owners, James Leach and Mich Jobson. Historical records place its construction sometime between 1726 and 1728, which makes it one of the earlier structures built in Brunswick. The foundation is divided in the basement by a solid partition wall. The north room has a sunken entranceway from Front Street, and artifacts found within this room suggest it was a store. The south room was accessed through steps

Table 7. Artifact Assemblage from James Espy's House (S8) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**19,592**	**60.2**	20. Thimbles	0	0.0
1. Ceramics	8097	24.9	21. Buttons	24	0.1
2. Wine Bottle	9326	28.6	22. Scissors	0	0.0
3. Case Bottle	896	2.8	23. Straight Pins	53	0.2
4. Tumbler	468	1.4	24. Hook & Eye Fasteners	4	< 0.1
5. Pharmaceutical Bottle	388	1.2	25. Bale Seals	7	< 0.1
6. Glassware	387	1.2	26. Glass Beads	0	0.0
7. Tableware	20	0.1			
8. Kitchenware	10	< 0.1	**VII. Personal Group**	**9**	**< 0.1**
			27. Coins	7	< 0.1
II. Bone Group	**3472**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	3472	n/a	29. Personal Items	2	< 0.1
III. Architectural Group	**8994**	**27.6**	**VIII. Tobacco Pipe Group**	**3697**	**11.4**
10. Window Glass	5370	16.5	30. Tobacco Pipes	3697	11.4
11. Nails	3554	10.9			
12. Spikes	43	0.1	**IX. Activities Group**	**18**	**0.1**
13. Construction Hardware	15	< 0.1	31. Construction Tools	5	< 0.1
14. Door Lock Parts	12	< 0.1	32. Farm Tools	1	< 0.1
			33. Toys	3	< 0.1
IV. Furniture Group	**33**	**0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	33	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**116**	**0.4**	37. Storage Items	0	0.0
16. Musket Balls, Shot	80	0.2	38. Ethnobotanical	1	< 0.1
17. Gunflints, Gunspalls	36	0.1	39. Stable and Barn	5	< 0.1
18. Gun Parts	0	0.0	40. Misc. Hardware	1	< 0.1
			41. Other	2	< 0.1
VI. Clothing Group	**100**	**0.3**	42. Military Objects	0	0.0
19. Buckles	12	< 0.1			
			Total (minus Bone Group)	**32,559**	**100.0**

on the west side, or rear, of the structure, and was likely a private room for the household. Like many of the structures in this southern area of the town (cf. Beaman et al. 1998:19–20), it was destroyed by fire, likely in 1776.

Table 8 illustrates the artifacts recovered from excavation of the Leach-Jobson House. A total of 252 marine shells, 110 fragments of slate, 71 prehistoric ceramic sherds, 2 prehistoric lithics, and 566 unidentified artifacts were not included as part of the artifact profile.

Nath Moore's Front. The residence of Nathaniel Moore, brother to town founder Maurice Moore, is on the eastern end of lot 29 at the corner of Front and Cross streets, a very prominent position on the landscape

Table 8. Artifact Assemblage from Leach-Jobson House (S9) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**18,373**	**48.6**	20. Thimbles	3	< 0.1
1. Ceramics	12,984	34.3	21. Buttons	50	0.1
2. Wine Bottle	4214	11.1	22. Scissors	1	< 0.1
3. Case Bottle	198	0.5	23. Straight Pins	414	1.1
4. Tumbler	296	0.8	24. Hook & Eye Fasteners	17	< 0.1
5. Pharmaceutical Bottle	242	0.6	25. Bale Seals	0	0.0
6. Glassware	352	0.9	26. Glass Beads	12	< 0.1
7. Tableware	75	0.2			
8. Kitchenware	12	< 0.1	**VII. Personal Group**	**75**	**0.2**
			27. Coins	57	0.2
II. Bone Group	**2894**	**n/a**	28. Keys	4	< 0.1
9. Bone Fragments	2894	n/a	29. Personal Items	14	< 0.1
III. Architectural Group	**13,320**	**35.2**	**VIII. Tobacco Pipe Group**	**5435**	**14.4**
10. Window Glass	3934	10.4	30. Tobacco Pipes	5435	14.4
11. Nails	9274	24.5			
12. Spikes	78	0.2	**IX. Activities Group**	**41**	**0.1**
13. Construction Hardware	12	< 0.1	31. Construction Tools	2	< 0.1
14. Door Lock Parts	22	0.1	32. Farm Tools	3	< 0.1
			33. Toys	0	0.0
IV. Furniture Group	**38**	**0.1**	34. Fishing Gear	2	< 0.1
15. Furniture Hardware	38	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**40**	**0.1**	37. Storage Items	1	< 0.1
16. Musket Balls, Shot	32	0.1	38. Ethnobotanical	6	< 0.1
17. Gunflints, Gunspalls	8	< 0.1	39. Stable and Barn	1	< 0.1
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	24	0.1
VI. Clothing Group	**521**	**1.4**	42. Military Objects	2	< 0.1
19. Buckles	24	0.1			
			Total (minus Bone Group)	**37,843**	**100.0**

overlooking the Cape Fear River. It is one of the earliest residences built at Brunswick, as well as the first one excavated by South in 1958 (who designated it ruin S10). The foundation wall is constructed of ballast stones, and measures 22.5 ft by 34 ft. Doorway openings to the basement were located on the north and south walls, and a large hearth and chimney was constructed on the west wall. This household changed hands many times, but continued to be referred to as "Nath Moore's Front." In addition to a residence, the basement served as an ordinary (or tavern) at one point. This residence was also destroyed by fire in 1776.

Table 9. Artifact Assemblage from Nath Moore's Front (S10) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**6795**	**51.8**	20. Thimbles	1	< 0.1
1. Ceramics	4618	35.2	21. Buttons	43	0.3
2. Wine Bottle	1753	13.4	22. Scissors	2	< 0.1
3. Case Bottle	29	0.2	23. Straight Pins	3	< 0.1
4. Tumbler	100	0.8	24. Hook & Eye Fasteners	2	< 0.1
5. Pharmaceutical Bottle	45	0.3	25. Bale Seals	2	< 0.1
6. Glassware	191	1.5	26. Glass Beads	3	< 0.1
7. Tableware	35	0.3			
8. Kitchenware	24	0.2	**VII. Personal Group**	**20**	**0.2**
			27. Coins	7	0.1
II. Bone Group	**519**	**n/a**	28. Keys	3	< 0.1
9. Bone Fragments	519	n/a	29. Personal Items	10	0.1
III. Architectural Group	**4116**	**31.4**	**VIII. Tobacco Pipe Group**	**1829**	**13.9**
10. Window Glass	838	6.4	30. Tobacco Pipes	1829	13.9
11. Nails	3098	23.6			
12. Spikes	123	0.9	**IX. Activities Group**	**159**	**1.2**
13. Construction Hardware	52	0.4	31. Construction Tools	13	0.1
14. Door Lock Parts	5	< 0.1	32. Farm Tools	3	< 0.1
			33. Toys	9	0.1
IV. Furniture Group	**82**	**0.6**	34. Fishing Gear	3	< 0.1
15. Furniture Hardware	82	0.6	35. Stub-Stemmed Pipes	9	0.1
			36. Colonoware	0	0.0
V. Arms Group	**45**	**0.3**	37. Storage Items	40	0.3
16. Musket Balls, Shot	13	0.1	38. Ethnobotanical	4	< 0.1
17. Gunflints, Gunspalls	17	0.1	39. Stable and Barn	10	0.1
18. Gun Parts	15	0.1	40. Misc. Hardware	68	0.5
			41. Other	0	0.0
VI. Clothing Group	**72**	**0.5**	42. Military Objects	0	0.0
19. Buckles	16	0.1			
			Total (minus Bone Group)	**13,118**	**100.0**

As presented in Table 9, the artifact profile for Nath Moore's Front calculated by South (1977:126–127) is one of the Brunswick ruins that served as basis for the Carolina Artifact Pattern.

Judge Maurice Moore House. Lot 28 contains the house, kitchen, smokehouse, and well of Judge Maurice Moore, son of town founder Maurice Moore. It is fixed at the corner of Front and Cross Street, a very prominent place on the landscape. This property is a half-acre lot, which is 10 ft wider than the standard town lot. It was acquired by Moore in April 1759. The primary household, designated S11, had a ballast stone foundation. Brick steps led to a cellar hallway which opened into two rooms, one of which contained a fireplace. A burned pine floor in the

Table 10. Artifact Assemblage from Judge Maurice Moore's House (S11) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**14,885**	**55.4**	20. Thimbles	3	< 0.1
1. Ceramics	9622	35.8	21. Buttons	50	0.2
2. Wine Bottle	4195	15.6	22. Scissors	2	< 0.1
3. Case Bottle	110	0.4	23. Straight Pins	172	0.6
4. Tumbler	228	0.8	24. Hook & Eye Fasteners	48	0.2
5. Pharmaceutical Bottle	268	1.0	25. Bale Seals	2	< 0.1
6. Glassware	430	1.6	26. Glass Beads	8	< 0.1
7. Tableware	20	0.1			
8. Kitchenware	12	< 0.1	**VII. Personal Group**	**17**	**0.1**
			27. Coins	8	< 0.1
II. Bone Group	**677**	**n/a**	28. Keys	2	< 0.1
9. Bone Fragments	677	n/a	29. Personal Items	7	< 0.1
III. Architectural Group	**7229**	**26.9**	**VIII. Tobacco Pipe Group**	**4043**	**15.1**
10. Window Glass	2084	7.8	30. Tobacco Pipes	4043	15.1
11. Nails	5031	18.7			
12. Spikes	100	0.4	**IX. Activities Group**	**73**	**0.3**
13. Construction Hardware	8	< 0.1	31. Construction Tools	3	< 0.1
14. Door Lock Parts	6	< 0.1	32. Farm Tools	1	< 0.1
			33. Toys	3	< 0.1
IV. Furniture Group	**37**	**0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	37	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	43	0.2
V. Arms Group	**272**	**1.0**	37. Storage Items	1	< 0.1
16. Musket Balls, Shot	258	1.0	38. Ethnobotanical	14	< 0.1
17. Gunflints, Gunspalls	14	< 0.1	39. Stable and Barn	3	< 0.1
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	5	< 0.1
VI. Clothing Group	**294**	**1.1**	42. Military Objects	0	0.0
19. Buckles	9	< 0.1			
			Total (minus Bone Group)	**26,850**	**100.0**

cellar suggests that the house was destroyed by fire, likely with others around it in 1776.

Artifacts recovered during the excavation of the Judge Maurice Moore House are illustrated in Table 10, with the exception of fragments of slate (n=49), marine shells (n=224), prehistoric ceramics (n=31), a prehistoric lithic (n=1), and unidentified artifacts (n=336).

McCorkall-Fergus House. Located on the western portion of lot 71, at the intersection of Cross Street and Second Street, are the foundation remains designated as S18. Measuring 19 ft by 28 ft, the foundation is constructed of ballast stones. It is curious that there was no evidence of a chimney connected to the foundation. The basement of the ruin was

Table 11. Artifact Assemblage from McCorkall-Fergus House (S18) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**1622**	**53.7**	20. Thimbles	0	0.0
1. Ceramics	855	29.3	21. Buttons	0	0.0
2. Wine Bottle	687	22.7	22. Scissors	0	0.0
3. Case Bottle	7	0.2	23. Straight Pins	0	0.0
4. Tumbler	18	0.6	24. Hook & Eye Fasteners	1	< 0.1
5. Pharmaceutical Bottle	5	0.2	25. Bale Seals	0	0.0
6. Glassware	16	0.5	26. Glass Beads	0	0.0
7. Tableware	3	0.1			
8. Kitchenware	1	< 0.1	**VII. Personal Group**	**6**	**0.2**
			27. Coins	0	0.0
II. Bone Group	**1**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	1	n/a	29. Personal Items	6	0.2
III. Architectural Group	**973**	**32.2**	**VIII. Tobacco Pipe Group**	**401**	**13.3**
10. Window Glass	727	24.1	30. Tobacco Pipes	401	13.3
11. Nails	243	8.0			
12. Spikes	2	0.1	**IX. Activities Group**	**9**	**0.3**
13. Construction Hardware	1	< 0.1	31. Construction Tools	0	0.0
14. Door Lock Parts	0	0.0	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**2**	**0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	2	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**6**	**0.2**	37. Storage Items	8	0.3
16. Musket Balls, Shot	1	< 0.1	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	3	0.1	39. Stable and Barn	1	< 0.1
18. Gun Parts	2	0.1	40. Misc. Hardware	0	0.0
			41. Other	0	0.0
VI. Clothing Group	**1**	**< 0.1**	42. Military Objects	0	0.0
19. Buckles	0	0.0			
			Total (minus Bone Group)	**3020**	**100.0**

filled with ballast stones, possibly from the upper walls of the structure. While it is uncertain when the residence was built, the first deed record is from October 1763 when it was willed to surgeon Dr. John Fergus and his mother-in-law, Margaret McCorkall. South's ceramic analysis revealed the house was occupied for a very brief time. This structure was not destroyed by fire, but was abandoned prior to 1776. Perhaps it is one of the households irreparably damaged by the 1769 hurricane (Beaman and McKee 2011).

Table 11 presents the artifact profile for the McCorkall-Fergus House. Not counted as part of this profile are marine shells (n=2), prehistoric ceramics (n=4), and a prehistoric projectile point.

Public House and Tailor Shop. Identified as S25, a six-room ruin constructed of ballast stones stands on lot 27. Each room measures ten foot square with a hearth on the partition wall. South initially interpreted its function as an inn based on its architecture, but during excavation considered that it likely functioned for a time as a tailor shop (based on the large quantities of buttons, straight pins, and sewing material recovered). However, newer theoretical ideas of gender have led to more recent discussions of other functions, such as a brothel. Based on a sale of the lot, this structure was likely constructed before December 1732. It apparently functioned for the duration of Brunswick's existence until its destruction by fire in 1776.

As presented in Table 12, the artifact profile for the Public House calculated by South (1977:126–127) is one of the Brunswick ruins that served as basis for the Carolina Artifact Pattern.

Edward Scott House. Little is known of ruin S28, which South referred to in his 1968 field notes as the Edward Scott House. Located on the back of lot 29, in 1968 South began excavation around two parallel brick walls. His field notes of May 6, 1968 report finding "large numbers of artifacts." One of these artifacts was a silver spoon with the letters "E.S." on the handle, which South surmised belonged to Edward Scott, who occupied nearby S10 ("Nath Moore's Front") in 1744. This was the last excavation South and his crew conducted prior to his departure to South Carolina. From his field notes, it is not clear if the excavation of this household ruin was ever completed.

At present, in addition to the 8,534 artifacts from the Edward Scott House presented in Table 13, fragments of marine shells (n=83), slate (n=7), brick (n=41), burned wood (n=59), wood (n=20), plaster (n=18), coal (n=5), prehistoric ceramic sherds (n=64), unidentifiables (n=63), as well as small ballast stones and water worn pebbles (n=95) were not included in this artifact profile.

Artifact Profiles of Excavated Ancillary/Dependency Structures

Each ancillary structure that South excavated is briefly described, with an associated table containing its artifact profile. Specific details regarding ownership or function are primarily drawn from the Historic Sites Section files at the Office of State Archaeology Research Center, as well as from South's *Archaeology at Colonial Brunswick* (2010). Additional artifacts not included in each ruin's profile are noted as well.

Russellborough Kitchen. Forty feet to the north of the Russellborough ruin, a stone foundation that measures 32 ft by 52 ft was

Table 12. Artifact Assemblage from Public House and Tailor Shop (S25) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**22,479**	**52.9**	20. Thimbles	16	< 0.1
1. Ceramics	16,288	38.3	21. Buttons	225	0.5
2. Wine Bottle	3895	9.2	22. Scissors	33	0.1
3. Case Bottle	445	1.0	23. Straight Pins	4398	10.3
4. Tumbler	768	1.8	24. Hook & Eye Fasteners	9	< 0.1
5. Pharmaceutical Bottle	473	1.1	25. Bale Seals	4	< 0.1
6. Glassware	431	1.0	26. Glass Beads	827	1.9
7. Tableware	122	0.3			
8. Kitchenware	57	0.1	**VII. Personal Group**	**71**	**0.2**
			27. Coins	29	0.1
II. Bone Group	**5497**	**n/a**	28. Keys	14	< 0.1
9. Bone Fragments	5497	n/a	29. Personal Items	28	0.1
III. Architectural Group	**9620**	**22.6**	**VIII. Tobacco Pipe Group**	**2830**	**6.7**
10. Window Glass	1261	3.0	30. Tobacco Pipes	2830	6.7
11. Nails	8095	19.0			
12. Spikes	162	0.4	**IX. Activities Group**	**578**	**1.4**
13. Construction Hardware	78	0.2	31. Construction Tools	13	< 0.1
14. Door Lock Parts	24	0.1	32. Farm Tools	6	< 0.1
			33. Toys	11	< 0.1
IV. Furniture Group	**83**	**0.2**	34. Fishing Gear	6	< 0.1
15. Furniture Hardware	83	0.2	35. Stub-Stemmed Pipes	1	< 0.1
			36. Colonoware	231	0.5
V. Arms Group	**1262**	**3.0**	37. Storage Items	158	0.4
16. Musket Balls, Shot	1228	2.9	38. Ethnobotanical	9	< 0.1
17. Gunflints, Gunspalls	22	0.1	39. Stable and Barn	3	< 0.1
18. Gun Parts	12	< 0.1	40. Misc. Hardware	140	0.4
			41. Other	0	0.0
VI. Clothing Group	**5574**	**13.1**	42. Military Objects	0	0.0
19. Buckles	62	0.1			
			Total (minus Bone Group)	**42,497**	**100.0**

identified as it appeared on the 1769 Sauthier map of Brunswick. Designated as N51, historical records place its construction after 1765. Upon excavation, South interpreted this ruin to be a kitchen. It was divided into three rooms and contained a 7-ft wide fireplace and attached brick oven. This structure was apparently destroyed by fire at the same time as the main residence of Russellborough in 1776.

The artifact profile for the Russellborough kitchen is presented in Table 14. Of particular interest was the recovery of an impressive quantity of 5,506 wine bottle fragments from a kitchen. Weighing a total of 163 lbs., South calculated this to represent a total of 108 wine bottles. Some excavated artifacts were not included in this table, such as

Table 13. Artifact Assemblage from Edward Scott House (S28) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**5098**	**59.7**	20. Thimbles	0	0.0
1. Ceramics	3364	39.4	21. Buttons	0	0.0
2. Wine Bottle	1398	16.4	22. Scissors	0	0.0
3. Case Bottle	112	1.3	23. Straight Pins	0	0.0
4. Tumbler	129	1.5	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	56	0.7	25. Bale Seals	0	0.0
6. Glassware	15	0.2	26. Glass Beads	0	0.0
7. Tableware	18	0.2			
8. Kitchenware	6	0.1	**VII. Personal Group**	**2**	**< 0.1**
			27. Coins	0	0.0
II. Bone Group	**2783**	**n/a**	28. Keys	1	< 0.1
9. Bone Fragments	2783	n/a	29. Personal Items	1	< 0.1
III. Architectural Group	**1517**	**17.8**	**VIII. Tobacco Pipe Group**	**1873**	**21.9**
10. Window Glass	347	4.1	30. Tobacco Pipes	1873	21.9
11. Nails	1110	13.0			
12. Spikes	47	0.6	**IX. Activities Group**	**38**	**0.4**
13. Construction Hardware	5	0.1	31. Construction Tools	1	< 0.1
14. Door Lock Parts	8	0.1	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**1**	**< 0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	1	< 0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**1**	**< 0.1**	37. Storage Items	37	0.4
16. Musket Balls, Shot	1	< 0.1	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	0	0.0	39. Stable and Barn	0	0.0
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	0	0.0
VI. Clothing Group	**4**	**< 0.1**	42. Military Objects	0	0.0
19. Buckles	4	< 0.1			
			Total (minus Bone Group)	**8534**	**100.0**

fragments of marine shells (n=38), melted glass (n=78), coal (n=25), ballast stones (n=60), slate (n=2), charcoal (n=2), a prehistoric ceramic sherd, and artifacts that could not be identified (n=77).

