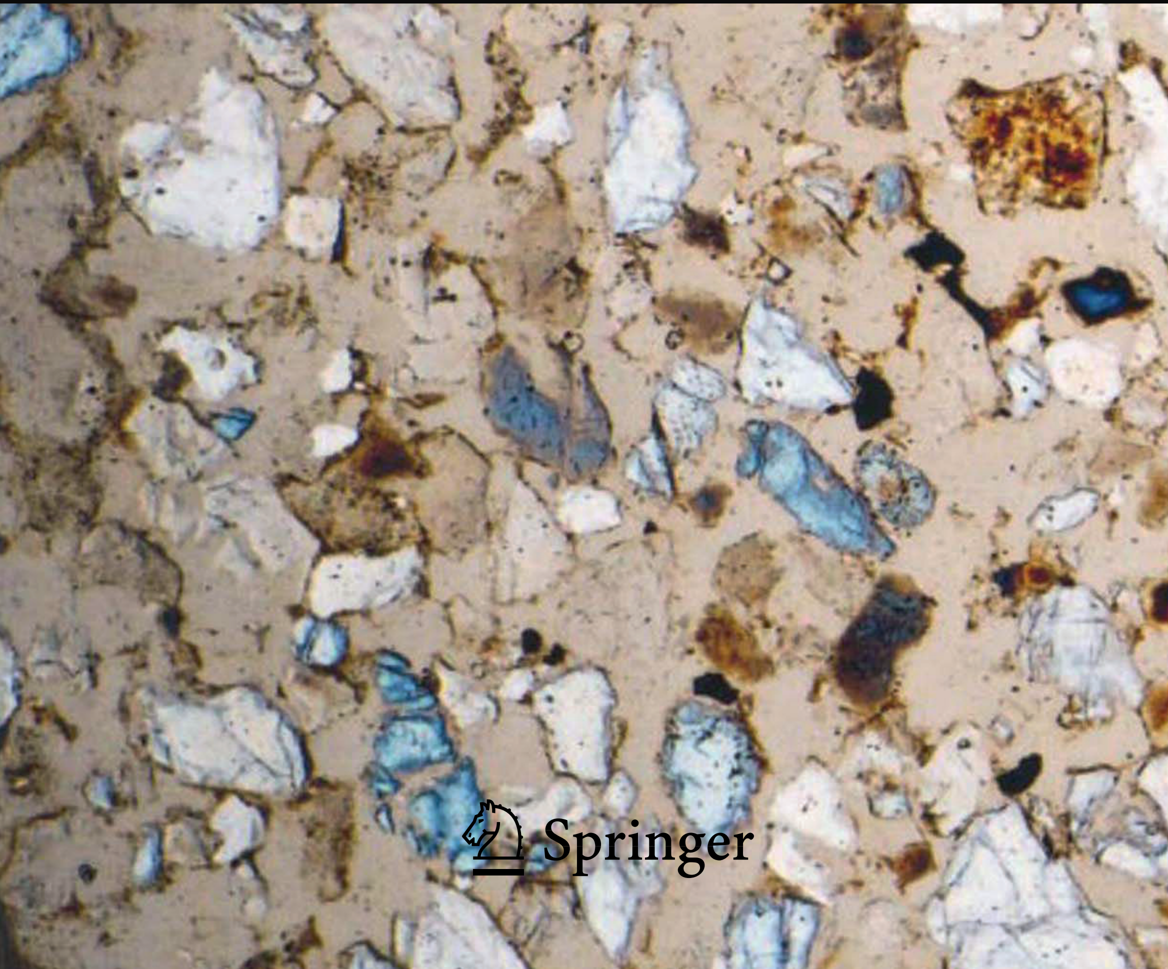
Between Dirt and Discussion

Methods, Methodology, and Interpretation in Historical Archaeology

Edited by Steven N. Archer and Kevin M. Bartoy



Springer

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PREFACE

This volume originated with a session entitled "Methodology in Historical Archaeology: Current Research and Critical Perspectives" organized for the 2004 meetings of the Society for Historical Archaeology in Saint Louis, Missouri. We would like to thank the original participants in that session, many of whom graciously elaborated their papers as chapters for this volume. Adrian Praetzellis and Fraser Neiman were thoughtful discussants in the session and we thank them for their insightful comments, which prompted some of our thinking on the need for a critical revisiting of methodology within historical archaeology. We all use methods, of course, but few of us question the "whys" and "hows" often enough.

We hope that the readers of this volume glean a sense of the same renewed appreciation for complexities and potentialities of materials and materiality that we have in working on the book and thinking through the issue of methodology and its curious status within the institutional structures of archaeology. Indeed, we offer no definitive answers, but hopefully a renewed perspective on "materiality," both as the "stuff" we excavate and the archaeological record we generate and revisit as we weave structures of narrative about the past.

We also owe a debt of gratitude to many individuals for intellectual influence as well as institutional and moral support during the preparation of this volume.

Steve Archer would like to thank the entire staff of Colonial Williamsburg's Department of Archaeological Research, but particularly Marley Brown, Andy Edwards, and Joanne Bowen for continuous support of my own work, and for supporting methodological innovation and experimentation generally at Colonial Williamsburg. Jim Bowers and Tony Herrmann are terrific volunteers whose enthusiastic dedication to the Environmental Archaeology labs at Colonial Williamsburg greatly helped in freeing up time for me to work on this volume. Christine Hastorf at the University of California at Berkeley has been tirelessly supportive of my work and influential on my thinking. John Speth and Richard Ford of the University of Michigan provided me with early encouragement and the foundational knowledge of archaeology and archaeological method I appreciate more with each passing year. My family, friends, colleagues and students are too numerous to name but cannot go without a general, and unjustly brief, thanks for all kinds of support in both personal and professional spheres. Kevin Bartoy is a kindred spirit and our friendship that (sometimes inexplicably) endures and strengthens our collaboration is one of the great pleasures in life.

Kevin Bartoy would also like to thank the staff of Colonial Williamsburg's Department of Archaeological Research, particularly Marley Brown and Andy Edwards. Their tireless support for innovation in archaeology has allowed for numerous trials, errors, and, hopefully, some insights. Pacific Legacy, Inc. and, particularly, John Holson have provided tremendous enthusiasm and funding for this project. I also owe an enormous debt to Jon Erlandson and Madonna Moss of the University of Oregon, who ushered me in to the world of archaeology and instilled in me a strong material-driven perspective as well as a crucial emphasis on the importance of conservation archaeology. I am truly honored to consider Jon Erlandson a mentor and a friend. Joanne Mack of the University of Notre Dame also deserves a great deal of credit for allowing me free rein to explore and study historical archaeology as part of her Klamath River projects. Finally, I wish to thank my beautiful wife, Jenny, my family, and my friends, particularly Paolo Pellegatti, Erika Radewagen, and Kari Jones. I have been privileged to study, explore, debate, and laugh with my colleague, collaborator, and dear friend, Steve Archer.

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INTRODUCTION

Considering methods and methodology in historical archaeology

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"There is no right way of digging, but there are plenty of wrong ways."

-Sir Mortimer Wheeler (1954:2)

In trying to address the historical roots and current trends concerning methods and methodology in historical archaeology, we were quickly struck by a lack of discussion in either the literature or even colloquially amongst practitioners of the discipline. Historical archaeology has been dominated by theoretical debates (e.g., Funari et al., 1999; Leone, 1995; Leone et al., 1987; McGuire and Wurst, 2002; Wilkie and Bartoy, 2000) and debates concerning disciplinary identity (e.g., Cotter, 1978 [1958]; Fontana, 1965; Griffin, 1978 [1958]; Harrington, 1955; Noël Hume, 1969; Schuyler, 1970) with little attention to the actual methods and methodology through which we create the data upon which interpretations are built. Theoretical debates endlessly probe the prevailing philosophical concepts that guide how we conceptualize the machinations of the lived past and the relationship of said past to the interpretive present (e.g., Binford, 1988a, 1988b; Hodder, 1985, 1986, 1991). Yet, few discussions specifically focus on the ways in which we generate "data" from "dirt."

In the current social climate of archaeology, it seems preposterous to even conceive of a heated panel discussion at a professional conference concerning basic analytic and field methods and methodology. The passionate debates over typology by Ford and Spaulding (Ford, 1952, 1954a, 1954b, 1954c; Spaulding, 1953a, 1953b, 1954a, 1954b) or the rabid pursuit of ideal, elucidating sampling strategies by Watson, LeBlanc, and Redman (1971, 1984) and Redman (1974) are treated as the growing pains of a developing discipline (now, presumably, happily resolved) and are summarily relegated to historical moments to be read in a course on the history of archaeology. Yet, all of the routine and comparatively facile steps through which we generate data provide the essential support for our "grander" meta-narratives of past human life. In the age of phenomenology, object-subject discourse, and deconstruction, these steps have become the mundane, unquestioned, and "boring" mechanics of archaeology. We uncritically use familiar techniques learned in field schools or early in a career that have simply become the unavoidable means to an end, replicated with little alteration from project to project, a convenient toolkit that produces reliable and predictable results. However, we should remember the old aphorism: "When the only tool you have is a hammer, every problem looks like a nail."

This volume was conceived to revisit the notions that guide our core understanding of data generation in historical archaeology. We believe that innovation in archaeology comes not simply from new theoretical concepts applied to "end product" evidence, but rather through a reinvigoration of critical attention paid to the entire archaeological process. Archaeological discussions often begin as if "data" were established *de facto* and somehow independent of the research designs and analytical choices that produce them. Our intention is to cast a critical eye at the fundamental question in archaeological knowledge production: How do we create the data that we interpret?

One of the enduring legacies of the post-processual critique, is the general disciplinary agreement that archaeological "data" do not exist independently in the ground (Patrik, 1985; Wylie, 1986). Data are the result of the archaeologists' choices in research design, materials collected, attributes of such material deemed significant, accepted professional standards of recording, specialists' analytical methods, and so forth. Any individual data set could be "parsed," ignored, or amplified in the creation of the evidentiary "skeleton" on which we hang interpretation. Yet, only when such research choices are radically outside the conventional norms are these aspects of the archaeological process considered worthy of debate, or even note.

The archaeological process is described in most texts, and enshrined in our pedagogical practices (for a classic introductory example, see Sharer and Ashmore, 2003: 156) as an idealized model: 1) Formulation of a research question; 2) Development of a research design; 3) Excavation; 4) Analysis; and, 5) Publication. While this structure fits an archetypal concept of how "archaeology is done," it is actually something of a fabrication. Archaeologists are usually positioned somewhere within the process rather than at the idealized, blank-slate beginning. The archaeological process is really a continuum in which archaeologists are continually working outward, backward, and forward to new ends. More often than not, archaeologists are faced with sites or collections that have been partially or wholly excavated by one or many other archaeologists. Most of the contributors to this volume start from "within" the process. It is precisely this lack of a controlled linear research sequence that has led us to question our traditional assumptions about the relationship between material, data, and interpretation.