Quince Kitchen. The ruin designated N15 was located on lot 40 behind the Richard Quince House (N14). Historical records indicate that Quince likely occupied the household on this lot between 1769 and 1775, which provides a general framework for the existence of this kitchen structure. Like the main household, excavations at the kitchen site yielded no associated artifacts. With no evidence of fire, this kitchen could have been abandoned at the same time of the structure. There are no records of an artifact catalog nor could any artifact within the

Table 14. Artifact Assemblage from Russellborough Kitchen (N51) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**9419**	**90.7**	20. Thimbles	0	0.0
1. Ceramics	3625	34.9	21. Buttons	3	< 0.1
2. Wine Bottle	5506	53.0	22. Scissors	0	0.0
3. Case Bottle	39	0.4	23. Straight Pins	43	0.4
4. Tumbler	17	0.2	24. Hook & Eye Fasteners	2	< 0.1
5. Pharmaceutical Bottle	89	0.9	25. Bale Seals	0	0.0
6. Glassware	138	1.3	26. Glass Beads	0	0.0
7. Tableware	5	< 0.1			
8. Kitchenware	0	0.0	**VII. Personal Group**	**3**	**< 0.1**
			27. Coins	1	< 0.1
II. Bone Group	**549**	**n/a**	28. Keys	1	< 0.1
9. Bone Fragments	549	n/a	29. Personal Items	1	< 0.1
III. Architectural Group	**853**	**8.2**	**VIII. Tobacco Pipe Group**	**47**	**0.5**
10. Window Glass	257	2.5	30. Tobacco Pipes	47	0.5
11. Nails	568	5.5			
12. Spikes	15	0.1	**IX. Activities Group**	**5**	**< 0.1**
13. Construction Hardware	12	0.1	31. Construction Tools	0	0.0
14. Door Lock Parts	1	< 0.1	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**5**	**< 0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	5	< 0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**1**	**<0.1**	37. Storage Items	0	0.0
16. Musket Balls, Shot	0	0.0	38. Ethnobotanical	1	< 0.1
17. Gunflints, Gunspalls	1	< 0.1	39. Stable and Barn	1	< 0.1
18. Gun Parts	0	0.0	40. Misc. Hardware	2	< 0.1
			41. Other	1	< 0.1
VI. Clothing Group	**51**	**0.5**	42. Military Objects	0	0.0
19. Buckles	3	< 0.1			
			Total (minus Bone Group)	**10,384**	**100.0**

collection be specifically linked to N15. As such, there is no artifact profile for this ruin.

Newman Kitchen. Located on town lot 77, the same lot that contained the Newman-Taylor House, a portion of a ballast stone foundation was discovered by Lawrence Lee in his initial exploration of the Brunswick site in 1958. Lee began excavation of the top layer, which was completed by South in 1959. There was no evidence of a wooden or brick floor. A square of stones in the southwest corner appeared to be a bake oven, and a brick hearth was discovered on the center of the south wall. A feature of this ruin that South considered

Table 15. Artifact Assemblage from Newman Kitchen (N4) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**1389**	**56.0**	20. Thimbles	1	< 0.1
1. Ceramics	1129	45.5	21. Buttons	9	0.4
2. Wine Bottle	202	8.1	22. Scissors	0	0.0
3. Case Bottle	1	< 0.1	23. Straight Pins	0	0.0
4. Tumbler	4	0.2	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	9	0.4	25. Bale Seals	0	0.0
6. Glassware	24	1.0	26. Glass Beads	0	0.0
7. Tableware	13	0.5			
8. Kitchenware	7	0.3	**VII. Personal Group**	**3**	**0.1**
			27. Coins	2	0.1
II. Bone Group	**215**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	215	n/a	29. Personal Items	1	< 0.1
III. Architectural Group	**980**	**39.5**	**VIII. Tobacco Pipe Group**	**74**	**0.3**
10. Window Glass	25	1.0	30. Tobacco Pipes	74	0.3
11. Nails	886	35.7			
12. Spikes	63	2.5	**IX. Activities Group**	**11**	**0.4**
13. Construction Hardware	6	0.2	31. Construction Tools	4	0.2
14. Door Lock Parts	0	0.0	32. Farm Tools	0	0.0
			33. Toys	1	< 0.1
IV. Furniture Group	**3**	**0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	3	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**8**	**0.3**	37. Storage Items	1	< 0.1
16. Musket Balls, Shot	1	< 0.1	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	5	0.2	39. Stable and Barn	1	< 0.1
18. Gun Parts	2	0.1	40. Misc. Hardware	4	0.2
			41. Other	0	0.0
VI. Clothing Group	**14**	**0.6**	42. Military Objects	0	0.0
19. Buckles	4	0.2			
			Total (minus Bone Group)	**2482**	**100.0**

unique was a circle of stones added to the south end of the structure, which he interpreted as a protective area for a planted bush, tree, or herb.

Designated N4, Table 15 illustrates the artifacts recovered from the Newman kitchen. Not included were fragments of marine shells (n=11), slate (n=4), prehistoric ceramic sherds (n=6), unglazed earthen tile fragments like those in St. Philip's Church (n=5), mortar (n=23), and unidentified artifacts (n=46), as well as a ballast stone (n=1), a brick (n=1), and a charcoal fragment (n=1).

Judge Maurice Moore Kitchen. This wooden kitchen structure, designated ruin S15, was located 30 ft to the west of the Judge Maurice Moore residence on lot 28. It had a large fireplace that measured 9 ft in

Table 16. Artifact Assemblage from Judge Maurice Moore's Kitchen (S15) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**4152**	**65.9**	20. Thimbles	2	< 0.1
1. Ceramics	2690	42.7	21. Buttons	29	0.5
2. Wine Bottle	1196	19.0	22. Scissors	4	0.1
3. Case Bottle	16	0.3	23. Straight Pins	0	0.0
4. Tumbler	159	2.5	24. Hook & Eye Fasteners	1	< 0.1
5. Pharmaceutical Bottle	19	0.3	25. Bale Seals	1	< 0.1
6. Glassware	31	0.5	26. Glass Beads	3	< 0.1
7. Tableware	19	0.3			
8. Kitchenware	22	0.3	**VII. Personal Group**	**27**	**0.4**
			27. Coins	13	0.2
II. Bone Group	**179**	**n/a**	28. Keys	4	0.1
9. Bone Fragments	179	n/a	29. Personal Items	10	0.2
III. Architectural Group	**1283**	**20.4**	**VIII. Tobacco Pipe Group**	**745**	**11.8**
10. Window Glass	392	6.2	30. Tobacco Pipes	745	11.8
11. Nails	865	13.7			
12. Spikes	18	0.3	**IX. Activities Group**	**27**	**0.4**
13. Construction Hardware	7	0.1	31. Construction Tools	4	0.1
14. Door Lock Parts	1	< 0.1	32. Farm Tools	2	< 0.1
			33. Toys	1	< 0.1
IV. Furniture Group	**11**	**0.2**	34. Fishing Gear	0	0.0
15. Furniture Hardware	11	0.2	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	7	0.1
V. Arms Group	**9**	**0.1**	37. Storage Items	1	< 0.1
16. Musket Balls, Shot	5	0.1	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	3	< 0.1	39. Stable and Barn	4	0.1
18. Gun Parts	1	< 0.1	40. Misc. Hardware	7	0.1
			41. Other	0	0.0
VI. Clothing Group	**45**	**0.7**	42. Military Objects	1	< 0.1
19. Buckles	5	0.1			
			Total (minus Bone Group)	**6299**	**100.0**

its interior, with an attached round bake oven on its outside corner. The kitchen building was destroyed by fire, possibly at the same time as the main residence.

The artifact profile for the Judge Maurice Moore kitchen is presented in Table 16. Not included in this profile are fragments of marine shells (n=2), bricks (n=12), plaster (n=4), sulfur (n=2), prehistoric ceramics (n=3), prehistoric lithics (n=3), unidentifiable artifacts (n=65), and a slate fragment (n=1).

Judge Maurice Moore Smokehouse. The third building excavated on lot 28 was what South (2010:37) described as an "unusual smokehouse." Located a few feet behind Moore's residence, it had a

Table 17. Artifact Assemblage from the Maurice Moore's Smokehouse (S20) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**3641**	**72.0**	20. Thimbles	0	0.0
1. Ceramics	2369	46.8	21. Buttons	8	0.2
2. Wine Bottle	891	17.6	22. Scissors	0	0.0
3. Case Bottle	65	1.3	23. Straight Pins	1	< 0.1
4. Tumbler	96	1.9	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	29	0.6	25. Bale Seals	0	0.0
6. Glassware	184	3.6	26. Glass Beads	0	0.0
7. Tableware	2	< 0.1			
8. Kitchenware	5	0.1	**VII. Personal Group**	**4**	**0.1**
			27. Coins	1	< 0.1
II. Bone Group	**218**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	218	n/a	29. Personal Items	3	0.1
III. Architectural Group	**804**	**15.9**	**VIII. Tobacco Pipe Group**	**570**	**11.3**
10. Window Glass	471	9.3	30. Tobacco Pipes	570	11.3
11. Nails	322	6.4			
12. Spikes	8	0.2	**IX. Activities Group**	**19**	**0.4**
13. Construction Hardware	3	0.1	31. Construction Tools	0	0.0
14. Door Lock Parts	0	0.0	32. Farm Tools	1	< 0.1
			33. Toys	4	0.1
IV. Furniture Group	**2**	**< 0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	2	< 0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	9	0.2
V. Arms Group	**9**	**0.2**	37. Storage Items	5	0.1
16. Musket Balls, Shot	8	0.2	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	1	< 0.1	39. Stable and Barn	0	0.0
18. Gun Parts	0	0.0	40. Misc. Hardware	0	0.0
			41. Other	0	0.0
VI. Clothing Group	**9**	**0.2**	42. Military Objects	0	0.0
19. Buckles	0	0.0			
			Total (minus Bone Group)	**5058**	**100.0**

ballast stone foundation 9.5 ft square, with a row of bricks extending ten feet to a firebox with a domed brick cover. The external firebox and brick channel would have allowed fire-produced smoke to cure meat hung within the smokehouse without any direct exposure to the fire's heat.

Designated as S20, the artifact profile of the Judge Maurice Moore smokehouse is presented as Table 17. Not included are fragments of marine shells (n=69), bricks (n=97), ballast stones (n=52), charcoal (n=75), mortar (n=21), plaster (n=4), slate (n=4), and unidentifiable artifacts (n=39).

Artifact Profiles of Excavated Public Buildings

Excavations of the two public buildings and St. Philip's Church are briefly described, each with a table containing its artifact profile. Specific historical details are drawn primarily from the Historic Sites Section files at the Office of State Archaeology Research Center, as well as from South's *Archaeology at Colonial Brunswick* (2010). Artifacts not included in each ruin's profile are also noted.

Courthouse. The courthouse at Brunswick was designated as N7. A law was passed in 1729 for its construction, and by 1731, a visitor to Brunswick confirmed its presence. Curiously, another law passed in 1764 empowered the justices of Brunswick County to build a courthouse at Brunswick (South 2010:41, 47). It is not clear to which period this courthouse ruin of N7 refers. Constructed of ballast stone, it measured 25 ft square. A partition wall at the south end of the ruin was interpreted by South as a divider between the court officials and the public courtroom area. In either case of a 1731 or 1764 construction, historical records indicate this structure was destroyed in the hurricane of September 7–8, 1769, as detailed in Beaman and McKee (2011).

The artifact profile for the courthouse at Brunswick is presented in Table 18. Not included within the profile are fragments of marine shell (n=1), slate (n=45), unglazed terra cotta tiles similar to the ones in St. Philip's Church (n=19), plaster (n=2), prehistoric ceramics (n=11), and unidentified artifacts (n=48).

Gaol (Jail). The date of the jail, as with the courthouse ruin, is in dispute. Both the 1729 and 1764 acts also call for the construction of a jail, stocks, and pillory. The Sauthier map of 1769 shows the jail as located between the courthouse and St. Philip's Church. South excavated a portion of lot 79, where the jail was suspected to be located, and it contained a quantity of colonial period refuse. No masonry foundation was found of a jail structure, just two post holes which South interpreted as being for stocks or a pillory. He designated this area as N22. No evidence of fire was identified, which may be interpreted as either the jail was never built or was abandoned by 1776.

An artifact profile for the refuse on lot 79, the area of the jail, is presented as Table 19. Not included within the profile are fragments of unglazed terra cotta tiles similar to those in St. Philip's Church (n=6), sheet copper (n=2), melted iron (n=14), slate (n=1), plaster (n=2), a prehistoric ceramic sherd, and unidentified iron artifacts (n=14).

Table 18. Artifact Assemblage from the Courthouse (N7) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**2572**	**42.0**	20. Thimbles	0	0.0
1. Ceramics	1764	28.8	21. Buttons	46	0.8
2. Wine Bottle	501	8.2	22. Scissors	0	0.0
3. Case Bottle	151	2.5	23. Straight Pins	8	0.1
4. Tumbler	75	1.2	24. Hook & Eye Fasteners	1	< 0.1
5. Pharmaceutical Bottle	26	0.4	25. Bale Seals	2	< 0.1
6. Glassware	16	0.3	26. Glass Beads	1	< 0.1
7. Tableware	14	0.2			
8. Kitchenware	25	0.4	**VII. Personal Group**	**8**	**0.1**
			27. Coins	4	0.1
II. Bone Group	**165**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	165	n/a	29. Personal Items	4	0.1
III. Architectural Group	**3187**	**52.0**	**VIII. Tobacco Pipe Group**	**25**	**0.4**
10. Window Glass	1106	18.1	30. Tobacco Pipes	25	0.4
11. Nails	2055	33.6			
12. Spikes	17	0.3	**IX. Activities Group**	**103**	**1.7**
13. Construction Hardware	6	0.1	31. Construction Tools	7	0.1
14. Door Lock Parts	3	< 0.1	32. Farm Tools	3	< 0.1
			33. Toys	0	0.0
IV. Furniture Group	**23**	**0.4**	34. Fishing Gear	0	0.0
15. Furniture Hardware	23	0.4	35. Stub-Stemmed Pipes	1	< 0.1
			36. Colonoware	9	0.1
V. Arms Group	**137**	**2.2**	37. Storage Items	46	0.8
16. Musket Balls, Shot	120	2.0	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	16	0.3	39. Stable and Barn	2	< 0.1
18. Gun Parts	1	< 0.1	40. Misc. Hardware	12	0.2
			41. Other	1	< 0.1
VI. Clothing Group	**68**	**1.1**	42. Military Objects	22	0.4
19. Buckles	10	0.2			
			Total (minus Bone Group)	**6123**	**100.0**

St. Philip's Church. A small church was used during the early years of Brunswick's settlement. It was not until Royal Governor Arthur Dobbs moved to the town that the construction of St. Philip's, a large Anglican church, was undertaken. Construction was underway by November 1754, and a lottery was held to raise money for the structure. A storm damaged the nearly completed roof in 1760. A second lottery was then held, leading to its final completion by June 1768. It undoubtedly served as a social hearth for the community, as in all phases the occupants of the town rallied to complete its construction. At some point, the interior of the structure was destroyed by fire, perhaps in 1776. Today the brick edifice stands as the most prominent landmark on the

Table 19. Artifact Assemblage from the Area of the "Gaol" (N22) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**360**	**65.3**	20. Thimbles	0	0.0
1. Ceramics	225	40.8	21. Buttons	0	0.0
2. Wine Bottle	125	22.7	22. Scissors	0	0.0
3. Case Bottle	1	0.2	23. Straight Pins	0	0.0
4. Tumbler	4	0.7	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	0	0.0	25. Bale Seals	0	0.0
6. Glassware	0	0.0	26. Glass Beads	0	0.0
7. Tableware	0	0.0			
8. Kitchenware	5	0.9	**VII. Personal Group**	**1**	**0.2**
			27. Coins	0	0.0
II. Bone Group	**24**	**n/a**	28. Keys	0	0.0
9. Bone Fragments	24	n/a	29. Personal Items	1	0.2
III. Architectural Group	**183**	**33.2**	**VIII. Tobacco Pipe Group**	**2**	**0.4**
10. Window Glass	64	11.6	30. Tobacco Pipes	2	0.4
11. Nails	82	14.9			
12. Spikes	3	0.5	**IX. Activities Group**	**4**	**0.7**
13. Construction Hardware	34	6.2	31. Construction Tools	0	0.0
14. Door Lock Parts	0	0.0	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**0**	**0.0**	34. Fishing Gear	0	0.0
15. Furniture Hardware	0	0.0	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**1**	**0.2**	37. Storage Items	0	0.0
16. Musket Balls, Shot	0	0.0	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	1	0.2	39. Stable and Barn	2	0.4
18. Gun Parts	0	0.0	40. Misc. Hardware	1	0.2
			41. Other	0	0.0
VI. Clothing Group	**0**	**0.0**	42. Military Objects	2	0.2
19. Buckles	0	0.0			

Brunswick landscape. Interestingly, Dobbs was—and remains—buried within its walls.

South designated the church ruin as S1. While his excavation revealed the structural details of the church's interior, the artifacts that were recovered are presented in Table 20. As per the standardized catalog sheets, not included were 10 wire nails from the 1929 burial of Alfred Moore.

Beyond Brunswick Town

This study has covered the 19 structures at Brunswick Town that were excavated by Stanley South between 1958 and 1968. While the artifact profiles for five of these—Nath Moore's Front, the Hepburn-

Table 20. Artifact Assemblage from St. Philips Church (S1) in Carolina Artifact Pattern Format.

ARTIFACT CATEGORY	n	%	ARTIFACT CATEGORY	n	%
I. Kitchen Group	**42**	**3.3**	20. Thimbles	0	0.0
1. Ceramics	20	1.6	21. Buttons	1	0.1
2. Wine Bottle	17	1.3	22. Scissors	0	0.0
3. Case Bottle	0	0.0	23. Straight Pins	0	0.0
4. Tumbler	0	0.0	24. Hook & Eye Fasteners	0	0.0
5. Pharmaceutical Bottle	2	0.2	25. Bale Seals	0	0.0
6. Glassware	2	0.2	26. Glass Beads	0	0.0
7. Tableware	0	0.0			
8. Kitchenware	1	0.1	**VII. Personal Group**	**1**	**0.1**
			27. Coins	0	0.0
II. Bone Group	**0**	**n/a**	28. Keys	1	0.1
9. Bone Fragments	0	n/a	29. Personal Items	0	0.0
III. Architectural Group	**1207**	**95.4**	**VIII. Tobacco Pipe Group**	**1**	**0.1**
10. Window Glass	1085	85.8	30. Tobacco Pipes	1	0.1
11. Nails	118	9.3			
12. Spikes	1	0.1	**IX. Activities Group**	**6**	**0.5**
13. Construction Hardware	3	0.2	31. Construction Tools	0	0.0
14. Door Lock Parts	0	0.0	32. Farm Tools	0	0.0
			33. Toys	0	0.0
IV. Furniture Group	**1**	**0.1**	34. Fishing Gear	0	0.0
15. Furniture Hardware	1	0.1	35. Stub-Stemmed Pipes	0	0.0
			36. Colonoware	0	0.0
V. Arms Group	**6**	**0.5**	37. Storage Items	0	0.0
16. Musket Balls, Shot	6	0.5	38. Ethnobotanical	0	0.0
17. Gunflints, Gunspalls	0	0.0	39. Stable and Barn	0	0.0
18. Gun Parts	0	0.0	40. Misc. Hardware	1	0.1
			41. Other	0	0.0
VI. Clothing Group	**1**	**0.1**	42. Military Objects	5	0.4
19. Buckles	0	0.0			
			Total (minus Bone Group)	**1265**	**100.0**

Reonalds House, the Public House and Tailor Shop, Russellborough, and the Courthouse—have seen the light of limited publication beyond the folders contained in the dusty file cabinets, their inclusion here is warranted to offer a complete portrait of the older excavated structures of Brunswick Town. Such data can be used for comparison of individual ruins to new excavations at Brunswick and other sites, or could be used to construct a larger community portrait of this meddling port-town.

The forthcoming second part of this study will highlight older excavated structures and sites beyond Brunswick whose artifact data have likewise seen little to no publication. Some of these structures will be from other colonial towns, such as Halifax, Bath, Edenton, and New

Bern, while others will be from more rural contexts, such as Stagville and Fort Fisher. There will also be a few featured from early cultural resource management studies and volunteer excavations of non-state historic site projects and properties. Many of these will feature nineteenth-century contexts as well. However, the goal of the forthcoming second part remains the same—to make older excavated data trapped in dusty file cabinets more useful to modern archaeologists.

Notes

Acknowledgments. This study is not the sole effort of an individual but a collaborative endeavor of many, for which the author thanks for their valuable encouragement, advice, and assistance, and he hopes this final product reflects well on their efforts. My most valuable acknowledgments and thanks for making this overall study possible are to Dr. Linda F. Carnes-McNaughton, former Head of the Historic Sites Section Archaeology Branch, and to Dr. Billy Oliver, former Director of the Office of State Archaeology Research Center. It is with their permissions and blessings that I not only undertook this task, but spent many reams of paper copying artifact catalogs and associated documentation from their files, as well as working with these collections to attempt to ascertain or confirm artifact counts and identifications. Editorial advice on different stages of this study was generously provided by Linda F. Carnes-McNaughton (Fort Bragg Cultural Resources), John J. Mintz (North Carolina Office of State Archaeology), Jim McKee (Site Manager of Brunswick Town/Fort Anderson State Historic Site), Martha A. Zierden (The Charleston Museum), and Pam Beaman. Additional thanks go to R. P. Stephen Davis, Jr., for providing the technical support to see this manuscript into print.

Earlier versions of this study on the Brunswick Town households were crafted for presentation at the 2015 Southeastern Conference on Historic Sites Archaeology and at the 2016 Society for Historical Archaeology conference in Washington, D.C., in the symposium “Off the Public Walkway: Expanding Interpretations of a Colonial Era Town and Civil War Fort at Brunswick Town/Fort Anderson State Historic Site.” While the basic content has not changed, these earlier versions have been expanded and sections elaborated for its presentation in print. Its publication here represents the final incarnation of this set of data from Brunswick Town, though future installments of “Archival Excavations from Dusty File Cabinets” will cover data from different archaeological sites.

The first installment of this study is dedicated to the memory of Stanley South, whose work at Brunswick Town and other sites paved the way for the growth of historical archaeology in North Carolina. Though his light was extinguished this past March (2016), his nomothetic lantern of scientific archaeology continues to illuminate the path upon which so many of us travel. As an archaeologist, poet, mentor, and friend, he is and will continue to be missed.

Figures. Excerpt from the 1769 Map of Brunswick Town by Claude Joseph Sauthier is from the North Carolina State Archives. The labels added to Figure 1 are by Matt Nisbet, who continues to have my thanks. Figure 2 is from the Brunswick Town files as part of the Historic Sites Section files at the North Carolina Office of State Archaeology Research Center. All images are reproduced here with permission.

Collections. The master paperwork files and artifact collections related to the archaeology of Brunswick Town/Fort Anderson State Historic Site are stored at the Office of State Archaeology Research Center in Raleigh, North Carolina.

Disclaimer. Even with the tremendous support and assistance of the individuals acknowledged above, the author assumes full responsibility for any factual errors and the interpretations presented in this article.

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PREFACE: IDENTIFYING AND DEFINING NORTH CAROLINA'S ARCHAEOLOGICAL HERITAGE THROUGH REMOTE SENSING AND GEOPHYSICS

by

John J. Mintz and Shawn M. Patch

For scientists it's what one can't see that intrigues us. It is where the mystery begins and too often ends. Researchers interested in historic properties and cultural landscapes have long wished for ways to identify, explore, document, and interpret subsurface archaeological sites and their attendant features without disturbing the often fragile nature of the landscape. In respect to archaeological investigations, it is a well-accepted axiom that archaeology often alters or rearranges the medium that contains the desired information. However, applying the appropriate archaeological field methodology and positing a comprehensive research design with relevant research questions can and often does mitigate the loss of ancillary data and helps to ensure the capture of all pertinent information.

Remote sensing and *geophysics* are terms that are sometimes used interchangeably in archaeological applications. Both rely on non-invasive methods and techniques, but their applications aren't quite the same. Remote sensing generally refers to data that are acquired from above the earth's surface such as aerial or satellite imagery. Geophysics refers to data that are collected by scanning the earth's near surface either in direct contact with the ground or very close to it. And, newer methods such as 3D laser scanning don't fit neatly into either category because they can be applied to the built environment as well. The common element of these methods, however, is that they are non-invasive and provide ways of investigating and understanding archaeological sites that cannot be accomplished by other methodologies.

Kvamme (2003) has promoted the idea that geophysical surveys can collect high-quality data over large areas and then use these data to investigate cultural features at the landscape scale (e.g., tens of hectares). Primary data can then be further filtered and used to identify and explore not only intra-site site structure and feature patterning but other site characteristics as well.

PREFACE

The following papers are the result of a symposium titled "Exploring North Carolina's Archaeological Heritage through Remote Sensing and Geophysics" that was organized by John J. Mintz and Emily McDowell (North Carolina Office of State Archaeology) and Shawn M. Patch (New South Associates, Inc.), and held at the North Carolina Museum of History on March 12, 2016. These papers examine the recent use of archaeological geophysics on several prehistoric and historic archaeological sites (including cemeteries) in North Carolina with some parallels drawn from neighboring states. While archaeological geophysics cannot be considered as the only "tool" in the archaeological tool box, if properly selected and used it is an effective one whose utility is only now being realized.

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THE ROLE OF GPR IN ARCHAEOLOGY: A BEGINNING NOT AN END

by

Charles R. Ewen

Abstract

The general public, via such television programs as *CSI* and *Bones*, think they know all about the amazing detecting capabilities of ground-penetrating radar (GPR). Some reality programs employ the technology to quickly pinpoint the location of all manner of buried treasure. However, real archaeologists know better. Or do they? This paper examines the archaeological potential, limitations, and cost effectiveness of GPR as employed by East Carolina University archaeologists.

Many archaeological methods have been developed to locate subsurface features such as burials, foundations, and other buried materials. One such technique involves the utilization of ground-penetrating radar (GPR) and has been found to be particularly successful in identifying locations of historic graves. Despite GPR's ability to detect soil anomalies, it is only through the interpretation of the GPR data, combined with archaeological excavation, that its validity can be measured.

GPR is a geophysical technique that transmits high-frequency radar pulses, or electromagnetic waves, into the ground from a sending unit equipped with a surface antenna and a computer for data collection. The transmitted signal reflects off of subsurface features, such as changes in sediment or archaeologically buried materials, and returns to the antenna. There is clearly more to it than what I have just described, but that is for a more technical paper. Suffice it say, the more experienced the operator, the better the results. My intent with this paper is to show its utility in a couple of our field projects.

In the case of historic burials, the strength of the anomaly is determined by a number of factors, such as the underlying geology and overall character of the burial (Conyers 2004; Nobes 1999). More recent burials should be much more apparent since there should be more left to detect. In earlier burials, where the coffin has decomposed, the skeletal remains, despite their survival, are generally not detected. Rather, the disturbed soil of the grave shaft, compared to the more uniform surrounding soil, is what may be more easily perceived (Bevan 1991; King et al. 1993; Mellett 1992). However, the well-drained sandy soils of the North Carolina coastal plain often do not retain distinct soil differences beyond subtle color differences, and this makes detection ambiguous.

Despite the wealth of knowledge that can be gained from a GPR analysis, there are a number of limitations due to the very nature of GPR data collection. For example, soil conditions must be favorable, archaeological subsurface features need to be markedly unambiguous so as to be distinguished from geological or man-made (such as utility trenches) elements, and those features must be at a depth where they can be recognized by the machine and the data interpreter. Also, an anomaly is almost never exactly where the GPR data projects it to be; rather, it can be within a one-meter radius of that area (Bevan 1991; Conyers 2004). Although no project can ever overcome all of these variables, when taken into consideration these limitations can be minimized.

The utilization of GPR within historical archaeology for the purpose of mapping cemeteries and locating unmarked graves is becoming more commonplace (Bevan 1991; Conyers 2004; Davenport 2001; King et al. 1993; Mellett 1992; Nobes 1999). Recently, GPR was employed at the forensic investigations at the Dozier Boy's School in Marianna, Florida to locate unmarked burials in a scandalous case of long-term abuse. Though there were often no coffins, the clay soils of the Florida panhandle were conducive to revealing anomalies produced by grave excavation (Kimmerle 2016).

Fort Macon

At East Carolina University, we have had mixed results with our GPR surveys. My first personal experience with GPR was at Fort Macon State Park. We were asked by Fort Macon park historian, Paul Branch, to relocate the commandant's house outside the fort proper (Bregger et al. 2003). We had an historic map that got us to the general area, then we turned to remote sensing. A colleague, Jami Lockhart of the Arkansas Archeological Survey, brought several types of geophysical instruments (e.g., GPR, electromagnetic conductivity, resistivity, and electromagnetic susceptibility) to the site. And he actually knows how to use them! However, as occasionally happens, this suite of remote sensing techniques produced somewhat ambiguous results. We tried it again in 2011 with similar ambiguity. Follow-up excavations through six to eight feet of sand overburden revealed brick features that were

Figure 1. Stripping topsoil at Beebe Park, Washington, NC.

related to outbuildings but not the main house foundation (Robbins 2014).

Washington, 2004

My Public Archaeology class was called out to Washington, North Carolina in 2004 to survey a vacant lot, which the City wanted to turn into a park. It had been the site of the former black cemetery in town. We were assured that the graves had all been moved decades ago. The headstones had certainly been moved, but a GPR survey performed by private contractor Ron Crowson suggested that some graves were present. The archaeologists stripping the topsoil demonstrated that all of them were still there (Figure 1). This further demonstrated the value of GPR in guiding excavation and led us to acquire our own unit (Wilde-Ramsing 2004).

According to Geophysical Survey Systems, Inc. (2016), the SIR-3000 was the industry's number one choice for data accuracy and versatility. It is a tool developed to save time, money, and even lives.

That last claim is interesting but the website didn't go into any further detail on its life-saving features. The SIR-3000 is a small, lightweight system designed for single-user operation. This product provides the essential features and flexibility that experienced GPR users require, as well as simplified, application-specific user interfaces for inexperienced GPR users. The onboard computer, cart, 400mhz antenna, and RADAN software cost us about $17,000 in 2008.

Somerset Place, 2008

Somerset Place was one of North Carolina's largest antebellum plantations. It was a community unto itself and served as the home of Josiah Collins III, his wife Mary, and their six children. Not only was it a home to them, but also to the others, both enslaved and free, whom it took to keep a plantation of its size functioning during the nineteenth century. One of those persons was Sarah Howser, who acted as governess to the Collins children during most of the 1830s. She played an important role in the Collins' household, and her death in 1838 must have been a significant loss to the Collins family. A five-foot tall marble tombstone marked her grave at the time of her burial on the plantation. Unfortunately, around 1938 the damaged tombstone was removed, never to be returned to its proper place, and was stored at various locations around Somerset (Redford, personal communication 2008). As a result, the exact location of Sarah Howser's grave had been lost. The purpose of our project was to relocate Sarah's gravesite in order to facilitate the reinstallation of the tombstone to its rightful place above her grave. Historical research got us within 100 square feet (Amato 2008). The GPR narrowed that space to 10 square feet, and archaeological excavation found the grave. The grave was uncovered and the tombstone fitted to the broken base (Figure 2).

Richard Caswell Grave, 2008

Despite the visibility that he earned as the first governor of the State of North Carolina, Richard Caswell (b1729–d1789) quite literally disappeared from public view after his death. Some individuals felt that the loss of his burial location was a loss for North Carolina's citizens, his direct descendants, and groups like the Daughters of the American Revolution. The location of Caswell's grave was sought through historic documentation, geophysical, and archaeological techniques. As Figure 3 shows, there really was not a GPR signature at the site of what we believed to be Caswell's grave. The outline of the grave pit was subtle as well. Excavations produced a grave shaft and remnants of a wooden

Figure 2. Restored grave of Sarah Howser.

coffin (Ewen & Balko 2008). There just was not enough remaining to cause much of a reflection.

ECU Dental School, 2008

Later that year, John Clauser (CEO, Of Grave Concerns) subcontracted with us to conduct a GPR survey of an area suspected to be an unmarked African-American cemetery (Ewen et al. 2008). The area in question was the site of East Carolina University's proposed Dental School, and it was important to identify the graves so they could be moved prior to any construction activity.

The radar performed reasonably well in the soil conditions presented by the cemetery on MacGregor Downs Road. All of the recorded anomalies and physical landmarks were mapped and reproduced graphically. The GPR results corresponded very closely with the depressions observed by Clauser and his associate Ward Sutton, and flagged in the field. As it turns out, probing was probably just as effective (and a lot cheaper!). However, ECU was glad they were shown

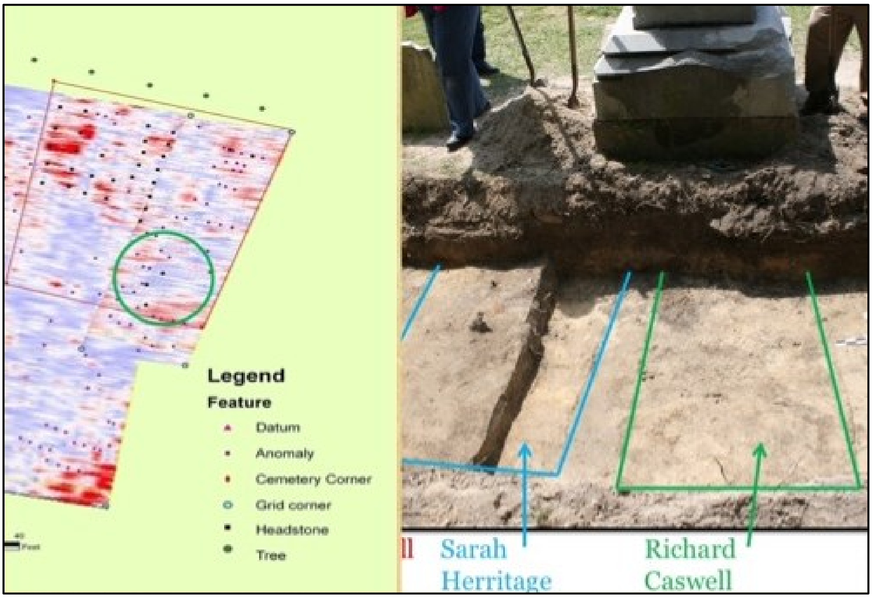

Figure 3. GPR Survey at Caswell Cemetery.

to be doing the due diligence in making sure that the graves were all located and reinterred.

Results

Ground penetrating radar is an excellent tool when used judiciously. It should always be followed up with ground-truthing excavation. A large liability is that the general public has high expectations of this "magic" machine and it doesn't matter how much you explain its limitations. In many cases, if the scans show no anomalies then further research is deemed unnecessary, when features, such as graves, may in fact be present.

A government memorandum stated that "Extensive pilot tests completed at Arlington National Cemetery in 2010 demonstrated that ground penetrating radar (GPR) and other technology currently being used to determine irregularities below the ground with regards to interred individuals, caskets and urns are statistically unreliable and subject to a wide range of interpretation. Subject matter experts have provided analysis stating that the results of GPR introduce more uncertainty than conclusive evidence for individual gravesites. The significant costs associated with GPR also far outweigh any reasonable expectation of benefit for cemetery purposes. Therefore, GPR and other technology currently being used to determine irregularities below the ground will not be used for cemetery purposes on Army property until further notice" (Condon 2012).

Something changed over the next couple of years because in 2014 a programmatic agreement between the Arlington National Cemetery and the Virginia SHPO (2014: 5) stated: "As noted previously deeply intrusive historic period features are most likely to be a surviving and significant resource type. Remote sensing survey is an effective and non-invasive archaeological technique for identifying these types of features. In particular, ground penetrating radar (GPR) should be well suited to finding such features at ANC. GPR works best where the surface geology, as at ANC, is composed of sandy sediments, and the ground is even and lacks coarse vegetation. A remote sensing expert may elect to employ other technologies to augment this, such as magnetometer and electrical resistivity." So, has the technology advanced so much in four years, or are the government's expectations more realistic?

We will continue to use GPR wherever possible in our investigations. However, we will not make positive claims about subsurface anomalies until we can ground-truth them with archaeology. We hope that the technology will continue to improve and that GPR will help provide us with good information upon which sound decisions can be made to follow up with appropriate archaeological investigations.

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THREE-DIMENSIONAL REMOTE SENSING AT HOUSE IN THE HORSESHOE STATE HISTORIC SITE (31MR20), MOORE COUNTY, NORTH CAROLINA

by

Stacy Curry and Doug Gallaway

Abstract

The House in the Horseshoe (Alston House) located in Sanford, North Carolina, is an eighteenth-century property with a complex history of land use. It was the scene of a small skirmish between North Carolinians loyal to the British crown and those in favor of independence. This project used a single-lens reflex digital camera to capture multiple overlapping photos of the house in order to create digital three-dimensional (3D) models of the structure. VisualSFM and Agisoft Photoscan were used to create multidimensional point clouds of the building exterior, and these resulted in the 3D models. An evaluation of these two modeling and point cloud generation tools is presented. The paper concludes with a discussion of future refinements that can be made to increase the accuracy of 3D models created in this manner.

The following discussion is taken from a larger, more in-depth, long-term research project that involves the use of geophysical remote sensing to investigate both natural and cultural landscapes. The rapidly emerging practice of using digital photography to produce three-dimensional models of archaeological sites has informed the research goals presented herein.

The focus of this study is to demonstrate the utility of using two differing approaches to capture, model (i.e., reconstruct), and visualize cultural features in a three-dimensional perspective. The Alston House, located at the House in the Horseshoe State Historic Site, presents an opportunity to model an intact structure and test the availability and applicability of several low-cost open-source software packages. By using multidimensional data generated from a digital camera, a point cloud (i.e., a set of points in a three dimensional [3D] system with x, y, and z coordinates) can be developed that allows landscape features to be visualized, and provides a nonintrusive measurement option. This point cloud allows for a more in-depth understanding of the use of landscape and the built environment over time and space (Thompson et al. 2011).

Environmental Setting

The House in the Horseshoe State Historic Site is located on the east bank of the Deep River in Moore County, North Carolina. The most prominent feature on the site is an eighteenth-century, two-story wood frame house built (ca. 1770) by former four-term North Carolina Governor Benjamin Williams. The house is more commonly referred to as the Alston House due to its occupation by Whig Colonel Phillip Alston. The house and its immediate environs was the scene of a skirmish between North Carolinians loyal to the British crown and those in favor of independence.

Methods

The Alston House site provides a unique chance to study the culturally modified landscape that evinces over two hundred years of occupation by the property's former owners. The overall objective of this study was to test imagery obtained from a digital SLR camera and to determine if "LiDAR-like" (Light Detection and Ranging) point clouds could be generated along with 3D models of the Alston House using multiple photographs taken of the Alston House from several angles.