In this volume, we intend to draw a distinction between *methods* and *methodology*. *Methods*, at their core, are "the way we do the things we do." These are the "hows" of data generation. In this sense, the "Harris Matrix" (Harris, 1979) could be seen simply as an innovation in *method*. It is a novel and useful means of recording and representing the stratigraphic dimensions of archaeological sites, improving by expansion the limitations of traditional profile drawings. Indeed, *methods* do draw critical attention in historical archaeology, albeit in a proscribed domain of discourse and usually prior to publication. Only rarely in the years that have passed since the early enthusiasm of processual archaeology (e.g., Watson, LeBlanc, and Redman, 1971, 1984; Flannery, 1976; South 1977; Binford, 1981) are substantive critiques of methods voiced in print. For the processual archaeologists, method was a clear epistemological issue; today, the linkage between method and knowledge is strangely muted, while issues of agency, identity, and political aspects of archaeological knowledge production are (quite properly) fertile ground for discussion. In our experience, discussions of methods in the twenty-first century are confined to impromptu on-site debates or other types of discussions at varying levels of formality. Essentially, methods are viewed in binary form: they either support or do not support the research aims or conclusions of the researcher. Because data are seen as "theory-laden," somehow we have missed an opportunity to refine our material inferences, through method, to be laden with *better* theory.

In contrast, *methodology* is the study and critical evaluation of methods; the means of linking method with theory; the "whys" of data creation. The "Harris Matrix," as an innovative recording method, was developed from a critique of traditional methods of interpreting and representing archaeological stratigraphy. While the "Harris Matrix" did not fundamentally modify the initial theoretical aim behind its creation, namely, the primacy of understanding the temporal sequence of a series of deposits, Harris (1979) did make a significant contribution to methodology in his recognition of previously unrecorded surfaces and interfaces within a deposit. The definition of surfaces and interfaces changed how archaeologists interpret and represent archaeological stratigraphy; engaging with, in essence, a new correlative theory of the materiality of the ground. It is testament to the current lack of debate about methods and methodology that while many archaeologists have adopted the use of the "Harris Matrix" as a recording system, few archaeologists are conversant with the most innovative methodological concepts that underlie its creation. Many archaeologists use the "Harris Matrix" as a slightly modified, albeit written, version of the traditional soil profile. However, as Harris demonstrates in this volume (Chapter 7), the primary contribution of his system was meant to be methodological and not merely methodical.

To further highlight the distinction between methods and methodology, we would like to offer a hypothetical example with respect to stratigraphy. A *methodological* innovation with respect to stratigraphy would perhaps involve the re-evaluation of individual stratigraphic deposits for new information in addition to, and perhaps decoupled from, the temporal sequence of their deposition. For example, chemical, environmental, or microstructural aspects of deposition may provide additional data potential, research questions, or interpretations beyond a mere temporal sequence. In a given circumstance, the differences in microstructure between two deposits may be more significant and informative than the temporal sequence (e.g., Archer, Bartoy, and Pearson, Chapter 5). Yet, our disciplinary tradition always gives primacy to sequence. If a temporal relationship between two deposits cannot be determined stratigraphically (a common occurrence), those two deposits are immediately demoted to a lower status of interpretive significance without exploring alternate potentials. This is an example of a "tyrrany of the status quo," an inertia in archaeological thinking that is difficult to overcome.

We believe that archaeologists must undertake meaningful and substantive discussions of methods and methodology, working towards increased transparency of the analytical processes and decisions that underlie our explanations and interpretations. Methods and methodology must be evaluated in any discussion of the archaeological process. Critical attention to methods can exceed the simplistic goals of substantiating or refuting archaeological interpretation. Indeed, methodology can *guide* archaeological interpretation into more potentially productive avenues than the discipline has currently realized.

All archaeologists have heard familiar critiques about insufficient sample sizes, poor underlying assumptions about technical data sets, contrary competing evidence, or other interpretive problems that "invalidate" their conclusions. Unfortunately, this is often where the discussion seems to end. While we are not apologists for the use of bad data, we feel that attention paid to the process of *data creation* cannot only circumvent poor interpretation, but also assist in guiding archaeological data (by its very nature, incomplete and often statistically unstable in a "hard science" sense) to more productive questions. Essentially, it is folly to repeatedly throw "data" at theory when the data is fundamentally incapable of supporting the theory in question in any legitimate sense.

The core of a more critical and refined approach to methods should be the essential question:

"What *drives* the theoretical and interpretive aims of archaeological reportage"?

To answer this question, we have found it useful to return to the core of what makes archaeology *archaeology*, rather than history, literary criticism, or philosophy. That is, the *material evidence* of the past. We propose that theory-driven archaeology, in its worst sense, (i.e., archaeology that is crafted in order to support a particular theoretical position or interpretation of the past) leads to narrowness in interpretation, circularity in argument, and obfuscation, rather than elucidation, of the lived past. Although theoretical innovation is undoubtedly valuable, we cannot shoehorn archaeological resources, unique and nonrenewable, to the sole service of theoretical agendas. Rather, we should increase our ability to let the potentialities of the site, the collection, or the sample guide and generate research design, excavation, analysis, and theoretical interpretation.

With the increased "development" of the modern world, archaeological resources are quickly becoming, the irony duly noted, "things of the past," in that they will no longer exist. Although present human activity continues to create new archaeological sites, the pace at which sites are being destroyed bodes ill for archaeologists of the future. We must keep in mind that each time an archaeologist begins research on a site that is not threatened, archaeology also becomes part of this problem. We do destroy carefully, or "transform" (e.g., Lucas, 2001), but such transformations are still in so many aspects, irreversible.