A point cloud is a collection of discrete three-dimensional locations (points) that can have additional metadata associated with each point. Point clouds appear realistic to even the most casual observer because of their three-dimensional nature. Technologies like laser scanning, standard digital photography, and other visual technologies not only produce images but extend the power to detect, record, and imagine landscapes (Mlekuz 2013). Two types of point cloud technologies exist—active and passive. Active collection involves the emission of energy (light in a particular wavelength) from a scanner where the light reflects from a surface, returns to the scanner, and generates a 3D point cloud. Terrestrial laser scanning (TLS) or ground-based LiDAR is an example of active point cloud collection. Conversely, passive collection accumulates energy reflected off of surfaces from many different locations (White 2013). For the research outlined in this study, the point cloud is generated from the passive use of a single-lens reflex (SLR) digital camera.

Recent advances in photogrammetric software have allowed the creation of three-dimensional models using unstructured imagery. "Unstructured" refers to imagery that lacks the typical metadata required by standard photogrammetry, such as information about the interior and exterior orientation of the camera. Much of this has been done in the open-source software community, thus setting the stage for free or low-cost software solutions and spurring the use of three-dimensional modeling for a variety of applications. Both software packages used in this study generate point clouds based on the estimated camera positions and calculate depth information for each camera.

The structure under study is a wood-frame, two-story home with brick chimneys on either end. Due to the extant vegetation and topography of the site, camera angles and positions could not capture all of the façade; the roof and porch of the house exhibit some gaps in data collection. The only way to alleviate this problem is to use an unmanned aerial vehicle (UAV) or employ an active sensor, such as a terrestrial laser scanner, to collect the point cloud data. In regards to the imagery used for the model generation, 124 images were taken sequentially around the structure. The overlapping photographs were taken from a variety of angles and encompass the entire structure *sans* certain sections of the roof and porch.

The study also examined the utility of two software packages, one free open source (VisualSFM) and one low cost (Agisoft Photoscan), for modeling the Alston House. VisualSFM uses a graphical user interface (GUI) for the reconstruction of 3D models using a method called Structure from Motion (SfM). SfM operates under the same rules as stereoscopic photogrammetry, where the structure is recreated from a series of overlapping images (Westoby et al. 2012). VisualSFM also utilizes algorithms known as Clustering View for Multi-view Stereo (CMVS) and Patch-based Multi-view Stereo (PMVS2) for creation of point clouds (Furukawa and Ponce 2007). The CMVS breaks the images into manageable clusters, and the PMVS2 is used to reconstruct a denser point cloud, cluster by cluster. This dense point cloud can then be used in additional processes such as meshing (i.e., creating a single 3D image from many different photos) and texturing (i.e., making the final image appear seamless).

The workflow for VisualSFM using the Alston House imagery involves several steps. After loading the images, feature detection is run along with the full pairwise image matching. Feature detection is the locating of common points or features in two or more images. In Figure 1, the feature matches can be viewed along with their corresponding tie points. Next in order is the creation of an initial "sparse" point cloud model. This point cloud has far fewer points and is more general than the point cloud used in the final model. Finally, a dense reconstruction of the point cloud is generated using Yasutaka Furukawa's

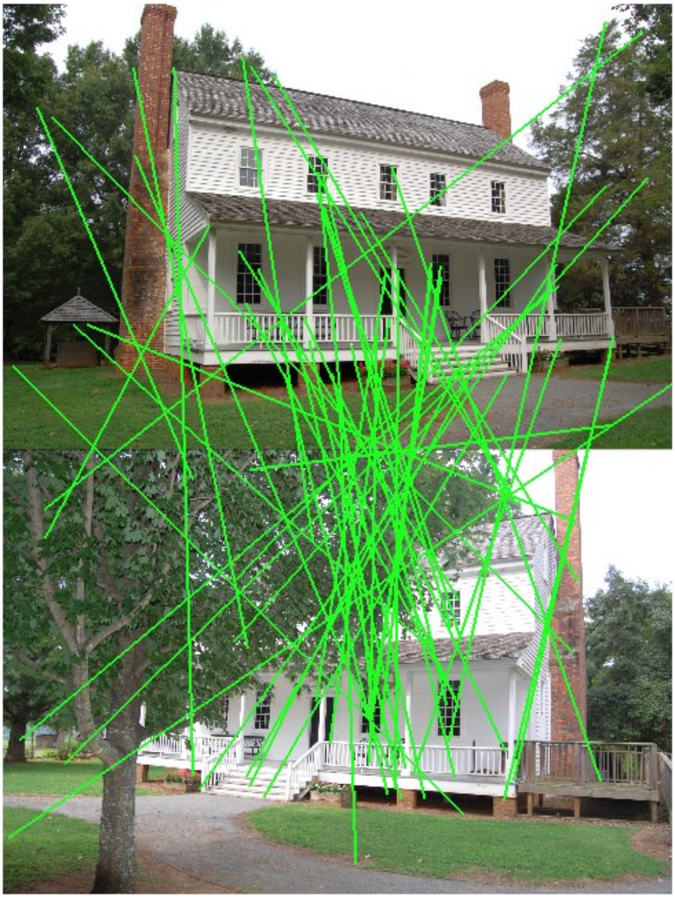

Figure 1. VisualSFM feature matching.

CMVS/PMVS algorithms. The resulting model is depicted in Figure 2. The chimneys and upper story of the structure were captured in great detail within the model. Obstructions, such as invasive topography and vegetation, are retained in the model, although these objects can be better handled by using a manual editing program such as Meshlab. Finally, holes or gaps in the data indicate the inability of the camera to capture certain angles caused by external obstructions. Again, outside editing software could interpolate and fill the holes and gaps, but a better solution would be to capture more imagery with increased angles as well as increased customization of the parameters of the feature-matching step.

Figure 2. VisualSFM 3D model.

In addition to using VisualSFM, Agisoft's Photoscan Professional proprietary software was used also with the same set of imagery to build a texturized 3D model. As with VisualSFM, Photoscan uses the structure-from-motion (SFM) process, where the imagery can be captured from any angle and the structure reconstructed only if features are present in at least two photos (Agisoft User Manual). Photoscan has several stages of processing that lead to the creation of the final model. The first stage involves the alignment of the imagery or feature matching of common points, and results in the generation of a sparse point cloud. Next, the dense point cloud is constructed from the estimated camera positions in relation to the images. Once the dense point cloud has been constructed, a mesh can be built showing the structure's geometric surface. The final step is the texturizing of the model. This gives the model a realistic look to replace the dense points.

Using the 124 images of the house, the basic Photoscan steps were implemented. The results are seen in Figures 3 and 4. Figure 3 depicts the first step in sparse point cloud construction, the feature-matching stage. Figure 4 shows the texturized model. The mesh creation and texturing improve the aesthetic and fill holes previously seen in the VisualSFM model. Photoscan also provides more effective removal of the vegetation. However, there is significant warping of some of the areas along the porch, roof, and upper middle window. Further refinement of the various steps in the process and additional images (to provide for more angles) could alleviate these discrepancies.

Figure 3. Agisoft Photoscan point cloud reconstruction.

Figure 4. Agisoft Photoscan 3D model.

Discussion

Having tested both VisualSfM and Photoscan, there are limitations and benefits to each package. Processing time is relatively manageable in both packages. Not surprisingly, the more images that are used, the longer the processing time; both software packages required about the same amount of time to process the data. The more images uploaded, the more points generated. In the Alston House study, more points meant more editing, both of which allowed for filling "gaps" in the point cloud. This may not always be the case and other sites may require fewer points to get a viable coverage.

Each software package presents a different format and result. The benefit of Photoscan is that the software can process, edit, texturize, etc., all within (internal to) the program. In VisualSfM, the point cloud data are processed and then edited in Meshlab. VisualSfM software also provides a running log of exactly what is happening and statistics on your images. With Photoscan, one of the more valuable attributes is the ability to mask out unwanted features. This allows for less editing and more feature matching of the images within a specified area.

These results are not exhaustive and still need further refinement. Measurement comparisons of the tie points to actual ground measurements could highlight the benefits of either software. Testing the texture and surface rendering algorithms in Meshlab could enhance the results, making the model more realistic. Finally, one of the most valuable enhancements to the study would be to obtain photography at a higher altitude and from different angles. Until then, the gaps in the point cloud will persist.

The research presented shows two different approaches to 3D modeling and point cloud generation. The models generated from such data are easy to visualize and represent the feature in great detail. The Alston House study demonstrates the benefits and limitations of a camera system for 3D modeling of a structure. This methodology demonstrates how easily the data can be obtained and processed, manipulated, and modelled using low-cost, open-source software. The spatial accuracy of each model has not been determined yet, nor have the data fusion capabilities been investigated.

Future Work

The most pressing research question remaining involves the spatial accuracy of the data models. An accuracy assessment needs to be performed which will provide a statistical analysis of how close the points relate to real world coordinates. Previously obtained survey data provides the ground control points (GCPs) for answering this question. The 3D models from software packages will need to be compared to the total station data. In order to evaluate the quality of the image triangulation procedure, some circular targets, measured with a total station, should be used as GCPs and others as check points (CK). Then the Root Mean Square Error (RMSE) could be calculated for all the point clouds for statistical comparison and accuracy assessment.

Another component to future endeavors would involve expanding the study footprint at the House in the Horseshoe in order to examine and model the grounds. Ultimately, future research would bring in other data sources, such as satellite/aerial imagery and geophysical testing results, for data fusion. An additional key research element would include data collection by a terrestrial laser scanning system for comparison to the digital camera results outlined in this study. Another emerging research topic in the field would be to utilize UAV technology. Developing methodologies and techniques for UAV use in modeling of the landscape features would allow a new perspective and chance at exploring the potential of the technologies for this type of research. Again, this future endeavor would only be attempted in legal and appropriately permitted instances.

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AN OVERVIEW OF GEOPHYSICAL SURVEYS AND GROUND-TRUTHING EXCAVATIONS AT HOUSE IN THE HORSESHOE (31MR20), MOORE COUNTY, NORTH CAROLINA

by

Jacob R. Turner and Ari Lukas

Abstract

The geography and anthropology departments at the University of North Carolina at Greensboro (UNCG), in partnership with North Carolina Historic Sites and the Office of State Archaeology, conducted ground penetrating radar (GPR), magnetic gradiometer, and electromagnetic induction (EMI) surveys at House in the Horseshoe from March 2013 to December 2014. These surveys were conducted in an effort to find the original Alston House kitchen, explore the hilltop where oral history suggests that eight Revolutionary War militiamen are buried, and identify the locations of historic outbuildings. While the kitchen and burial locations were not found, resulting survey maps display four structure/activity areas, two of which are historic and not previously known to exist. The combined interpretive information gained from using multiple geophysical instruments at House in the Horseshoe can be applied to similar historic sites in North Carolina and beyond.

From March 2013 to December 2014, the geography and anthropology departments from the University of North Carolina at Greensboro (UNCG), in partnership with the North Carolina State Historic Sites division and North Carolina Office of State Archaeology, conducted several geophysical surveys at House in the Horseshoe (31MR20). The general goal of the surveys was to test the benefits and limitations of geophysical research on a historic site and, more specifically, to evaluate two research questions posed by former site manager John Hairr while also adding new information to prior work that sought to map the former locations of outbuildings that existed onsite in ages past (Baroody 1978). After considering the noninvasive subsurface mapping capabilities of ground penetrating radar (GPR) and magnetic gradiometry, Hairr requested that the research team explore a potential location of the original Alston House kitchen and, if possible, discover the location of eight individuals who were buried onsite following an armed conflict that surrounded the house during the American Revolution in 1781 (Caruthers 1854). Following the initial GPR and gradiometer surveys designed to explore these questions, an electromagnetic induction (EMI) survey of the study area was added for comparison of feature detection abilities. This report is a brief summary of the geophysical research findings and ground-truthing efforts to date at House in the Horseshoe.

The House in the Horseshoe, also known as the Alston House, is located in the far northeast corner of Moore County, North Carolina, in a great bend in the Deep River. The house is most notable as a historic landmark associated with the American Revolution: its initial owner Colonel Philip Alston and his family were attacked while inside the house by David Fanning and a small band of Tory militia on Sunday July 29, 1781 (Willcox 1999). Oral history indicates that the day following the conflict, eight individuals were buried "…on the brow of the hill, a few rods from the house" (Caruthers 1854:189). The Alston House was also the center of a slave-managed agricultural plantation during its occupation by many of the early owners, including Philip Alston (1772/73 to 1790/91), Thomas Perkins (1790/91 to 1798), and North Carolina Governor Benjamin Williams (1798 to 1814), among others (Willcox 1999). The most detailed record of plantation architecture at House in the Horseshoe is contained in Governor Williams' correspondence, which lists the function and dimensions of many planned and constructed outbuildings (Baroody 1978; Willcox 1999). However, no map of his constructions, or those of Alston, are known to exist.

Baroody (1978) attempted to discover the remnants of outbuildings at House in the Horseshoe using a combination of methods, including oblique infrared aerial photography, test holes dug by powered auger, and systematic metal probe survey. Baroody's maps indicate that a buried gravel walkway led to the entrance of the house, and that there may have been a structure in the eastern yard, marked by the presence of brick fragments and nails. Until the present geophysical research conducted by UNCG, the 1978 report represented the most comprehensive work in search of the buildings that were arranged about the house in ages past.

To investigate potential locations of the original Alston house kitchen, soldiers buried onsite following the conflict, and the general placement of outbuildings, a 10x10-m georeferenced grid system was established at House in the Horseshoe in the yard east and north of the house, with a total survey area of 2,840 sq m (Figure 1). Survey instruments included a Bartington 601 dual sensor magnetic gradiometer, a GSSI SIR 3000 GPR equipped with a 400 MHz antenna and three-

Figure 1. House in the Horseshoe geophysical survey area.

wheel cart with survey encoder, and a Geonics EM38 MK2 EMI meter. The EM38 MK2 produced two datasets simultaneously: earth conductivity and magnetic susceptibility. EMI data were collected using a 1-m coil spacing in vertical dipole mode. All survey transects were spaced at 0.5-m intervals, with a density of eight samples per meter, except for the GPR, which collected 50 traces per meter.

Ground truthing of geophysical anomalies included a variety of methods. A 1x2-m test unit was placed over the suspected root cellar of the Alston House kitchen. Two 0.5-m controlled shovel tests were also excavated to investigate geophysical anomalies that were likely to produce cultural information. Other ground-truthing methods included metal detection, probing, and coring using a bucket auger and a small soil probe.

Results and Discussion

The surveys conducted at House in the Horseshoe revealed the locations of four structures with varying levels of certainty (Figures 2 and 3). Structure 1, measuring approximately 7.16 m (23.5 ft) square and located in the northernmost portion of the survey area, is a relatively modern building foundation that is visible in all of the geophysical maps. The area where this structure is located was probed and augered by Baroody (1978), but was not detected according to the site report maps. Structure 1 is visible in the 1939 and 1950 aerial photography of the site and absent from the 1966 aerial photos (Moore County GIS 2016), suggesting that it was removed during the restoration of House in the Horseshoe which began in 1954 (Willcox 1999). Ground-truthing investigations revealed bricks and rocks along the foundation line that is best articulated in the conductivity (Figure 2a) and magnetic susceptibility maps (Figure 2b). The solid objects delineating the structure edge were visible at the surface after removing the grass, which also revealed a single wire nail. The southern extremity of Structure 1 is also currently visible at the surface, marked by an elongated mound of earth. The foundation is visible in conductivity surveys due to the surrounding soil having greater conductivity than the foundation remnants buried within it. Conversely, bricks and nails decomposing within the central fill, and possibly fire, likely enhance the magnetic susceptibility of the structure area soils. The GPR slice displays a corresponding square-shaped area of high amplitude (Figure 3a). The gradiometer also displays an intense, linear dipole along the feature's northern edge, coincident with the uncovered objects forming the buried foundation (Figure 3b).

Structure 2 was discovered primarily due to its appearance in the GPR as a high amplitude rectangle measuring approximately 5.79 m by 3.35 m (19 ft by 11 ft), visible in the 0.2-0.3-m subsurface depth slice (Figure 3a). Baroody (1978) indicated that this area was not probed or tested at the time of his fieldwork, as it was thought to be the previous location of a pond. The gradiometer offers additional information, with burned post or pier-like magnetic dipoles appearing along the structure boundary, as well as a slight positive increase in nanoTesla values

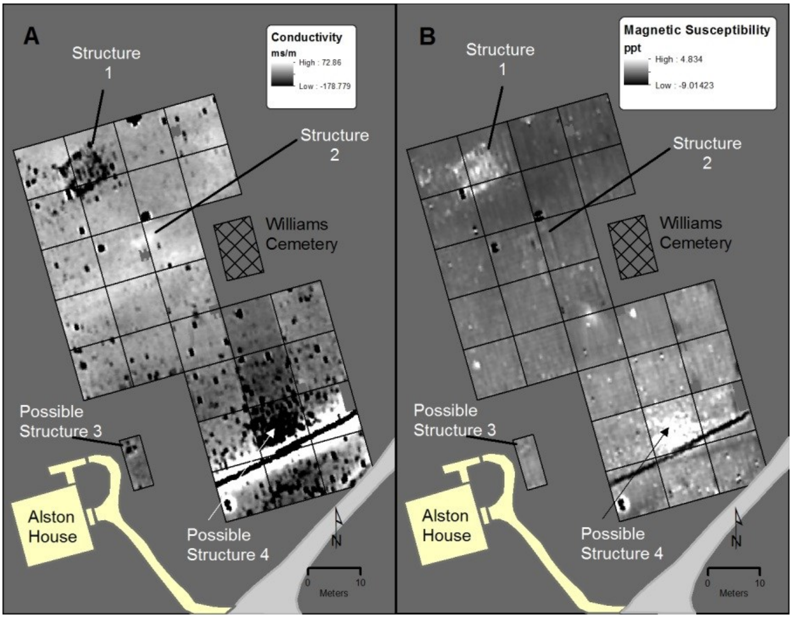

Figure 2. Geophysical survey results using conductivity (A) and magnetic susceptibility (B).

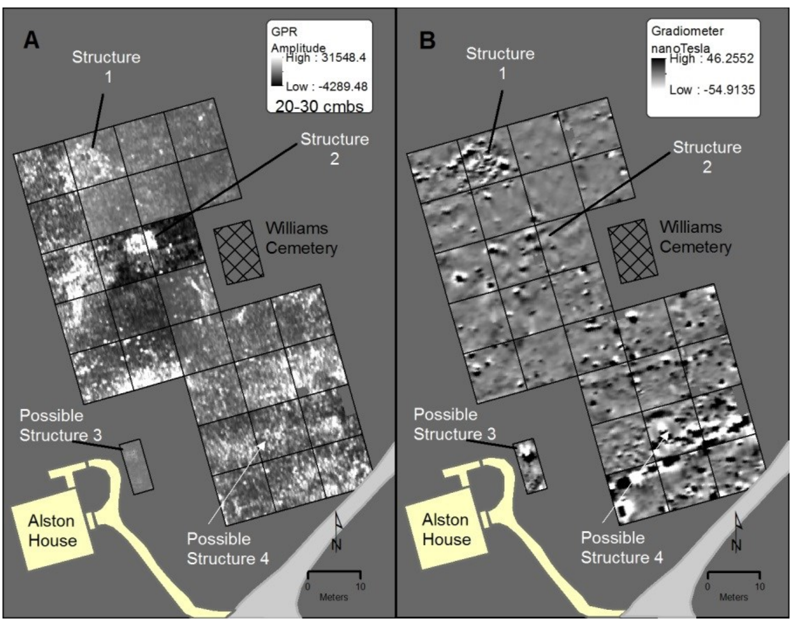

Figure 3. Geophysical survey results using ground penetrating radar (A) and magnetic gradiometer (B).