Due to the endangered nature of archaeological resources, it is our belief that an archaeologist's primary ethical responsibility is to the resource's potentials for research, not only of the present, but those not yet imagined, as opposed to the theoretical agenda of the moment. A responsible archaeology includes a willingness to let materiality drive interpretation. With this belief, we still advocate that theory in archaeology can innovate and enhance our interpretations and understandings of the past. However, we argue that theories, be they processual, post-modern or otherwise, must be formulated and assessed for their ability to expand the potentialities of the material record of the past. We should not search out resources that can be molded to a given theory. Instead, we should search out theories that better help us to understand and interpret the often ambiguous archaeological record.

In advocating a willingness to allow materiality to drive interpretation, we do not wish to create a false distinction between "theory-driven" and "data-driven" archaeology. In practice, theory and data are situated in a recursive relationship. However, given that most archaeologists are trained within an anthropological tradition, the theoretical agenda often will assume the lead even in cases where methodology suggests more productive interpretive potential for a resource. In essence, we are arguing for more inductive approaches that include a willingness to confront the institutional structures that pressure archaeologists towards the relative "safety" of social theory, where arguments are based on interpretation or philosophical positioning that have more nebulous boundaries of evidential constraint. We encourage evaluation of archaeological resources through any number of lenses, but at the same time, rigorously pursuing, through the institutional structures at our disposal, those that make the most of the core resources of our field, the material evidence of the past. In reasserting *material* and our methodological approaches to material on an equal footing with abstract theory, we can only improve the archaeological reportage that results from our labors.

In this volume, we have collected papers from scholars who have not followed the archetypal linear sequence of the "traditional" archaeological process. While the contributors address a range of methodological considerations, they each show the potentialities of an archaeology driven by materiality. In almost every instance, the contributors have derived their data from sources outside of the mainstream of novel academic excavations. Their data are derived from historical archives, existing collections, re-evaluations of past excavations, and testing and salvage excavations of threatened sites. As each contributor struggled with their materials, they created innovative approaches that led to opportunities to pose heretofore unasked questions that enhance our understanding of the lived past.

The contributions in this volume are necessarily but a small boat on the "endless sea" that awaits a methodologically informed historical archaeology. Within our circumscribed niche, concerned with frequently overlapping research areas (the lower Chesapeake) and materials (clay pipes aplenty!), we are attempting to show the possibilities of realignment when method informs theory. Some authors use case studies that explore the relationship between novel methods and research issues, while others address topical and theoretical concerns about the relationship between methods and interpretation. We have included authors who use the very latest technologies of DNA recovery (Dixon, Chapter 4) and Geographic Information Systems (GIS) (Madry, Chapter 3), as well as authors who continue to grapple with improving methods that have been basic to archaeology since its inception, such as typology (Agbe-Davies, Chapter 6), interdisciplinary collaboration (Clark and Corbett, Chapter 8) and stratigraphic recording (Harris, Chapter 7). The willingness to both experiment with new methods (Archer, Bartoy, and Pearson, Chapter 5; Dixon, Chapter 4; Madry, Chapter 3; Vince and Peacey, Chapter 2) and re-evaluate traditional methods (Agbe-Davies, Chapter 6; Bartoy, Holson, and Ballard, Chapter 11; Brown and Edwards, Chapter 9; Clark and Corbett, Chapter 8; Harris, Chapter 7; Kostro, Chapter 10) is crucial to the growth of archaeology.

Our intention is not to provide definitive or authoritative statements on the "correctness" of methodological choices, but rather to increase the transparency of our analytical processes and the means to judiciously evaluate them as part of archaeological discourse. This volume represents a holistic approach to archaeological methodology "between dirt and discussion." The contributions to this volume primarily use case studies to explore the intersections between methodology and interpretation. In this way, each chapter represents an exploration of a given method and is a small beacon in the darkness to show what serious attention to method *can* accomplish. We hope this emphasis on explanation and application will increase dialogues beyond the individual contribution and encourage future novel applications and critical reappraisals of a variety of archaeological methods. It is at this intersection between "dirt" and "discussion" that we see so much potential for a reinvigorated archaeology.

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Chapter 2

PIPEMAKERS AND THEIR WORKSHOPS

The use of geochemical analysis in the study of the clay tobacco pipe industry

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Abstract: The smoking of tobacco was introduced into the British Isles in the late sixteenth century and the production of the clay pipes in which it was smoked was initially a London monopoly. However, in less than a century, clay tobacco pipes were being produced in a network of centers spread across the whole country. These centers range from major cities down to small market towns and rural settlements. Our interest in this paper is to consider the supply of pipeclay. We describe the natural occurrence of pipeclay in the British Isles, some of the evidence for its exploitation and distribution, and the two main analytical techniques used to characterize it. Eventually, we hope to investigate the use of clay on a macro-scale, to reconstruct the routes over which pipeclay was supplied to this network, and on a micro-scale, to help reconstruct the way in which pipemakers worked. At present, however, we have shown the viability of our methodology and produced some initial results. We use as our main example the Pipe Aston Project, run by Allan Peacey in northeast Herefordshire. Finally, we discuss ways in which this study could progress.

Key words: Clay tobacco pipes; chemical analysis; Pipe Aston, Herefordshire, United Kingdom.

1. THE INTRODUCTION OF TOBACCO PIPES TO ENGLAND

Before contact with the Americas in the late fifteenth century, there was no tradition of smoking in Europe. There was not even a concept of "smoking" and initially the term used was to "drink" tobacco. During the sixteenth century, however, tobacco was imported and grown in Europe and the habit of smoking in a clay pipe was well established. To understand something of the background of the use of the pipe, we should consider the social context of its spread.

The first Europeans to smoke tobacco were sailors and adventurers who had observed and then adopted smoking. Subsequently, there were probably three main forces at play: its novelty and exotic nature; the medicinal benefits of tobacco (it was noted as an appetite suppressor); and, the social status of its earliest users (courtiers).