(Figure 3b) coincident with the edges of the GPR feature. A controlled shovel test was excavated by natural levels at the edge of the northernmost central magnetic dipole, revealing a layer of charcoal underlain by layer of ash and charcoal mixed with dark reddish brown sticky silt-like soil. Excavation of the ash layer revealed a single brick in the northern profile wall, likely from the edge of a brick pier. All layers were underlain by a reddened and hardened, baked clay floor which, along with the ash layering, indicates prolonged exposure to heat. This baked and hardened surface, combined with the burned brick pier, are the source of the geophysical anomalies visible in GPR and gradiometer maps of the area. The most likely function of Structure 2 was as a smokehouse dating to the era of Philip Alston, Thomas Perkins, or possibly Governor Williams (Willcox 1999), based upon the analysis of nails (Nelson 1968) recovered from the ash.

The detached survey grid containing a possible structural remnant (Structure 3) was placed to examine a potential location of the original Alston house kitchen as indicated by Hairr. GPR data from the initial survey revealed a large pit-like feature, approximately 2.5 m by 1.5 m (8.20 ft by 4.92 ft) in plan view, with an estimated depth of 0.9 m (Figure 3a). The moderate-to-high amplitude reflections as represented in slice maps represent the pit as a sub-rounded rectangle, with vertical profiles indicating a weakly reflective transition 10 to 30 cm beneath the surface, and dipping toward the eastern half of the pit. The gradiometer data revealed a single large dipole (Figure 3b) in association with the rectangular feature visible in the GPR depth slice. This suggested prior to excavation that the feature contained a large iron object or that the soils were heated to their Curie point temperature and then cooled, consolidating the weak and random magnetic characteristics of iron soil components in the pit fill (Clark 1990). Test unit excavations confirmed the feature as a large pit, very closely matching the dimensions estimated from the GPR data. The later ranges of the ceramic dates from the base layer of the feature suggest that this pit/basement postdates the construction of the house in 1772 or 1773 (Willcox 1999) by approximately 100 years, revealing that the pit is not contemporaneous with the original construction of the house and therefore not related to an external kitchen from that era. The feature was likely used as a basement, root cellar, or privy in the years immediately following the American Civil War. Nine potsherds from this context produced a mean ceramic date of 1866.17 (South 1977).

The Structure 4 area was originally identified as the location of a potential structure by Baroody in 1978. The maps produced during his 1978 work indicate that many nails (type not indicated) and a few brick fragments were found in association with the area. During ground-truthing efforts following the geophysical surveys, metal detection by Mac McAtee of Old North State Metal Detectorists also indicated the widespread presence of metal near the surface, which made the precise location of individual geophysical anomalies without shovel tests or test units difficult if not impossible. GPR surveys (Figure 3a) did not visibly display any structural remnants, such as a basement, foundation, or piers. However, the EMI surveys (Figure 2) of the Structure 4 area indicate a drop in conductivity values (Figure 2a) that may be consistent with a concentration of small metal objects, and a distinct rise in magnetic susceptibility (Figure 2b), also consistent with small decomposing metal and brick fragments enhancing the induced magnetic response of the soils in the near surface plow zone. Gradiometer survey of the area (Figure 3b) is dominated by what is likely a single iron object, making this dataset very difficult to interpret for other features, but further supporting the presence of iron close to or at the surface. Additionally, all datasets (not depicted in the GPR, Figure 3a) indicate that a buried metal utility line runs through the southern end of the survey grid, also complicating the complete delineation of this potential structure or activity area.

While it is clear to see that geophysical survey illuminated a portion of the buried and forgotten historic landscape at House in the Horseshoe, it is also evident that not all objects that are visible within the surveys are of archaeological interest. Many metal objects were identified within the plow zone during ground truthing that clutter these images. At House in the Horseshoe, natural features such as tree roots and rodent burrows also clutter GPR time slices and profiles. These modern and natural objects exist on many sites, potentially creating an overshadowing effect or false pattern challenge when attempting to discern the location of intact archaeological features using geophysical instruments. While each instrument has its own set of strengths and limitations, it is often the case that where one instrument fails to detect a feature, another is able, or as in the case with Structure 2, each instrument reveals different characteristics of the same feature, thereby strengthening archaeological interpretations.

Conclusion

The geophysical surveys at House in the Horseshoe display the benefits of multiple instrument surveys. Two of the four potential structural remnants (Structure 2 and 3) discussed here display complementary GPR and gradiometer information pertaining to different characteristics of the features that they image. In these cases, the gradiometer indicates soils and objects that have received exposure to intense heat, while the GPR is more reliably able to delineate the surfaces' and objects' shape and depth below the surface. When used together, the gradiometer and GPR form a powerful geophysical toolkit. In situations like the Structure 4 area where structural remnants or debris may not be visible to a GPR, or metal objects near the surface dominate or overshadow other features that may otherwise be visible in gradiometer data, EMI performs successfully in a supplemental way by adding new information to the site plan view that is not clearly made visible by other sensors. At House in the Horseshoe, conductivity and magnetic susceptibility maps neatly delineate the Structure 4 activity area where metal and brick are concentrated in the plow zone.

While the surveys presented here do not reveal the location of the eight soldiers buried at House in the Horseshoe or the location of the original Alston house kitchen, they do display the benefit of conducting exploratory geophysical surveys: they indicate precisely where other features of interest are located. This in turn informs archeologists, historians, and site managers about portions of the landscape that need a closer look, both for historical interpretation and for administrative site management requirements when culturally sensitive areas need to be avoided.

Notes

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CEMETERIES AND GEOPHYSICS: A DISCUSSION

by

Sarah Lowry

Abstract

Conducting geophysical survey in cemeteries is complex and is increasingly a necessary part of geophysical practice. This paper discusses two key challenges associated with ground penetrating radar (GPR) surveys in historic cemeteries: meeting high, often unrealistic client expectations and issues of interpretive certainty. The case studies provided are all from North Carolina cemeteries. Successful GPR surveys in cemeteries can be conducted while working with an understanding of the limitations of GPR technology and communicating those limitations to stakeholders. Finally, the paper outlines a methodological approach that allows geophysical work to be conducted as accurately as possible in a cemetery context.

Cemeteries are not eternal resting places. Markers are ephemeral surface features that require periodic maintenance to remain visible. They are moved and disintegrate over time. Often graves are never marked and their locations are forgotten. When descendant populations move away and vegetation begins to intrude, cemeteries can be “lost”. It is not uncommon to find sections or whole cemeteries that are unmarked or improperly marked. Combined with the desire to preserve cemeteries for ethical and historical reasons, these problems have created a huge hurdle as development increasingly encroaches upon cemeteries. Additionally, many historic cemeteries continue serving as active burial places, and improperly or unmarked graves can result in the accidental disturbance of a burial. The need to avoid or mitigate disturbance has pushed cemetery managers, descendants, cultural resource professionals, and other stakeholders toward geophysics—most often ground-penetrating radar (GPR)—as a means of noninvasively mapping graves in cemeteries (Conyers 2006:129–152; Mellett 1992).

There is no remote method, including GPR, which can be used to map all human graves in all conditions with complete accuracy. When graves need to be identified remotely, it can be comforting to believe claims made by some equipment manufacturers (Sensors and Software 2016) and the depictions on popular television programs (e.g., *Bones*, *CSI*, and other procedural dramas) that suggest unrealistic efficacy and simplicity for GPR surveys. Such portrayals, for example, do not account for the fact that the results of any geophysical survey are dependent on the presence of a series of contrasts. Something associated with the grave must contrast with the surrounding soils in a manner that can be measured by the specific instrument used in the survey. For GPR surveys, contrasts include the stratigraphic breaks from the excavation of the shaft, the coffin or casket, void spaces, burial goods, or, rarely, the skeleton itself (Conyers 2006; Buck 2003; Damaita et al. 2013; Mellett 1992). Human graves are particularly complicated because as the grave decomposes over time and natural pedogensis occurs in the soils, the contrasts can diminish. The rate and extent that contrasts diminish is highly variable and dependent on burial conditions, and they may even differ in sections of the same cemetery (Damaita et al. 2013; Schultz and Martin 2012).

Practitioners face many challenges when conducting GPR surveys in cemeteries, and this paper will discuss two key challenges and offer suggestions to address them. The first challenge is clients' unrealistic expectations for the results of a given survey. The second challenge is one of data clarity. GPR results for cemetery surveys are often complicated, and, while there is no magical way to solve the problem of inconclusive cemetery results, it is imperative that trained practitioners interpret their data and communicate clearly with stakeholders.

Challenge 1: Client Expectations

Clients are pursuing GPR because they need to determine the presence and location of burials, and they often feel that error is unacceptable. When they request or commission a GPR survey of a cemetery, they can be emotionally or financially invested in the results. Referencing popular culture or media portrayals of GPR, clients often expect levels of clarity and certainty that are not possible. Personal association with the cemetery or possible graves and/or financial involvement in the outcome can exacerbate the void between expectations and what is possible.

This is a problem that can largely be solved through careful communication. When discussing GPR in cemeteries, it is important to disclose the possibility for both false positives and false negatives and explain how GPR works (Mellett 1992; Gaffney et al. 2015; Doolittle and Bellantoni 2010). The limitations of GPR should be outlined. If the client needs a truly complete survey, where the possibility for error is greatly reduced, alternative and complementary methods must be discussed. Additional geophysical methods such as electromagnetics, resistivity, or magnetometer can show different types of contrast and may help increase the number of graves identified (Clay 2001; Bigman 2014; Kvamme, Ernenwein, et al. 2006; Kvamme, Johnson, et al. 2006; Byer and Mundell 2003). These methods, however, suffer from some of the same problems as GPR. A survey using multiple geophysical methods sometimes may be slightly more accurate than a single-instrument survey, but the possibility for error persists (Gaffney et al. 2015; King et al. 1993). Multi-instrument surveys pose additional problems, such as increased cost and surface or environmental conditions that make some instruments difficult to use. Adding soil scraping to remove the topsoil and visually look for grave shafts is often the best solution for clients who need or want more certainty (Hansen and Pringle 2011). This does incur significant costs but is still the only way to obtain the accuracy needed for certain projects. Upfront acknowledgment of the costs and results of a GPR survey along with a discussion of alternative or complementary methods will empower clients to analyze their own needs and decide how best to move forward.

The survey conducted at the Snow Creek Community Cemetery is an example where communication throughout the project stages was imperative to a successful project. The cemetery is located in Iredell County, North Carolina, and has internments dating from 1780 to the present (Lowry 2014). Cemetery managers were concerned that headstones had been moved, lost, or stolen from the oldest section of the cemetery. Where managers saw potential unmarked graves, community members were seeing empty spaces in prime sections of the cemetery. The Snow Creek Cemetery contacted New South Associates, Inc., concerning a GPR survey in the old section of the cemetery. Prior to agreeing on contract terms, the geophysics specialists had detailed conversations with the cemetery managers concerning the accuracy of GPR and the specific cemetery needs. It was agreed that the level of accuracy found in GPR results was acceptable, because adding additional methods was cost-prohibitive and ground disturbance was unnecessarily invasive in this case. Cemetery managers wanted results to demonstrate either the available space or lack thereof to their constituency.

The interpreted GPR survey results included detailed maps with marker locations and possible graves. These possible graves identified using the GPR results were symbolized to indicate if they were marked or unmarked (Figure 1). In addition to maps, tables with the exact spatial locations of possible graves were provided. In all communication, the results referenced possible graves and reminded clients that there could be additional graves not identified during the survey.

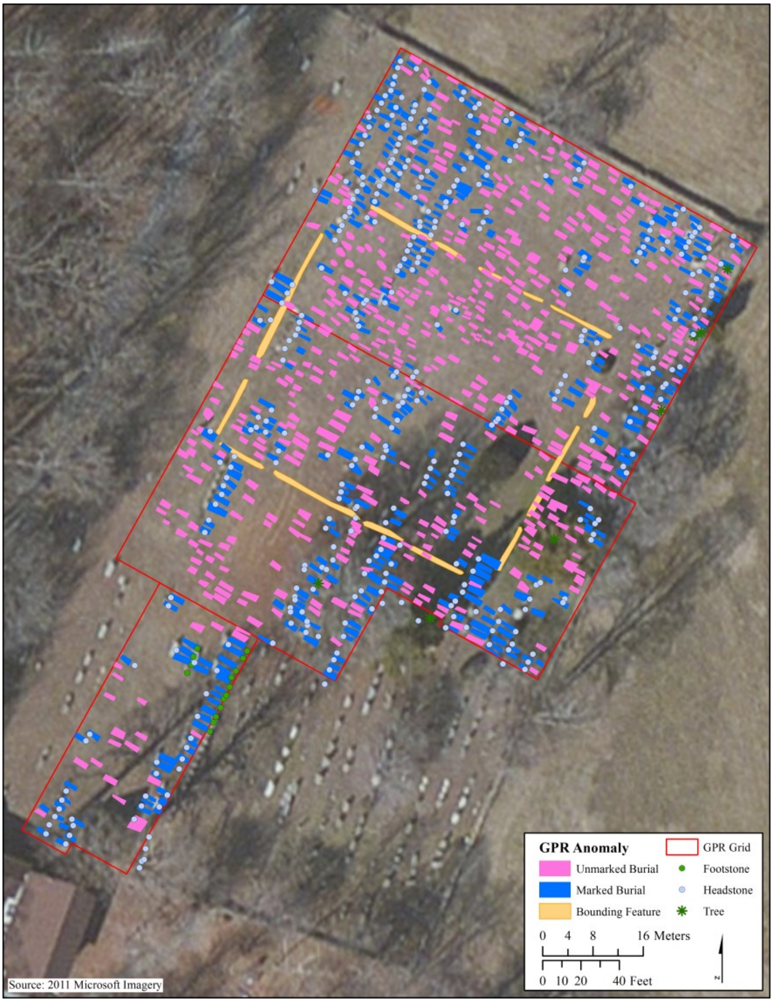

Figure 1. Snow Creek Cemetery GPR Results, Iredell County, NC.

Challenge 2: The Need for Technical Expertise

GPR data from cemeteries are often difficult to interpret, because the efficacy of GPR is dependent on contrast. The presence of contrast can be highly dependent on the preservation of the grave, which itself can vary based on how the remains were interred as well as micro-environmental variables. Micro-environmental variables include differences in moisture level and soil type that can be highly dependent on the depth of the burial, the slope it is buried on, and vegetation that is growing nearby (Damaita et al. 2013; Schultz and Martin 2012; Schultz et al. 2006). The appearance of a possible grave in the processed GPR data depends on the type of contrast reflecting the radar energy. A casket or coffin will look different from a stratigraphic break caused by the excavation of the grave shaft (Conyers 2006). Burials ranging from remains without a coffin to lead-lined coffins or concrete caskets can all appear in a typical cemetery. Remains without a coffin or casket will typically present less contrast and will be more difficult to identify with GPR. In order to accurately identify as many graves as possible using these variable GPR results, proper and careful processing must be undertaken. Experienced practitioners must interpret the data, and contextual clues need to be mapped and incorporated into the GPR results.

Due to the complicated and ephemeral nature of graves, techniques used to process and interpret GPR data obtained from subsurface architectural features cannot be simply applied to cemeteries. Archaeological GPR data are collected in rectilinear grids, as a series of individual transects of data collected in a series of parallel and evenly spaced profiles of data. Typically, after processing steps have been applied to the collected GPR profiles, they are interpolated into a three-dimension block of data and then reprocessed to produce "time-slices," which can be thought of as a proxy for archaeological levels (Conyers 2004; Conyers and Cameron 1998; Conyers and Goodman 1997; Gaffney and Gater 2003). Using these images, archaeological features can often be interpreted. In cemeteries, possible graves are not always visible in the "time slice" view, particularly if the possible grave is too subtle or surrounded by complicated stratigraphy. Realistically, to interpret graves, each of those data profiles has to be individually examined by an experienced practitioner to identify reflections that are consistent with those seen for different types of graves (Conyers 2012:150). This is a tedious process of pattern recognition and comparison that presently must be done through human interpretation. If only slice maps are used for interpretation, it is possible that the complicated stratigraphic clues caused by the excavation of the shaft or subtly buried and highly decomposed burials will be missed.

The variability of cemetery results and the careful interpretation they require necessitate that the practitioner conducting the processing and interpretation of cemetery data be experienced in these kinds of data sets (Watters 1994). Cemetery data require the ability to recognize a variety of possible burials and a detailed understanding of how GPR works. As such, interpretation should not be left to a student, novice, or someone only experienced with non-grave GPR data.

Finally, to get the best possible results from a GPR survey in a cemetery, a comprehensive map of contextual clues should be included. Depending on the cemetery, this could include standing markers, surface depressions (often caused by the collapsing coffin), and indications of utilities, planted vegetation, trees, and fences. Spatially collecting all of this information and the GPR results in a digital geographic information system (GIS) software package, such as ArcGIS, will in turn produce a more robust data set. At a minimum, this type of data set allows the possible graves identified in GPR to be labeled "marked" if they are associated with standing markers.

The Elmwood and Pinewood Cemetery is an example of a cemetery where careful data interpretation was required. The cemetery is a large, National Register of Historic Places listed property in downtown Charlotte, North Carolina (Patch et al. 2012). A section of this cemetery was surveyed using GPR to identify possible unmarked graves at the edge of the cemetery. The surveyed area included a small section that caretakers referred to as "baby land," where marked internments suggested a proportionally large number of infant and child graves dating primarily to the late nineteenth and early twentieth centuries. This type of grave illustrates why careful data analysis is so important. Infant and child burials are relatively small and are therefore difficult to identify in profile. They are typically buried shallower than adult internments (Hugh B. Matternes, personal communication) and impacted by pedogenesis (Schultz and Martin 2012; Schultz 2008; Schultz et al. 2006). The child burials are not visible in the slice maps made using the GPR data, but can be seen faintly in the profile view (Figure 2).

The Clarks Creek Cemetery in Mecklenburg County illustrates the importance of profile analysis and mapping contextual clues (Lowry and Turco 2016). The cemetery was probably used by African American residents from the mid-nineteenth to early twentieth century, but archival documentation of the cemetery's history has to date not be identified. This cemetery did not contain any formally made markers, and it is likely many of the burials were interred without a coffin or casket, or in a wooden box at most. Accordingly, these types of graves can be very difficult or impossible to identify in a geophysical data set. A detailed site map was created using a total station with sub-centimeter accuracy where 219 fieldstone markers and 133 depressions (likely from collapsed

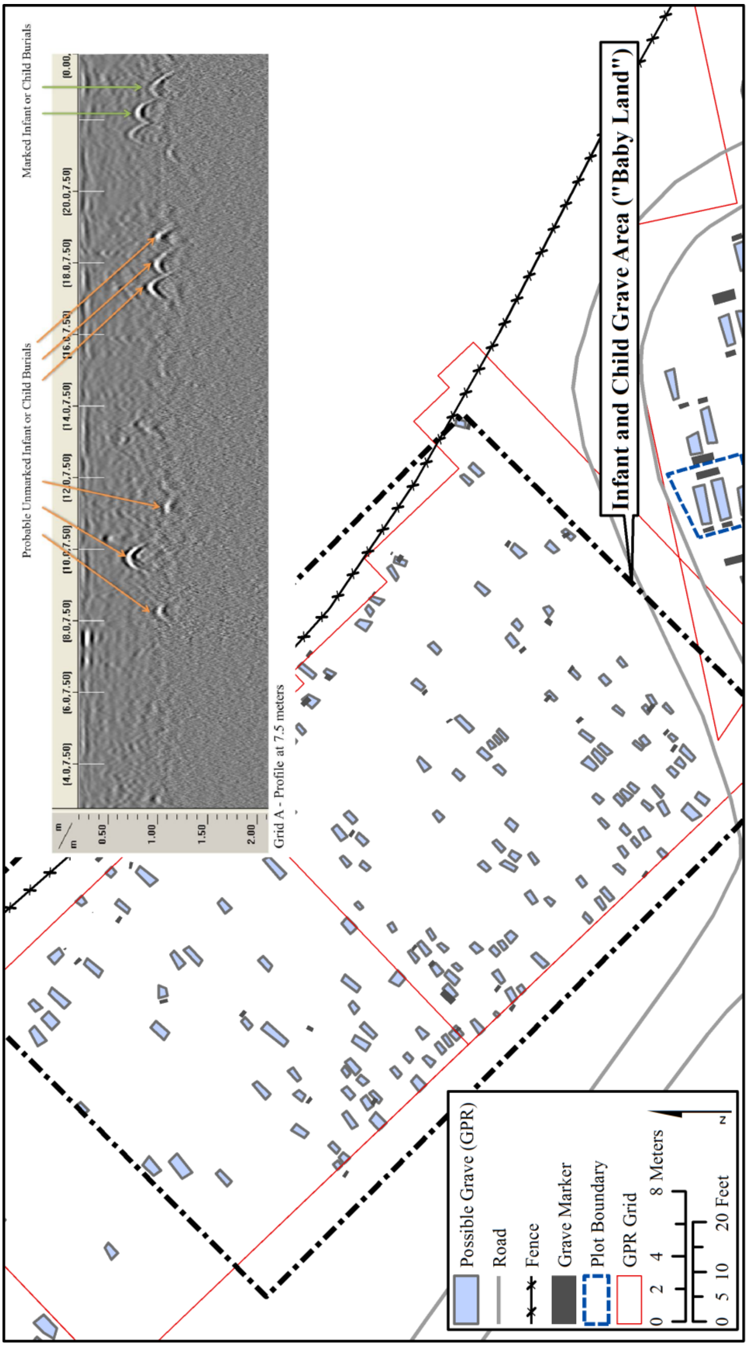

Figure 2. Possible infant or child grave in the Elmwood and Pinewood Cemeteries, Mecklenburg County, NC.