The progress of tobacco into England, as with the rest of Europe, is shrouded in uncertainty. At best, the documents only provide cameos on which to form a judgment. English sailors under the command of Hawkins in 1565 observed the native Floridians taking smoke through a pipe consisting of a cane and earthen cup, and recorded that the French, who had already established a colony there, also practiced the smoking habit (Hakluyt, 1589:47). In the face of this experience, it seems unlikely that some of the English sailors did not experiment also. Only six years later, in 1571, attempts were being made to cultivate tobacco in England (MacInnes, 1926:75, quoting Lobelius, 1576). If Hawkins' men brought pipes into England, they would have been of the stub-stemmed type that they observed in Florida. The pipe from Cambridge Backs illustrated by Oswald, conforming to this general type is atypical (Oswald, 1975:35). From the outset, English pipes had a bowl and stem formed as one.

After an initial expedition in 1584, Sir Walter Raleigh sponsored his second voyage to Virginia in 1585 with the intention of founding a permanent settlement. Thomas Hariot, mathematician, astronomer and tutor to Sir Walter Raleigh (Stephen and Lee, 1917:1321-1323), was a member of this expedition. In his *Briefe and true report of the new found land of Virginia,* he provides a reliable description of native tobacco culture and smoking habits (Hariot, 1588). Significantly, he writes "they use to take the fume or smoke thereof by sucking it through pipes made of claie ... We our selves during the time we were there used to suck it after their maner, as also since our returne" (Ibid.). An engraving by De Bry after a watercolor by White (the recording artist of the expedition) shows two Native Americans sitting on a mat surrounded by various foodstuffs and artifacts. Amongst these artifacts is a tobacco pipe of the angular elbow form still popular in the second half of the seventeenth century and forming a significant part of the production of Emmanuel Drue of Swancove, Maryland, whose production site has been investigated by Luckenbach et al. (2002:46-63). Pipes of this form are likely to have been the model for subsequent British clay tobacco pipe production.

By 1598, Paul Hentzner (1598:4), a visitor to England, records the constant custom of smoking in public places and notes that:

> The English – have pipes on purpose made of clay into the farther end of which they put the herb, and putting fire to it draw the smoak into their mouthe.

The first suggestion that these English pipes were modeled on American examples appeared in 1605. De l'Ecluse (1605) added a footnote to his abridged translation of Monardes' *Las Indias Occidentales,* based on Hariot's account (Mackenzie, 1957:81):

> In the year 1586 ... they found that the Inhabitants did frequently use some Pipes made of clay, to draw forth the fume of Tobacco leaves set on fire; which grew amongst them in great quantity, or rather to drink it down, to preserve their health. The English returning from thence (Virginy), brought the like pipes with them, to drink the smoke of Tobacco; and since that time the use of drinking Tobacco hath so much prevailed all England over, especially amongst the Courtiers, that they have caused many such like Pipes to be made to drink Tobacco with.

In England, it seems probable that pipes were being made in quantity by 1590, a supposition supported by Oswald's statement that pipes from deposits dating to the last decade of the sixteenth century are mold made (Oswald, 1975:5). The basic form of the pipe, exclusive use of white clay and the use of a two-piece mold to produce it in enormous quantities, were established at this time and both were retained with only minor alteration into the twentieth century.

2. PIPECLAY

In England, the term "pipeclay" has become synonymous with the white-firing, Tertiary ball clays of southern England and clays with similar characteristics. As luck would have it, all English-made clay pipes, from the late sixteenth century to the nineteenth century, were made from such clays. However, in northern America and the Caribbean, this was not the case, since some were made from red-firing clays, leading to the confusing but true statement that not all clay pipes are made of pipeclay. In what follows, we use the term pipeclay in its potting/geological sense.

2.1 Formation

Pipeclays are composed mainly of silica, kaolinite and muscovite. These three minerals also occur in china clay, but there is no evidence that this clay, which outcrops on the granite batholiths of southwestern England, was ever used for pipe making except when blended with other clays. Indeed, there are documentary references to the importation to Cornwall of ball clay from the Isle of Wight (Douch 1970:33-34). The main compositional differences between china clay and pipeclay are that the former is of a coarser texture, being poorly sorted, and that the clay requires sieving and crushing before it can be used, whereas most pipeclays are plastic when dug and could be used by potters and pipemakers without further treatment. Chemical analyses of china clays and ball clays show that the latter have a higher titanium content.

Pipeclays were formed by the in situ modification of fine-grained muds contemporary or immediately following their deposition. They formed in sub-tropical deltaic conditions where the sea level fluctuated seasonally. In these conditions, leaching of various elements took place, together with chemical modification of the clay minerals, leading to the formation of authigenic kaolinite and the redeposition of iron and associated minerals in a B horizon underlying the pipeclay, which is sometimes overlain by an organic deposit, such as coal or lignite. This gives rise to the alternative name for these clays, seatearth. This term simply implies "the clay/mudstone layer immediately underlying a coal," and does not necessarily imply that the clay is a pipeclay, in most cases it will be, in the other cases it might be a siltstone. Such conditions recurred several times in the geological past of the British Isles, from the Carboniferous Period (c.330 MY BP) to the Tertiary (c.55 MY BP). In some cases, the coal is absent, either because conditions did not allow it to form, or because of subsequent erosion. Because of the deltaic environment, it is not uncommon to find that the lithology of the strata is variable, with silt- and coal/lignite- filled channels cutting down through the earlier pipeclay. Furthermore, in many cases, the basins in which these deposits were forming were subject to cyclic variations in relative sea level, so that the coal is succeeded by sandstone.