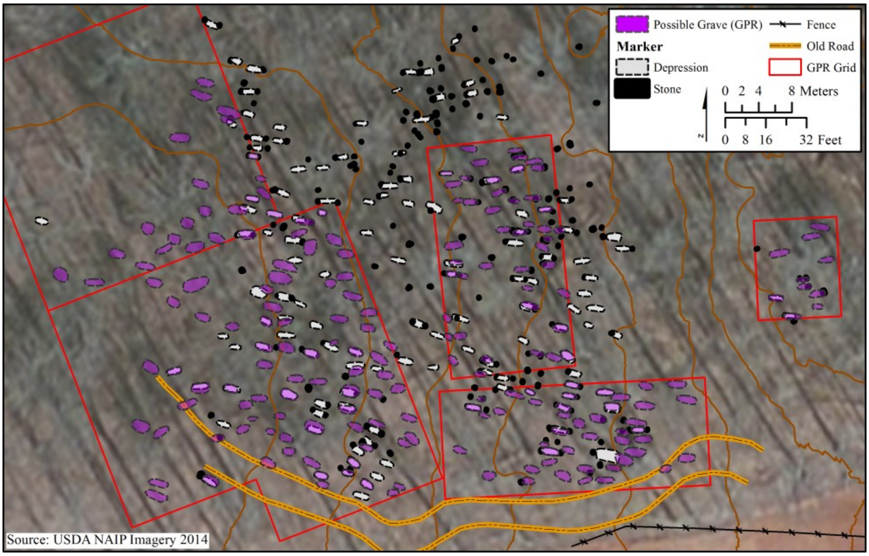

Figure 3. Results of GPR survey and total station map of the Clarks Creek Cemetery, Mecklenburg County, NC.

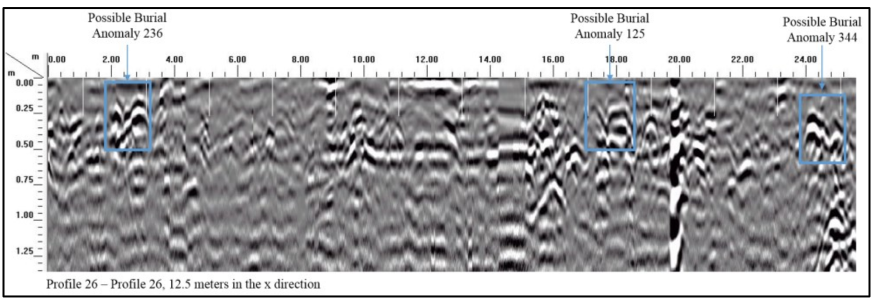

Figure 4. Example of the subtle graves identified through profile analysis in the Clarks Creek Cemetery, Mecklenburg County, NC.

coffins) together formed a total of 276 individual burials. A limited GPR survey was conducted (limited due to vegetation and topographic constraints). Profile analysis of the processed GPR data identified an additional 113 possible unmarked graves (Figures 3 and 4). The combination of the detailed surface map and the limited GPR survey helped to overcome the deficits of both data sets, particularly in a cemetery type where just using GPR results alone may have been problematic due to the age and grave type.

Conclusion

As discussed in this paper, using GPR in cemeteries is one of the most complicated applications of the instrument for archaeologists. Grave features are ephemeral, and interactions with cemetery stakeholders are fraught with emotions and unrealistic expectations. This paper has attempted to address some of those issues, including suggestions for client communication and an approach to geophysics in cemeteries that necessitates measured and time-consuming data collection and interpretation. When approaching a cemetery or gravesite and planning a GPR survey, there is no way of determining the accuracy of the interpreted GPR results without excavation. This type of excavation is often unnecessary to achieve client goals. If the practitioner communicates with the client about the way GPR survey works and takes steps to ensure that the data are as accurate as possible and results are carefully interpreted, it is possible to rise to the challenges presented by cemeteries while still accepting the limitations of the GPR technology.

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METAL DETECTING: THE DOWN-TO-EARTH TOOL OF REMOTE SENSING

by

Linda France Stine

Abstract

North Carolina archaeology is transforming to an inter- and multi-disciplinary social science incorporating remote sensing, geophysical exploration, and archaeological practices. One often overlooked area of improvement is in metal detection. Improved metal detection survey methodology has refined battle line interpretations and definition of domestic site boundaries. Archaeologists are developing their abilities to correctly use these light-weight machines, either through classes or by partnering with local experts. One Piedmont North Carolina avocational group of "detectorists" is from the Old North State Detectorist Club, and they have worked with a number of public/community-engaged archaeologists.

Where does an article about metal detecting fit in a compendium of works about remote sensing? The author's charge was made by John Mintz, Office of State Archaeology (OSA), and it was to investigate the history and use of metal detecting by North Carolina archaeologists. He requested this exploration as part of an initial symposium on the burgeoning use of remote sensing and geophysical research in North Carolina. This Public Archaeology/Community-Engaged symposium was advertised widely and offered free for citizens, visitors, and archaeologists at the North Carolina Museum of History, March 12, 2016.

Metal detectors are simply machines that electronically sense the presence of metal in the ground. The most expensive types can actually determine depth to objects and types of metal (Connor and Scott 1998; Stine and Shumate 2015). This machine is being replaced in the archaeologists' remote sensing arsenal by magnetometers and ground penetrating radar that are now available for rent or for lower purchase price. I would like to advocate for the continued use of metal detectors in North Carolina for four major reasons: (1) it can be an inexpensive machine; (2) it can be learned quickly; (3) it can be used in areas less conducive to other forms of remote sensing; and (4) detecting is often undertaken as public/community-engaged archaeology.

The author's first introduction to the metal detector was literally at the hands of her father, who was at the time head of the North Carolina Civil War Roundtable and a member of another small group of battlefield tromping Ph.D. historians and avocational businessmen. A few members of the latter group had purchased metal detectors to enhance their research objectives, which usually consisted of seeking evidence for particular battle lines. It must be admitted that if someone found the occasional bullet or buckle they did not always drop it back on the ground. This group did, however, respect the law when it came to metal detecting on public lands, and they never detected on private land without permission (according to the author's father and brother, and the author's own memory of the few "tromps" she participated in in North Carolina [Bentonville], Virginia [Mt. Allegany], and Pennsylvania [Gettysburg] in the 1970s). For a long time metal detecting was viewed as the provenance of these kinds of avocational military buffs. The occasional archaeologist who employed a metal detector in this period most often simply viewed it as an archaeological tool for searching out old metal grid stakes.

The use of metal detectors in archaeology was sporadic until the publication of Connor and Scott's (1998) introduction of the historical archaeology readership to the benefits of using a metal detector. The writers stressed that an archaeologist could learn the basics with ease, that the machines were light to carry, and they were relatively cheap. Detectors also proved useful in research at any kind of historic site that held metal (Connor and Scott 1998). Archaeologists' abilities using these machines are not equal. They now can continue to improve their metal detecting abilities through either courses such as "Advanced metal detecting for the archaeologist (AMDA)" sponsored by the Registry of Professional Archaeologists (RPA) or a course undertaken with the Montpelier Plantation/Minelab field schools (Stine and Shumate 2015).

What kind of remote sensor is a metal detecting machine? A typical metal detector has an open collar that allows one to rest the wrist on the handle, which is attached to a moveable shaft (Connor and Scott 1998; Stine and Shumate 2015) (Figure 1). At the base of the shaft a flat, round search coil can be attached. Various coils can be interchanged depending upon the intensity of signal desired by the operator. A control box is affixed near the top of the shaft. In the hands of a trained metal detector user, or "detectorist," these light-weight instruments can be fine-tuned to pick up readings for all metal artifacts or to screen for specific types. A typical detector has batteries that send electricity through a

Figure 1. Metal detecting demonstration, University of North Carolina Greensboro 2015 field school, Smith Farm site, Guilford County, North Carolina.

transmitter coil wrapped around the shaft and extending to the base coil. This creates a magnetic field. The detectorist hovers the coil a few inches over the surface in a search area, causing the magnetic field to go through and around any metal objects. This is "read" by an additional coil as electricity which returns to the control box, emitting a "beep" signifying a find (Connor and Scott 1988; Tyson 2016; Woodford 2016).

Overview of North Carolina Metal Detecting

In 1989 a survey of the Wilmington area's Military Ocean Terminal or MOTSU buffer zone was undertaken by Stine for Lesley Drucker's Carolina Archaeological Services (Stine et al. 1989). This 2,000 or so acre survey included the grounds surrounding Fort Fisher State Historic Site upwards to the haul-over waterway near a large white sand hill traditionally used as a navigation marker called "sugar loaf." Although much of the area was under forest cover, some locations near Fort Fisher were open sandy expanses. The archaeology survey team used metal detecting to facilitate the search for previously recorded domestic and military sites and, when found, to refine site boundaries. Metal detecting was used in tandem with systematic ground observations and close interval shovel testing. This survey method proved useful in nonforested environments. When carried into forested areas with potential early historic sites it proved relatively easy to carry and could still record metal locations. It worked well in those environments where GPR and magnetometer would have been hard to maneuver and where their results would have been more ambiguous than those from metal detecting.

The MOTSU survey boundaries included numerous potential sites of Civil War skirmishes as well as the well-known battle of Fort Fisher. These regions were metal detected in using judgmental techniques (Stine et al. 1989). It was obvious that some of these grounds were already heavily surveyed or disturbed by local detectorist activities (Civil War aficionados). Typical evidence of previous site disturbance consisted of large metal objects such as plow parts cached overhead on tree limbs. This somewhat macabre metal graveyard was a way for detectorists to aide themselves and their fellow enthusiasts so they did not have to continue "reading" and digging up the same unwanted artifacts.

In search of information about what the local detectorist community might have turned up with their spades, the author contacted a Mr. James Legg who worked at a local area museum. (The author believes it was the Blockade Runner Museum.) Mr. Legg knew where many of the Civil War and other sites were in the region. He knew about the metal detecting on some of the sites and in fact had wielded his own metal detector across some of them. Twenty-seven years later, North Carolina's Jim Legg is currently one of the better known and respected Fields-of-Conflict archaeologists. He works closely with historians, archaeologists, and detectorists in North America and in Europe, and is based at the South Carolina Institute of Archaeology and Anthropology, housed at the University of South Carolina, where he publishes and co-publishes his research in a Public Archaeologist position. His research is often based on systematic research and follow-up metal detecting survey, often in the company of local detectorists volunteers and other archaeologists on a wide range of conflict sites dating from early settlement through World War II.

The notion of using a metal detector as a tool of historical archaeological inquiry is part and parcel of Legg and other's investigations at field-of-conflict sites. These are those places where battles, skirmishes, and encampments are found. These militarized landscapes also include those homes and churches used for headquarters and hospitals. Indeed, the boundaries of many of these places, whether early Spanish, Revolutionary, or American Civil War were actually discovered thanks to the use of the metal detector. Metal detecting is now foregrounded in this growing area of specialization, which has its own biennial international meetings and publications (Curry et al. 2014; Stine and Shumate 2015). These archaeologists often work with volunteer or paid avocational detectorists who are experts for a particular battlefield (Stine and Shumate 2015).

Other examples of early use of metal detectors on North Carolina archaeological sites is difficult to ascertain. An informal survey on the NC archaeology list serve in early 2016 did not elicit much volunteered information. Due to a lack of information in the files, this paper leans heavily on the author's own experiences in the state. From about 1986 to 1988 Stine undertook fieldwork for her dissertation on two farmsteads in Iredell County, North Carolina. One was the Nichols place, the other the Stine home-place. These farms were adjacent to one another. An important part of Stine's field methods was to determine spatial relationships between buildings and activity areas in order to undertake comparative research between the two farmsteads. Some buildings were extant, however, not all remained above ground. The majority of features also proved to be subsurface (Stine 1989). General metal detecting, slowly covering small quadrants at a time, allowed for the identification of subsurface features. For example, one "hot spot" on the Nichols farm proved to be rich in charcoal and artifacts such as nails in an area that was a grassed pasture (Figure 2). Oral history by the son of the now-abandoned household, who lived next door in his own house, described how his mother made soap in that exact spot (Stine 1990). In this case the metal detecting revealed a feature that provided a visceral connection for a son between himself, the archaeologist, and his deceased beloved mother.

In 2005 the author undertook a project for Rockingham County planners and the local historical society. They were enthusiastic about a site owned by the historical society that is known locally as either Speedwell Furnace or Troublesome Creek Ironworks (31RK135**). This was the site of one of the region's earliest iron furnaces, although the ore was poor quality. There were eventually associated mills in the complex, a dam, and a race. The site has an extant cabin to the southeast of the mill ruins, across Troublesome Creek and its horseshoe bend. West of the creek are the below-ground ruins of a circa 1830s plantation house and outbuildings. General Nathanael Greene used the area to protect his baggage train before the battle of Guilford Courthouse. He also retreated here for his protection after the battle.

Figure 2. Soap-making feature, Nichols Farmstead, Iredell County, Bottom Strat 1.

A 2005 UNC Greensboro field school was undertaken to ascertain the placement of entrenchments, the houses, and outbuildings. These were successfully located using a combination of surface survey, aerial photograph interpretation, oral history, systematic metal detecting, and unit testing (R. Stine et al. 2011; Stine and Shumate 2015). The student metal-detecting portion, as detailed in Stine and Shumate (2015), needed more planning and supervision. The results were still useful, though some students recorded generalized grid pattern results of metal detecting ("45 hits in grid box X") while others recorded precise locations of metal within each grid box.

Robinson and Mintz collaborated on a project for Bentonville State Historic Site that definitely used ground penetrating radar but did not use metal detecting. They were successful in discovering a cemetery in early 2007. The site director was given legal permission to use his metal detector on the state lands to seek artifacts in an area that may have been a trench line. They found a few bullets and marked their locations (Donny Taylor, personal communication 2016).

In 2008, Stine held a UNCG field school at Blandwood Mansion State Historic Site in downtown Greensboro, North Carolina (Stine 2011). She concentrated her efforts behind the house in the remaining backyard area, seeking evidence for activity areas and outbuildings. Although metal detecting and GPR were undertaken at the site, each proved to be adversely affected by the approximately 20-45 cm of fill, mostly clay, artifacts, and brickbats, dumped on the site sometime during restoration activities. GPR undertaken by members of New South and Associates did pick up some features such as pits, walls, and utility pipes (Stine 2011). Metal detecting results revealed trash dumping activities in the southeast yard, and scattered nails and miscellaneous corroded metal objects in the central south yard area. Systematic shovel tests, remote sensing, and geophysical survey maps were used to guide unit placement.

Tom Beaman and John Mintz led a group of students and detectorist volunteers in a systematic metal detector survey seeking the Civil War barracks at Brunswick Town/Fort Anderson State Historic Site. The condition of the woods and its underbrush made metal detecting a good choice (Beaman 2012). The soils in the thick brushy areas were also prone to dampness in this low-lying site, making other forms of survey more difficult.

In 2011 Robinson and Mintz worked with members of the Old North State Detectorists (ONSD) metal-detecting group at Alamance Battleground State Historic Site (Mintz 2011). They began a systematic collaboration and relationship with OSA that is maintained today. They walked the grounds in 4 ft transects moving their machines slowly side to side. When a positive “hit” was heard the find was flagged, a divet of dirt turned to find the item, which was then bagged separately. The artifact locations were recorded. On May 14, 2011, a public symposium was held at the battleground where the project results were shared, and Stine happened to be in the audience. Besides Mintz, she listened to Dr. Larry Babits, then at East Carolina University, discuss the importance of metal-detecting methodology in Fields-of-Conflict archaeology. He explained how adroit use of the machines in systematic transects or small grid boxes can reveal battle lines evidenced through dropped balls as well as by smashed bullets of certain calibers. This was of great interest to Stine as she was about to undertake a new field school, located at a military site in Guilford County. She was looking for examples of metal-detecting methodology and this symposium provided some great examples.

Prior to Stine’s work at Guilford Courthouse National Military Park (Stine and Stine 2011), John Cornelison at the Southeastern Archaeological Center of the National Park Service brought a group of detectorists to survey and verify the main battle lines at the park. He and his crew would sweep an area marked as a battle line, searching for dropped and impacted balls. According to the National Park Service’s Southeastern Archaeological Center, his first survey was in 1995 (GUCO-SEAC01189), his second in 2000 (GUCO-SEAC01487), and his

Figure 3. Guilford Courthouse Military Park personnel and the president of the Old North State Metal Detectorist Club, 2011.

last in 2003 (GUCO-SEAC01860) (SEAC 2016; summarized in Cornelison and Grohl 2007). Cornelison determined that two of the marked park lines were substantiated through metal detecting survey, while the last or Third Battle Line was perhaps more truly located a short distance north and west of the marked line. A complete summary of archaeological and geophysical surveys, including metal detecting, at the national park is presented in Cornelison and Grohl (2007). His surveys, and subsequent ones during the UNC Greensboro field school, helped bridge a divide between detectorists interested in archaeology and history, the Guilford Courthouse park service personnel, and the students (Figure 3).

The 2011 UNC Greensboro field school was part of a project at the Guilford Courthouse National Military Park (Stine and Stine 2013). It incorporated improved procedures for metal detecting based on lessons learned at Troublesome Creek and Alamance battleground. Students were paired with Old North State Detectorists (ONSD) who had worked with staff at OSA at Alamance. A standardized metal detecting form was created and used for each positive "hit" (Stine and Shumate 2015). Detectorist pairs walked 20x20 m grids in north-to-south transects, turned 90 degrees, and walked the same grid east to west (Stine and Shumate 2015; Stine and Stine 2013). A general sweep (metal detecting a few meters apart in the same direction from point A to point B) was undertaken in two areas west of the main project location. Metal detecting helped to delineate where heavy fighting probably did not occur in the case of our metal detection results, although there was evidence for some Revolutionary War action on a part of the property a small distance to the west and north of our main base of operations. These results substantiated those findings by Cornelison that actions extended north of the present park loop road (Cornelison and Grohl 2007).