2.2 Occurrence

Coal and pipeclay first occur in the early Upper Carboniferous, for example in the Millstone Grit Series. They become more widespread in the subsequent coal measures, outcropping in the coalfields of Scotland, Lancashire, Yorkshire, Leicestershire and South Derbyshire, Staffordshire, East Shropshire, and North Somerset. In addition, there were probably pipeclays in the Forest of Dean and in several other small outcrops not large enough to be exploited for coal extraction (Figure 2-1).

Figure 2-1. Location map showing places mentioned in the text.

These Carboniferous deposits are now often masked by later deposits, and are heavily faulted and indurated, all of which would have hindered their use. For the seventeenth and early eighteenth centuries, we can assume that only deposits outcropping at the surface would have been exploited.

Suitable conditions for pipeclay deposition did not recur until the Middle Jurassic Period. Two periods of coal deposition occurred in North Yorkshire, outcropping around the fringes of the North Yorkshire Moors and associated with seatearths. South of the Humber, now often exposed on the scarp slope of the Jurassic ridge, pipeclay is particularly well-developed and exposed in south Lincolnshire and Northamptonshire but not associated with a coal.

The next period in which pipeclays probably formed is the earlier part of the Lower Cretaceous, where deltaic conditions existed in the southeastern part of England, including patchy outcrops along the Oxfordshire/Buckinghamshire border and a more extensive, but poorly exposed, area in the center of the Weald.

Finally, the most important deposits of pipeclay, as far as pipe making is concerned, are those which were deposited in southern England during the Tertiary Period. These deposits have been subject to folding since deposition and now outcrop in isolated patches and basins. Outcrops exist in Devon to the north and south of Dartmoor (Peter's Marland and Bovey Tracey); in Dorset at Portland (especially at Arne, Povington and East Holme); and through Dorset, Wiltshire, Hampshire and Sussex (the Reading Beds, including the West Wellow clay, exported for pipe making and pottery). The Reading Beds in the Thames basin outcrop as a thin band from Surrey westwards into Berkshire then eastwards along the dip slope of the Chilterns and are exposed intermittently as far east as southern Suffolk. In the London basin, there are at least two periods of pipeclay deposition, the earlier being the Reading Beds and the later outcropping as part of the Bagshot Beds. In most of these outcrops, only a small proportion of the deposits consist of usable pipeclay and the only beds which are still worked today are Bovey Tracey, Peter's Marland, and the Isle of Purbeck. These clays are known as ball clays, initially because they were transported as large balls of clay.

3. THE PIPECLAY TRADE IN THE BRITISH ISLES

In 1619, James I granted a monopoly of pipe production to the pipemakers of Westminster, replacing and consolidating previous monopolies which had conflicting privileges. Although the 1619 charter covered the whole of England and Wales, it was openly flouted within the year at Bristol and prosecutions for infringement took place at Portsmouth (1622) and Reading (1623). This monopoly was closely linked to Philip Foote who, in 1618, was granted a 21-year monopoly to supply pipeclay to pipemakers (Atkinson and Oswald, 1969). Within a year, the monopoly was being broken and a lease dated 1619 between Swithen Bonham, one of the pipemakers who signed the 1619 Charter, Sir John Webb and Thomas Brundell, Knight and Baronet, records their agreement that the said Swithen Bonham "shall and may have and take any earth or shale for the making of tobacco pipes" from waste ground at Poole (Cooksey, 1980:338).

From the beginning, the London pipe making industry was supplied exclusively with clay from Poole and the Isle of Wight. There are many documented references for the coastal trade in tobacco pipeclay from these sources to ports as far west as the Helford estuary in Cornwall and as far north as Newcastle (Douch, 1970:33-34; Cooksey, 1980:337-347).

Ball clays from Peter's Marland, near Barnstaple in North Devon, were shipped up the channel to Bristol and Gloucester (Grant, 1983:40) and around the Welsh coast to Chester (Rutter and Davey, 1980:47). Some of this clay was taken by shipmasters acting as their own merchants, but 62 tons were shipped by a single individual, Peter Bewes (Grant, 1983:40).

Another source of pipeclay, presumably an outlying pocket of Tertiary ball clay, was being exploited at Chitterne in Wiltshire in the seventeenth century. Although the earliest reference dated 1646 recording pits upon the Cowedowne of Chitterne does not specify the type of clay being extracted, that it was tobacco pipeclay becomes clear in a later document since a license was issued in July 1651 by Henry Powlett to Edward Ffripp and Christopher Merriwether to dig "thirtie loades of clay to make tobacco pipes out of upon the downe of Chittern Mary" (Lewcun, 1987).

Documentary sources make it clear that Tertiary ball clays were favored by pipemakers from the early seventeenth century (and probably before) to the effective end of the industry at the turn of the twentieth century. Areas close to the coast were favored and the clay distributed around the coast in two main networks, one supplying the west coast and the other the south and east. Inland, other sources of ball clay were utilized, as at Chitterne, but probably only to supply pipemakers in their immediate neighborhood.

Coal measure pipeclays were inferior in quality but much more widely distributed in nature. This is confirmed by Plott (1686) when writing about the pipeclays of Staffordshire:

> As for tobacco pipe clays they are found all over the county, near Wrottesley House, and stile cop in Cannock Wood, whereof they make pipes at Armitage and Lichfield, both which though they are greyish clays yet burn very white. There is tobacco pipe clay also found at Darleston near Wednesbury, but of late disused, because of better and cheaper found in moreway field betwixt Wednesbury and Willingforth, which is of a whitish colour, and makes excellent pipes as doth also another of the same colour dug near the salt water pool in Pensnet chase, about a mile and a half south of Dudley. And Charles Rigge of Newcastle makes very good pipes of three sorts of clay, a white and a blew which he has from between Shelton and Hanley Green, whereof the blew clay burns the whitest, but not so full as the white, i.e. it shrinks more; but the best sort he has from Grubbers Ash, being whitish mixed with yellow, it is a short brittle sort of clay, but burns full and white, yet he sometimes mixes it with the blew before mentioned. But the clay that compasses all others of this county, is that of Amblecote, on the bank of the Stour, in the parish of Old Swinford yet in Staffordshire.