In 2012, Mintz and Stine participated in a conference at the annual meeting of the Society for Historical Archaeology, detailing our partnering with particular members of the ONSD metal detector club who were interested in teaching students and archaeologists best practices for metal detecting while learning about best practices for archaeology (Mintz 2012; Stine 2012). Some of these men remain working with Mintz or Mintz and Stine (and R. Stine) at sites such as House in the Horseshoe State Historic Site (a colonial skirmish site and plantation) and at a nineteenth-century cabin in Pleasant Garden, North Carolina.

Public and Community-Engaged Archaeology

Archaeologists, especially those working on military sites, often pair with avocational groups of detectorists (Stine and Shumate 2015). In North Carolina, there are ethical detectorist groups who want to learn about archaeology and to share their often deep knowledge of regional Fields-of-Conflict sites. Some of those detectorists also want to participate in general field research and contribute their machines and abilities to the research. They often teach the archaeologist and their students improved methods of using the metal-detecting machines. Locally, the ONSD club members that Stine knows are interested in learning more about colonial domestic sites as well as military ones.

By working with community detectorists, archaeologists can develop ties of mutual respect, such as those developed during the Guilford Courthouse 2011 geophysical and archaeological testing project (Figure 3). By working with a group, archaeologists can be assured of the ethical stance of the majority of members. We can teach them why it is important to continue to record what they do find and ask them to share their knowledge of area sites. Archaeologists will discover that some detectorists will contact them about sites that are in danger of destruction through planned construction, or about potential fieldwork that the group plans to undertake with the blessings of a private landowner. It is positive that they want our input and invite us along. In most cases, the ONSD detectorists and other detectorist groups that North Carolina archaeologists have worked with offer their recorded artifact finds to the land-owners when surveying private lands. Sometimes the owners want the objects, sometimes they give them to the detectorists. Many persons detect for the pure pleasure of being outdoors with friends and for the fun of finding things. That is not to say that some detectorists do not sell artifacts or destroy stratigraphy at some important sites. These are and will remain points of contention between the archaeological and detectorist communities (Stine and Shumate 2015). However, with open minds, and by reaching out to local detectorists to partner on specific community-based projects, we can pinpoint those who are more interested in history and archaeology than selling or trading artifacts. As a result we will find ourselves with community partners willing to work toward common goals, such as K-12 and university educational opportunities or working to improve the stewardship of important sites.

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GEOPHYSICAL SURVEY OF LARGE MISSISSIPPIAN VILLAGES IN THE SOUTH APPALACHIAN REGION

by

Shawn M. Patch

Abstract

The Tennessee Valley Authority manages thousands of archaeological sites, including some of the best known in the entire Southeast. In the past several years, TVA has applied geophysical survey as an innovative approach to managing sites, evaluating them for the National Register of Historic Places, and generating new research using non-invasive methods. This paper presents results from four case studies that provide new insight into feature patterning, community organization, site significance, and physical integrity of large, complex Mississippian sites in the Tennessee River Valley. By extension, these methods hold tremendous potential for a range of site types in North Carolina.

The Tennessee Valley Authority (TVA) is tasked with managing a large number of archaeological resources on more than 293,000 acres of land in seven different states (Figure 1). With more than 11,500 recorded archaeological sites from all time periods, the TVA has tremendous management and stewardship responsibilities. A few of the more prominent sites were excavated under the auspices of the Works Progress Administration (WPA) in the 1930s. However, despite the innovative archaeological techniques and high quality of the work, very few studies have been published. In addition, the discipline of archaeology has changed dramatically since then.

The TVA has applied non-invasive geophysical survey techniques to help identify new sites, generate new information about old sites, provide scientific data for better management, meet its annual survey and inventory goals, promote renewed scholarly and professional interest in archaeological sites under its control, and provide sufficient data to support individual site nominations to the National Register of Historic Places (NRHP).

Over the past several years, New South Associates has supported the TVA's efforts by conducting geophysical survey at four large Mississippian sites. In addition to those goals mentioned above, it became apparent as more data were acquired that incredibly detailed mapping and imagery were being generated that could also identify intra-

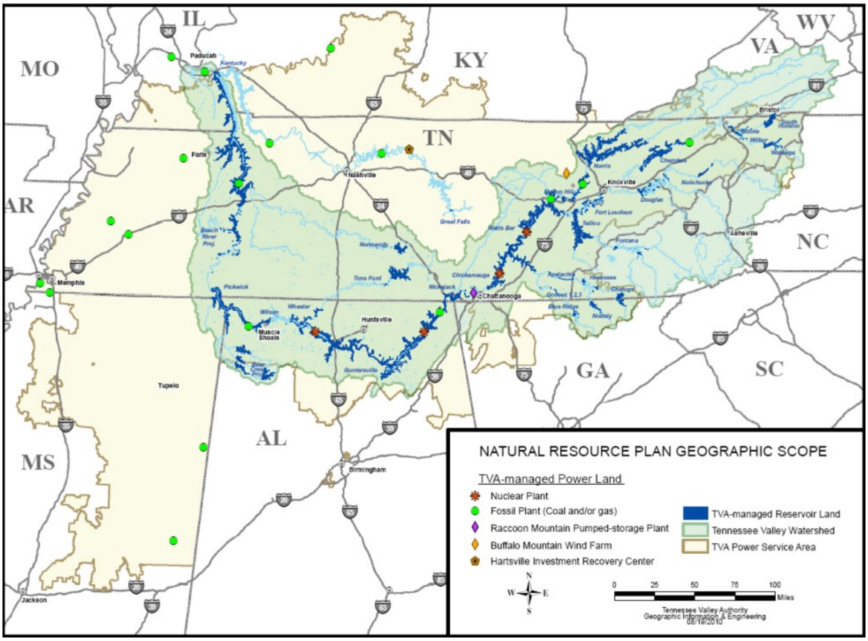

Figure 1. Map showing TVA-owned and managed land in the Southeast (courtesy of Erin Pritchard at TVA).

and inter-site patterning and help define Mississippian community organization and site layout. In many cases, the types of data and resolution that can be generated may be the only way to investigate certain sites. This paper provides an overview of those efforts and results to date.

Mississippian Sites

The South Appalachian Mississippian period is dated from approximately A.D. 1000-1600, with many local variations. In the study area, the chronological sequence is indicated by the Martin Farm phase (A.D. 1000-1100), the Hiwassee Island phase (A.D. 1100-1300), the Dallas phase (A.D. 1300-1600), and the Mouse Creek phase (A.D. 1450-1600) (Kimball 1985; Lewis et al. 1995; Polhemus 1987; Schroedl 2009; Schroedl et al. 1985, 1990, Sullivan 2009, 2016). Larger, more complex towns and villages tend to have earthen platform mounds with elite residences or public buildings, houses arranged around a communal plaza, and palisades or ditch enclosures (Chapman 1985; Lewis and Kneberg 1946; Lewis and Stout 1998). House types vary considerably, but in the Tennessee Valley were commonly wall trench (earlier) or single-set post (later) structures (Lewis and Kneberg 1946; Lewis and

Stout 1998; Webb 1938). The physical features in Mississippian towns and villages are particularly amenable to geophysical survey because of their regular, patterned distribution and high contrast.

Archaeological Geophysics

Kvamme (2003:335–336) aptly summarized the potential of geophysical surveys:

> Geophysical surveys…allow the detection, imaging, and mapping of subsurface features over large areas in potentially great detail. In particular, the notion is promoted that these surveys can offer primary data suitable for the study of cultural structures and features within archaeological sites and landscapes. That wide area geophysical mapping can offer informed guidance to the placement of expensive excavations should be well understood.

Since 2003, the application of geophysical survey in archaeology has increased substantially, due in part to major technological advances in computer processing and equipment, a new generation of practitioners, and recognition by American archaeologists that geophysical data have tremendous information potential.

Geophysical survey can be used for a range of purposes. Three prominent trends are present among researchers today, with a certain amount of overlap (Figure 2). In its simplest form, geophysical survey is useful for identifying potential feature locations. Basically, where should I dig? These data can be helpful for guiding more labor-intensive and expensive excavations and are particularly useful for non-geophysical specialists.

A second approach is to use geophysical results for anthropological research to address specific questions and derive interpretations in much the same way as any other dataset. This requires a deeper understanding of geophysical data and is typically integrated with a well-defined research design from its inception. In this scenario, geophysical data are used to link anomalies to specific feature types to identify patterns, assess chronological changes, and develop intra-site comparisons.

A third approach is to use geophysical data for NRHP evaluations and nominations. This is typically more applicable to resource managers who have ongoing responsibilities under various federal statutes such as Section 110 of the National Historic Preservation Act (NHPA). The identification of features and patterns at the landscape scale is an especially powerful aspect of geophysical methods that cannot be achieved through any other means.

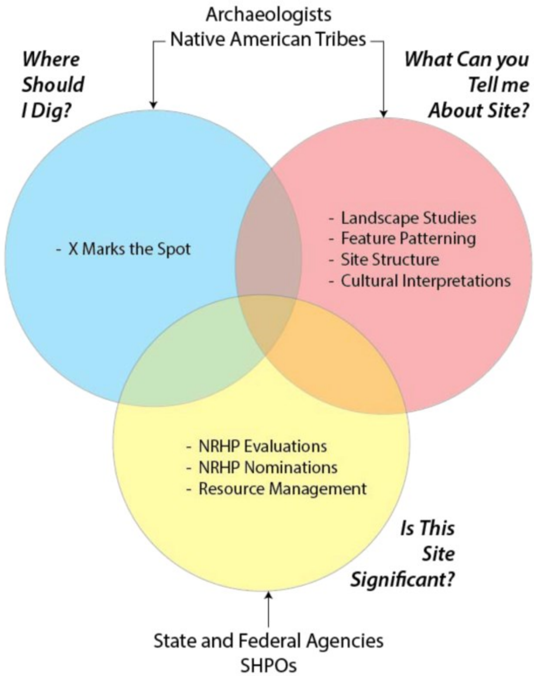

Figure 2. Venn diagram showing common applications of geophysical survey for archaeological research.

Methods

Geophysical survey of all four sites in this study included magnetic gradiometer and ground penetrating radar (GPR). Both instruments are well suited to archaeological sites. Although they generate independent datasets for different aspects of the geophysical spectrum, they are complementary techniques that together can provide highly detailed imagery. In all cases, each site was surveyed in its entirety with magnetic gradiometer because of the rapid data acquisition rates. GPR data at each site were acquired systematically based on previous excavations and the distribution of known or suspected features, as well as the gradiometer results. GPR is more labor intensive in terms of data collection, data processing, and interpretation, so careful consideration was given to these factors in the research design phase.

Case Studies

The four case studies are all located in the South Appalachian Region of the Tennessee River Valley (Figure 3). The sites are: Cox

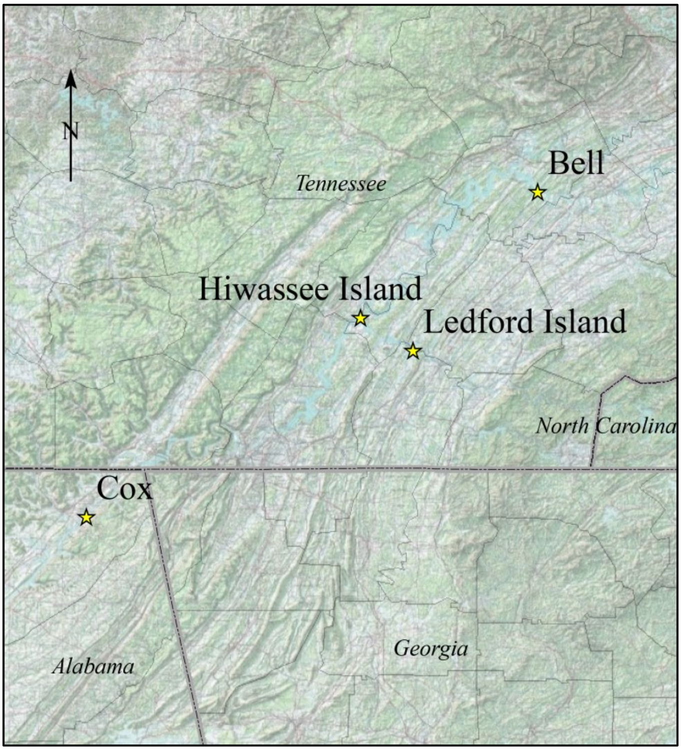

Figure 3. Case study locations in southeast Tennessee and northeast Alabama.

(1JA176) in Jackson County, Alabama (Webb and Wilder 1951); Bell (40RE1) in Roane County, Tennessee (Lewis 1935; Nash 1941); Hiwassee Island (40NG31) in Meigs County, Tennessee (Lewis and Kneberg 1946); and Ledford Island (40BY13) in Bradley County, Tennessee (Lewis et al. 1995). They share several critical similarities. All are Mississippian towns/villages; they are located in a Tennessee River flood plain setting; they are TVA-owned; they were previously excavated by the WPA (with a primary emphasis on mounds and burials) but under-reported or not reported at all; and little or no additional field research has been undertaken in the modern era of professional archaeology. The conventional wisdom was that these sites were largely destroyed.

Geophysical research at the Cox site began as a result of the recovery of human remains in traditional survey and the high costs of artifact curation (Gaffin et al. 2012). For these reasons, the TVA expressed concerns about potential impacts from ongoing management practices and sought more innovative approaches to site management and stewardship. Once the geophysical results from Cox were available, the TVA pursued additional studies. More detail on the individual site results can be found in Patch and Lowry (2013, 2014), Patch et al. (2015), and Patch et al. (2016).

Results

Cox Site

The Cox site is located in the upper end of Guntersville Reservoir. During the 1930s the site consisted of a small platform mound and associated village deposit. Investigations by Webb and Wilder (1951) focused largely on the platform mound and burial excavation in a small portion of the village.

Newly identified elements of the Cox site include a plaza, at least two different ditch/palisade systems that surrounded the entire town, multiple burned houses and other inferred houses, and overall high feature density (Patch and Lowry 2013; Patch et al. 2014) (Figure 4). These data led Patch et al. (2014) to conclude that Cox was a well-planned Mississippian community with a probable very Late Mississippian association.

Bell Site

The Bell site is located in the upper end of Watts Bar Reservoir on Huffine Island. In the 1930s the site was described as a large village with six mounds, five of which were arranged around a large plaza. Mound 51 was approximately 30 ft tall, making it one of the largest platform mounds in East Tennessee. Exploratory excavations were conducted by T.M.N. Lewis (1935) during the early years of WPA investigations in the Tennessee River Valley and prior to the groundbreaking work at Hiwassee Island. Those excavations were limited to the large Mound 51. Charles Nash (1941) returned a few years later, after the Hiwassee Island excavations were complete, and tested Mounds 52, 53, and 54 on a very limited basis. No formal reports or publications were ever produced on these investigations, and no subsequent research was carried out beyond cursory surface investigations and shoreline stabilization (Ahlman et al. 2000).

Geophysical survey confirmed certain features such as the large plaza, but also yielded new details such as a clay substructure and ramp on Mound 51, a large building on the summit of Mound 52, a probable clay substructure on Mound 53, two palisades and a plaza associated

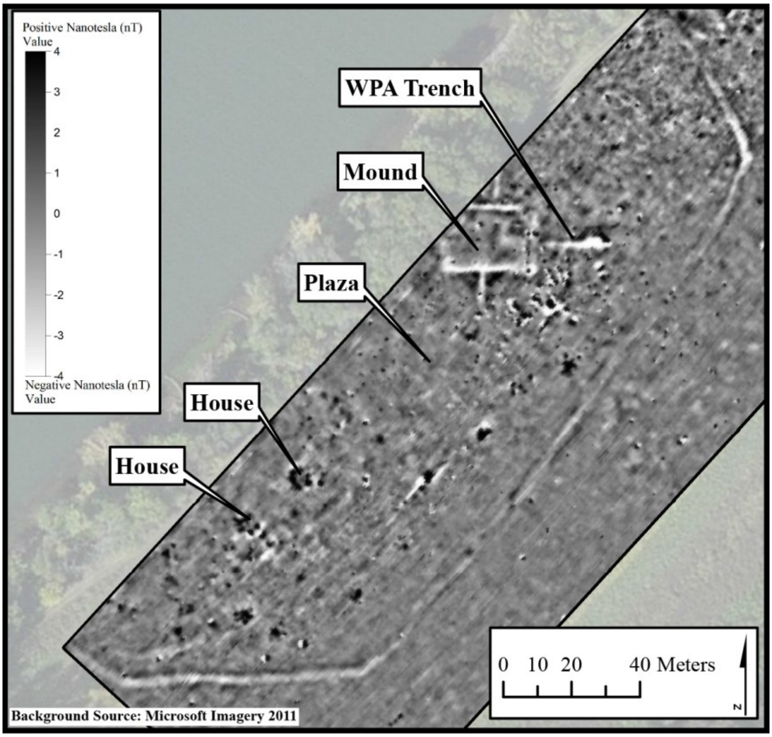

Figure 4. Geophysical survey results at the Cox Site.

with Mound 56 at the far eastern end of the site, and dense village/midden deposits between these zones (Figure 5). These data were sufficiently detailed that, when combined with available archaeological datasets and existing models of Mississippian sites in the region, they suggested spatial patterns that may represent different occupations in the Hiwassee Island (early), Dallas (middle), and late Dallas Mississippian phases. In short, the new data from Bell indicate a substantial site with multiple platform mounds arranged around a central plaza, as well as another mound/plaza/palisade complex within a few hundred meters. These are highly unusual elements for Mississippian towns in East Tennessee and further research is required.

Hiwassee Island Site

Hiwassee Island is one of the most famous archaeological sites in the Southeast because of its archaeological remains and the resulting publication (Lewis and Kneberg 1946). It is located in Chickamauga Reservoir at the confluence of the Tennessee and Hiwassee Rivers. At

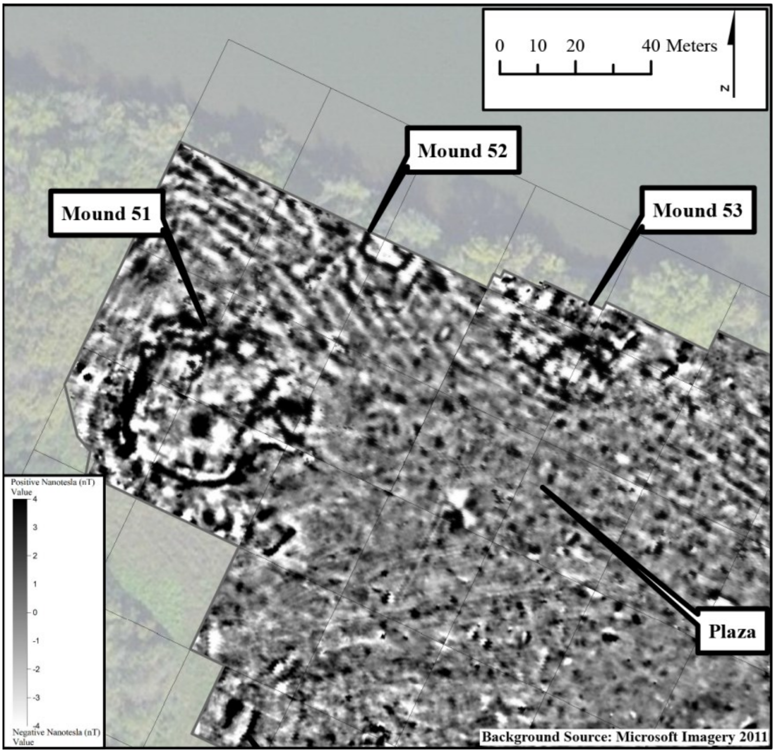

Figure 5. Geophysical survey results at the Bell Site.

more than two miles long, one mile wide, and covering almost 800 acres in the 1930s, it was the second largest island in the entire Tennessee River Valley. At that time, the site contained multiple Late Woodland burial mounds, two Mississippian platform mounds, and dense village midden. Over a two-year period, T.M.N. Lewis led excavations that provided data for the basic cultural and chronological framework for the region and broader Southeast. Limited field investigations were conducted again in the late 1990s by Lynne Sullivan (University of Tennessee) and Cheryl Claasen (Appalachian State University) but were not formally published.