The use of coal measure clays is also documented in Shropshire. From Caynham in south Shropshire, there is a document from 1680 recording the sale of the manor with the exception of certain mineral rights amongst which tobacco pipeclay is specifically mentioned. There are documented pipemakers at Caynham in the late seventeenth century, but presumably the clay was also supplied to workers in Ludlow and Cleobury Mortimer, both known from documentary and archaeological evidence. Caynham is the nearest possible source of clay for the Pipe Aston industry.

The use of the middle Jurassic pipeclays is less well documented than either the Tertiary ball clays or the coal measure clays although the pipeclay at Northampton was said to be amongst the best in the land and was supplied to pipemakers in Northamptonshire and neighboring counties (Morton, 1712). At some point in the late eighteenth century, this clay source was exhausted and pipemakers instead used imported ball clay (Moore, 1975).

These quoted documents give a varied picture of the extraction and use of pipeclays, from the direct involvement of the pipemaker Swithen Bonham with the clay pits at Poole to merchant handlers and ship owners of both Poole and North Devon acting as middle men between the clay diggers and the pipemakers.

4. THE PIPE ASTON PROJECT

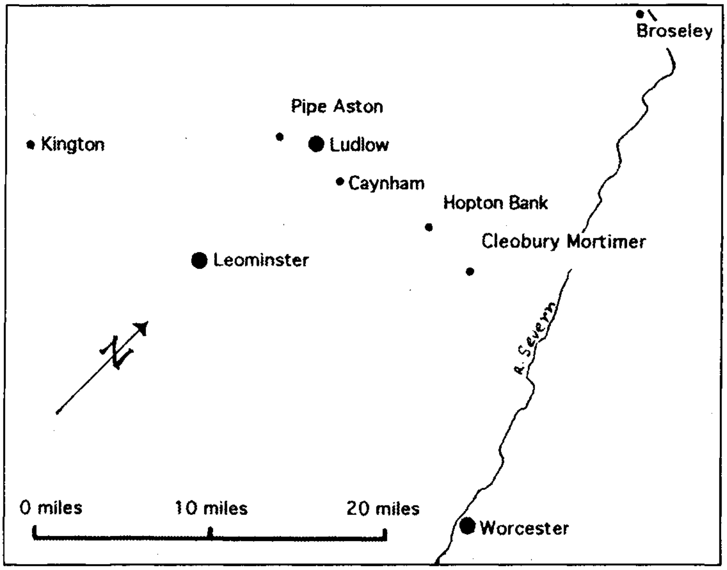

Figure 2-2. Map of North Herefordshire and South Shropshire showing places mentioned in the text.

Pipe Aston is situated in a predominantly wooded rural area of North Herefordshire, four miles to the west of the town of Ludlow (Figure 2-2). Although officially only known as Pipe Aston from the 1841 census onwards, pipemakers were active in the parish from the early seventeenth to the mid eighteenth centuries. Pipemakers had left the village a century before the place name was first recorded. To date, eight production sites have been located in the parish and at one of these, Roy's Orchard, at least eight makers were operating, although only one of these is known as a pipe-maker from written records. For a short period of time, little more than a century, a large number of pipemakers were working in this parish, and a study of the distribution of stamped pipes (mostly later than c.1650) shows that they had a limited market.

The Pipe Aston Project was set up to investigate developments in kiln design in the late seventeenth and early eighteenth centuries. The quality of the data recovered led to new avenues of research. Excavations in Roy's Orchard showed that pipemakers in this remote region of North Herefordshire worked in an extended family based, co-operative manner, sharing both workspace and molds, but using their own personal stamps to mark their products. Intermarriage between the pipe making families ensured a tight knit community with links extending from Cleobury Mortimer, 16 miles to the east, to Kington, 19 miles to the southwest. From this one production site, where up to seven makers were working at any one time, a total of 63 stamps were used, ranging from full names to initials to enigmatic symbols. That this array of stamps can be matched to as many as 36 identifiable molds shows clearly that the type of stamp had a market significance in many instances rather than simply maker identification. This diversity makes the products of this site ideal for further investigation by chemical analysis of their clay composition. Could different batches of clay be limited to product status, maker preference, or temporal factors? Initial work has shown identifiable patterns, the meanings of which remain somewhat enigmatic. Further work targeted at specific questions is anticipated.

Fieldwork over the ten year period of the project has identified eight production sites within a one mile radius of Roy's Orchard. They range in date from c.1620/30 to c.1740. Two of these sites, pre-dating the English Civil War, offer the opportunity to examine kiln structures of a significantly earlier date than any so far studied. That pipes were being made as early as the1620s in this seemingly remote region can probably be explained by the presence in Ludlow of the Council of the Marches, which was at this period the government of Wales. Even before the Pipe Aston Project began, the Ludlow area was noted for its high frequency of early seventeenth-century pipes. In Ludlow, there would have been a ready market conversant with London tastes and fashions.