Extensive geophysical survey was conducted of the entire island in 2014-2015 on behalf of the TVA to meet many of the research goals outlined earlier in this paper (Patch et al. 2015). Results indicated many surprises in the Mississippian village, including the identification of seven distinct palisades, one palisade with nine bastions and three gates,

Figure 6. Geophysical survey results at the Hiwassee Island Site.

a pond/low area that may have begun as a borrow pit but was later deliberately filled to create an artificial plaza, dozens of individual houses, and hundreds of other features such as shell middens and pits (Figure 6). All of these factors indicate very dense archaeological deposits in excellent condition with significant research potential. The geophysical data have recently been used to support a successful NRHP nomination of the site.

Ledford Island Site

Ledford Island is located along the lower Hiwassee River in Chickamauga Reservoir. At the time of WPA investigations in the 1930s, the site consisted of dense Mississippian village midden but had no associated mounds. Excavations identified a dense cluster of houses and approximately 500 burials in and around houses, as well as likely cemetery locations, a well-defined plaza, and portions of a palisade (Lewis et al. 1995). Subsequent research conducted by Sullivan (1987) has relied on original records with no additional fieldwork. The site is now recognized as part of the Mouse Creek phase, which may be a local variation of Late Dallas specific to the Chickamauga Basin.

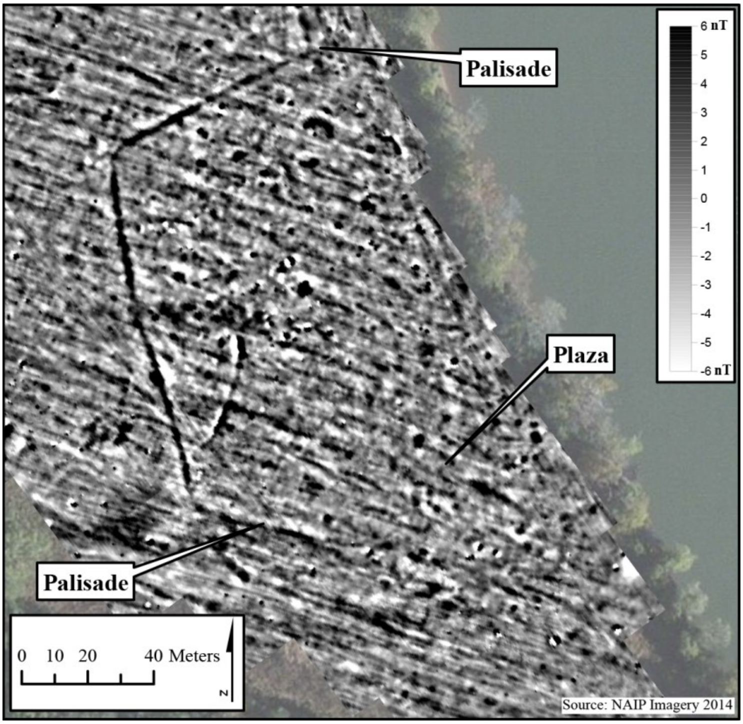

Figure 7. Geophysical survey results at the Ledford Island Site.

Geophysical survey has added considerable information to what was already known (Patch et al. 2016). Identification of new features includes a complete ditch/palisade surrounding the entire town, individual houses, and hundreds of features in the previously unexcavated areas (Figure 7). Comparison of the geophysical data with previous excavations suggests several winter houses and a possible second plaza.

Discussion

What are we learning about Mississippian sites in the South Appalachian Region of the Tennessee River Valley? First, it should come as no surprise that these sites are much larger and far more complex than previously recognized. They each contain extensive village deposits with identifiable houses, plazas, palisades, and other features. The geophysical datasets provide detailed information on internal site structure and community organization at a scale that is not achievable with any other method.

The Cox, Bell, and Hiwassee Island sites all have the characteristics of major Mississippian towns, with platform mounds, plazas, ditch/palisade systems, and well-defined house patterns (Lewis and Stout 1998). Ledford Island lacks a platform mound, but is otherwise consistent with this pattern. The identification of features such as multiple palisades at Cox, Bell, and Hiwassee Island is just one example of how geophysical data can be used to infer village expansion/contraction through time.

Second, the common perception that previous excavations destroyed the best components at particular sites is clearly misplaced. The geophysical data present compelling evidence that significant portions of each site are still intact.

Third, the types of data that are now available provide the basis for new research questions and future archaeological investigations. At the most basic level, the precise feature mapping provides a much more effective and efficient means of excavation that can be minimally invasive. This also assists with resource conservation and stewardship.

Geophysical datasets are a critical management tool for the TVA and, by extension, other federal agencies. Each of the sites discussed here has the potential to yield important information about research questions related to the Mississippian period, and it can be argued they meet the criteria for listing in the National Register of Historic Places (NRHP). The TVA is using the datasets to re-evaluate its management practices, prepare NRHP nominations, and encourage research with existing sites and collections under its ownership.

The application of geophysical methods to large, complex, prehistoric sites is rapidly evolving and becoming more widespread thanks to innovations in computing technology, more interest from research archaeologists, and a broader field of experienced practitioners. The examples provided in this article can serve as a guide for similar sites in North Carolina, of which there are many.

Notes

Acknowledgments. Erin Pritchard at the Tennessee Valley Authority managed all four of the case studies mentioned in this paper. I wish to acknowledge her enthusiasm, professional interest, and foresight in applying geophysical methods to archaeological research within a cultural resource management setting. TVA is the only federal agency in the east, and possibly nationwide, applying geophysical survey at such a large scale. I am also grateful to my colleague Sarah Lowry for our discussions about geophysical archaeology.

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REMOTE SENSING AND GEOPHYSICS IN NORTH CAROLINA ARCHAEOLOGY: A BRIEF HISTORY, DISCUSSION OF THE PAPERS, AND IDEAS ABOUT THE FUTURE

by

Roy Stine

Abstract

This paper is drawn from a talk presented at the "Exploring North Carolina's Archaeological Heritage through Remote Sensing and Geophysics" symposium held on March 12, 2016 in Raleigh North Carolina. All of the papers at this conference were open to the public and indeed prepared for and delivered to a general audience. John J. Mintz, Deputy State Archaeologist, and Shawn M. Patch organized the symposium and asked me to give a brief background on the use of remote sensing and geophysics in North Carolina, discuss the papers, and talk about what I saw as the future of archaeological remote sensing. My presentation was the last one in the event so it was short and concise.

My heroes of science, of which there are many, include one fictional character, Sheldon Cooper from the television show *The Big Bang Theory* and one actual scientist, Neil deGrasse Tyson. Why Sheldon? Well, anyone who goes to a Halloween party costumed as the Doppler Effect has to be loved by everyone who works with Ground Penetrating Radar (GPR) or any type of Radar. Why Neil deGrasse Tyson? He makes science very accessible to the public. While reading one of his books with the excellent title *Death by Black Hole and Other Cosmic Quandaries* (Tyson 2007:28), I came across a quote that he adapted from Edwin Hubble which reads "Equipped with our five senses, along with telescopes and microscopes and mass spectrometers and seismographs and magnetometers and particle accelerators and detectors across the electromagnetic spectrum, we explore the universe around us and call the adventure science."

With that statement Tyson basically summarized all of the papers in the symposium and the papers I'm discussing in this volume (Curry and Gallaway; Ewen; Lowry; Patch; L. Stine; and Turner and Lukas). All these papers discuss using equipment (GPR, magnetometers, cameras, and metal detectors) to extend our vision into the unseen, and we as scientists are all trying to explain what we do and to get the general public in North Carolina to join us in this adventure we call science.

History

Archaeologists have been using remote sensing for probably as long as the camera has been in existence. Cameras have been used to document all aspects of a project. Shortly after World War I (WWI) archaeologists started placing cameras on platforms and planes to obtain aerial views of both natural and cultural landscapes. John Bradford started flying over England after WWI. He detected similarities between the British and Italian countryside; these similarities stemmed from similar Roman-period ruins. In the United States Charles Lindbergh was one of the first to fly over Chaco Canyon, New Mexico, and study the ancient Pueblo cultures from above (Avery and Berlin 1992). These were some of the earliest uses of remote sensing techniques to extend the view of archaeologists.

I've only been asked to give a brief and general introduction to NC remote sensing. I'm sure I've left out many people so please forgive me. The father of North Carolina archaeology, Joffre Coe, started using platforms to acquire images from elevated surfaces in the early 1940s (Figure 1). There are great descriptions and pictures in Coe's book on Town Creek Indian Mound (Coe 1995:28; 51–52) showing a variety of elevated platforms from the 1940s through the 1960s. Those were the good old days; if I asked one of my graduate students to climb up on that platform now I'm sure that there would be a lot of whining, not to mention folks from the Office of Safety and Health Administration (OSHA) showing up to ask me questions.

Some of the earliest work in geophysical remote sensing was conducted by Gordon Watts in the 1970s. Watts, who was a maritime archaeologist and former director of the North Carolina Underwater Archaeology Branch, worked mostly with magnetometers and sonars on underwater sites. As a geographer and only having worked with land archaeologists, I am not that familiar with much of his work, but his remote sensing efforts are some of the earliest recorded at the North Carolina Office of State Archaeology (OSA) files. In the mid-1980s Scott Madry flew Richard Jenrette over the historic house and grounds of Ayr Mount in Hillsborough and the Occaneechi village site in Hillsborough. He pointed out the plantation features at Ayr Mont and the Native American remnants at the Occaneechi site. It must have been a great interpretation because after the flight Jenrette bought and renovated Ayr Mount, and later purchased the Occaneechi village site.

Figure 1. A photo platform used by Joffre Coe in the early 1940s at Town Creek Indian mound. Courtesy of the Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

So I guess that makes Scott Madry North Carolina's Lindbergh. Madry also directed an archaeological investigation at Ayr Mount with possibly the greatest field crew in the history of North Carolina (Linda and Roy Stine). In the early 1990s Tom Hargrove worked with a magnetometer on a variety of sites including locations in Orange, Brunswick, and Columbus counties. Metal detectors and detectorists were viewed with suspicion by many archaeologists in the 1980s and 1990s due to the work of looters at many sites. Linda Stine and a few others, however, started using metal detectors on historic sites in the 1980s.

In the late 1990s and 2000s John Cornelison with the National Park Service worked at Guilford Courthouse National Military Park in Greensboro, NC, with metal detecting and GPR. Around the same period Ken Robinson employed GPR on a variety of Wake Forest University projects. Some of the early work by Robinson was started by partnering with Kent Schneider from the United States Forest Service on a project at Historic Bethabara. Linda Stine at UNCG applied metal detection at Troublesome Creek Ironworks, and later in combination with Shawn Patch at New South they used GPR at the Blandwood Mansion in Greensboro. Charlie Ewen at ECU soon had a GPR unit and his paper (this volume) discusses his earliest efforts at Fort Macon State Park and several of his other projects. Beginning in 2007 Shawn M. Patch with New South Associates, Inc., started using GPRs and magnetometers more regularly in cemetery delineation projects. All of these individuals were beginning to expand their use of geophysical equipment throughout the 2000s.

Linda and Roy Stine finally received a grant to purchase their equipment in 2010 and have since joined the fun. During the 2010s, Alice Wright at Appalachian State University and Tim Horsley at Horsley Archaeological Prospection, the Research Laboratories of Archaeology at Chapel Hill, and UNC Charlotte all acquired geophysical tools and are employing them in various projects. Interestingly, despite the increasing use of geophysics in archaeological settings, I have been unable to identify any formal course offerings that focus on geophysics training for archaeology students listed on the UNC system's websites. In my experience this training is accomplished during archaeological field schools and in independent studies. Perhaps the time for formalized geophysical training has arrived in North Carolina. Let me now move on to discussing the papers.

Paper Discussions

I often ask my students if they think traditional remote sensing is a science, an art, or both? One can also ask the same question about all kinds of geophysical remote sensing. These questions have been discussed in all of the papers in one form or another. The answer is both. For any remote sensing project to produce good results the researcher must have a though understanding of the site they are working on. They need a scientific understanding of the equipment employed, spatial control given the terrain, and the capabilities of the instruments given the terrain and weather conditions. Also, the researchers need the interpretive skills and experience to analyze the data and the ability to develop understandable images, maps, and reports.

Ewen and Lowry point out how geophysical results have become over-sold and over-simplified in the popular press and on equipment websites, illustrated by the infamous "Bones" GPR television episode and the concept of "lifesaving GPRs" to the rescue that have shown up in the media. All of the authors have given warnings about the limits of the technology, including discussions on soils, vague features, features too small to detect, modern noise in the data, and data errors generated by terrain. With these mature cautions, based on garnered experience from many projects, all of the papers are pointing out that archaeo-geophysics is coming of age.

The Lowry and Ewen papers also point out that one of the main projects desired for the GPR is the location of graves. A government memorandum in 2014 reversed an earlier 2010 memorandum about the use of GPR on graves. As discussed by Ewen, the memorandum first said no you can't use GPR, then, well yes you can. The difficulty in locating graves is based on their size, length of time in the ground, properties of the soil, and erosion as pointed out by Lowry. However, Lowry also has shown that excavation is usually not an option and other than "dowsing" GPR is the best method. In cemetery studies the GPR needs to be used with caution, communicating clearly with the client and with the understanding that a complete, 100% accurate map is not possible. Lowry's experience and the impressive spatial variety and number of cemeteries she has surveyed needs to be gathered into a book that completely illustrates the differing grave signatures in the variety of soils she has surveyed. Sarah Lowry, I will even suggest a name for your book "GPR in Babyland!" (see Lowry paper this volume). Babyland, really Sarah, they called it that? That's just plain creepy.

Soil type and condition affects GPR returns. The Turner and Lukas paper addresses this and discusses several experiments in surveying the same location under a variety of weather conditions, particularly wet and dry. A second aspect of that paper was to analyze a variety of sensors at the same location. The returns generated from a GPR, a magnetic gradiometer, and electromagnetic (EM) conductivity are not the same, and they are not measured in the same units. If the data are to be overlaid in a Geographic Information System (GIS) or statistically analyzed, the data must be transformed in some manner to make the comparisons. Turner and Lukas are beginning that multidimensional analysis. Likewise, the Curry and Gallaway paper undertakes the research issue of addressing multiple data types.

Curry and Gallaway are providing new methods to combine Light Detection and Ranging (Lidar) with GPR to create a 3D image that displays the subsurface, micro-topography, and above ground (bushes, trees, and structures) elements. Their paper also uses multiple pictures taken from a camera and placed into *Structure from Motion* (SfM) software. SfM is growing in popularity (not only among scientists but also the public) and is derived from photogrammetric techniques. It allows one to create a 3D image from multiple pictures of the same object. Currently this type of research isn't suitable for someone who is not inclined to work on a variety of software. The authors have used at least 11 different software packages to date. This type of research is not only used for structures, such as the Aston House, but for a variety of physical features as well, combining both active and passive remote sensing systems.

Patch uses GPR and a magnetic gradiometer to investigate large prehistoric village/mound sites. He has shown how geophysics can effectively be used on archaeological sites that have been excavated, and identify and capture new data despite the presence of previous data noise generated from earlier investigations. These projects brought in a larger landscape and allowed Patch to ask questions on inter-regional patterns and intra-site pattering. All of the authors have shown that the continuous data or a synoptic view of a site is one of the great strengths of geophysical remote sensing and can engender new questions that could not be approached with a few test units. Likewise, the cost of excavating the whole site would be very large. The cautionary tale that geophysics is missing a variety of items certainly exists, but the amount of new data that are revealed through non-destructive means is a triumph for geophysical methods.

All of the papers presented in the symposium and included in this volume are to be commended and will create a great asset for North Carolinians in understanding the archaeological past and geophysical techniques' potential for significantly increasing our cultural data base. These papers have shown the readers new hidden landscapes, created new theoretical questions, and have accomplished this through non-destructive techniques. Geophysical remote sensing in archaeology has come of age in North Carolina.

Future

Finally, I was asked to give few brief ideas on what the future of remote sensing and geophysics may hold for archaeology in North Carolina. Expensive tools such as GPR and magnetometers will, I believe, have the slowest growth of the technologies, unless of course GPR starts "saving lives" or the software suddenly develops the clarity of the imaginary GPR in the Bones television episode. If that happens and there is a sudden rash of folks being buried underground, and we can see them in enough detail to determine the kind of digital song download they have (again watch that Bones episode), well then the growth of GPR will be exponential and it'll be a "must have" for lots of folks! However, the reality is that these two pieces of geophysical equipment are specialized tools and not in great demand other than in some of the sciences and engineering.

The biggest improvements in GPR and magnetometers will be in the software and filtering algorithms. New software will hopefully be able to edit out noise of all kinds, especially tree roots, terrain, and dielectric differences in soil. This would help us in the wooded environments of the southeast tremendously. With the beginning of digital GPR, methods may be devised to send/receive multi-directional beams from a single antenna, such as exist on imagery from current satellites. The beams could possibly be fore and aft or side to side. The parallax created by imaging the same object from different angles could create higher-quality 3D images similar to the stereoscopic viewing with aerial photographs. Returning to my fictional favorite scientist, Sheldon Cooper, and his Doppler Halloween costume, it is possible that the Doppler frequency shift could be used to help create a synthetic aperture GPR. This would mean that the size of the GPR antenna could be reduced, making it easier to transport. However, I would not look for any of this anytime soon.

The growth of small flying cameras (using drones or unmanned aerial vehicles [UAVs]) are booming in popularity; in fact they were one of the best-selling items for Christmas 2015. This consumer boom will continue to drive innovation, miniaturization, weight reduction, and, most importantly, lower prices. When I first looked into buying a drone for research around 2008 the price for one was about $30,000. Now, much better model UAVs can be purchased for around $1,100. An array of cameras, including normal color, near infrared, and thermal, as well Lidar, are all currently available to be flown on small UAVs. The quality of these sensors, their abilities to produce photogrammetrically accurate images, and the development of SfM software will continue to increase. With better avoidance software (these are currently being developed for self-driving cars), they may even fly though forested areas. With the widespread market UAVs are creating, their prices on base models will continue to decrease and new, affordable sensor packages will be developed.

Finally, I would like to point out that we as professionals have many outlets to give scientific papers (warning–a lot of acronyms to follow). For instance, we can talk at the SHAs where Charles Ewen is the past president, and places like the SAAs, SEAC, WAC, ASPRS, SEDAAG, NCGIS, AAG, ACSM, GITA, AAA, etc. Well, you get the picture. The symposium given in March was to my knowledge one of the only

Figure 2. Secretary of the North Carolina Department of Natural and Cultural Resources, Susan Kluttz, collecting Ground Penetrating Radar Data at the House in the Horseshoe State Historic Site, with author in the background. The photo is courtesy of the North Carolina Department of Natural and Cultural Resources.

conferences that is free and open to non-members. In fact, it invited the public of North Carolina specifically to come and ask questions. That makes the symposium and these papers an important part of community outreach. As both, L. Stine and Ewen have pointed out how community-engaged scholarship allows students, faculty, state employees at Office of State Archaeology and Historic Sites, the Forest Service, the Department of Transportation, and private professionals to work with the public and demonstrate that the science we do is way more fun than magic! As L. Stine stressed, we archaeologists and geographers should continue to partner with the public whether in the form of work at historic sites, federal parks, or with a community of detectorists at a battlefield, or simply through educational volunteer days. It's fun and even the Secretary of the North Carolina Department of Natural and Cultural Resources likes collecting data with a GPR (Figure 2). Following the lead of one of my real heroes in science, when volunteer days are announced please come out and join us as "we explore the universe around us and call the adventure science" (Tyson, 2007:28).

Notes

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