5. THE ORGANIZATION OF PIPE MANUFACTURE

In urban areas, tobacco pipe making, as with other trades, was controlled by burgesses through the apprenticeship and freedom system. This ensured a continuity of ideas and practices handed down from master to apprentice over a period of training lasting generally seven years. In rural settings, such as Pipe Aston, it is likely that less formal methods were followed, such as the kin relationships previously noted. Although no such relationships with Broseley have yet been discovered in contemporary documents, the evolving pipe forms of Aston, which follow closely those of Broseley, suggest powerful links between the two communities. In either case, formal or informal apprenticeship, knowledge of the methods and practices of the trade were handed down from the master. The influence of the master would greatly impact the source of clay used as well as its preparation.

Clay was generally transported as dry balls of about 56 pounds in weight. Before use, these balls had to be rendered plastic and of even consistency. Two methods were commonly used to bring this about: levigation; and, kneading or beating. In order for the dry clay to take on water, it must first be broken down into small particles. Levigation can be used to separate stones and grit, which sink to the bottom, and organic material, such as roots, which float to the top. In 1998, excavations of a series of nineteenth-century clay pipe making sites at Francis Street, Dublin, revealed two clay settlement tanks lined with thin slabs of stone, saddle jointed at the corners.

Beating clay is well documented throughout the history of tobacco pipe manufacture (Peacey, 1996:189-90). One example will suffice here:

> It must be dried before it can be worked, and in so doing it looses about a sixth part. Then water is strewn upon it which it greedily sucks in, till, 'tis like a past, after which 'tis very well beaten, till all parts be alike and it seems like a piece of dough (Houghton, 1694).

6. CHARACTERIZATION OF PIPECLAY ARTIFACTS

There are several methods which can be used to determine the source of the clay used to make pipeclay artifacts. The simplest of these is examination of a freshly-broken edge at 20x magnification using a stereo microscope. This simple technique can be sufficient to identify coal measure seatearths from other pipeclays, because the former usually contain rounded pellets of clay, which are so hard that they have survived whatever preparation processes were carried out on the clay (such as beating or levigation). Such pellets are rare in more recent pipeclays. At the seventeenth-century pipe making community at Pipe Aston, the earliest group of pipe making waste found to date (dating to the mid seventeenth century) contains these pellets, which distinguishes it from the later seventeenth- and early eighteenth-century pipe waste found on other sites. Similar pellets can be seen in some of the mid seventeenth-century products of Broseley. Therefore, with very little effort, it is possible to distinguish most pipes made from coal measure clays from the remainder. However, it is not possible using this technique to distinguish pipes made from one outcrop of coal measure clay from another.

Thin section analysis is a second approach that has been used with some success. Davidson and Davey (1982) took samples of pipes from seven sites: Norton and Chester in Cheshire; Buckley in Flintshire; Hull in East Yorkshire; Rainford and Liverpool in Merseyside; and, Broseley in Shropshire. By the systematic recording of each inclusion type present in the section, they demonstrated that the Hull pipes were made from different clay from the remainder, which were probably made from different outcrops of coal measure clay. However, because the range of inclusion types is so limited and because the technique depends to a great extent on being able to compare sections side-by-side, looking at roundness, grain size distribution, and the character of the grains (mostly quartz), it is a method which is: 1) only suitable for the coarser textured coal measure clays; and, 2) best used to answer simple questions, such as comparing two or three groups of pipes, perhaps where other evidence suggests the same pipemaker was operating at two separate sites, or where a group of distinctive pipes might be made by the same maker or in the same center. In these cases, the answer to the question "is this group of pipes made from the same clay as that group of pipes" might be meaningful. It is not possible to use the technique to identify the clay source of a pipe for which there is no way of narrowing down the possible sources since the section would need to be compared under the microscope with each of the comparative groups.

The third approach is to use chemical analysis, which is our method of choice. Various techniques of chemical analysis have been carried out on archaeological ceramics, such as Atomic Adsorption Spectroscopy and Neutron Activation Analysis. In several fields of study, there is a large body of analyses which make the continued use of a specific technique sensible. However, for clay pipes and other pipeclay artifacts, there is no such database, which means that we chose a method based on price and suitability rather than the need to ensure compatibility with earlier work. We therefore use Inductively-Coupled Plasma Spectroscopy (specifically, ICP-AES) which, although destructive, uses small samples and measures major elements, such as Aluminum, Potassium and Sodium, and minor elements, such as Barium, Chromium and the Rare Earth elements.

To date, we have analyzed 59 pipeclay artifacts, mostly clay pipes and a small number of wig curlers, made by the Pipe Aston pipemakers (Peacey and Vince, 2003). These samples were mainly obtained from groups of pipe making waste from sites in the Severn Valley and Welsh Borderland (Gloucester, Broseley, Pipe Aston), together with samples of coal measure pipeclays from outcrops at Ironbridge Gorge (close to Broseley) and Hopton Bank (between Caynham and Cleobury Mortimer). Three separate outcrops at Hopton Bank, between a quarter and half mile apart, were sampled. Tertiary ball clay from Peter's Marland in North Devon was also sampled. As an indication of the similarity in composition of pipeclays worldwide, two samples of clay pipes from a kiln in Maryland (USA) were analyzed together with one sample of pipeclay from the same area, which was thought to be the raw material used for making these pipes.

Table 2-1 shows the mean and standard deviation of the measured major elements, expressed as percent oxides. Silica, which was not measured, probably accounts for the majority of the sample. Subtracting the total measured oxides from 100% suggests that silica accounts for between 58% and 80% of the samples by weight.

Table 2-1. Mean and standard deviations for major elements measured in pipeclay samples from the Severn Valley and Welsh Borderland.

Element	Mean	Standard Deviation
Al_2O_3	25.76	4.558823373
Fe_2O_3	2.09	1.513243852
K_2O	1.39	0.751260464
TiO_2	1.22	0.163886177
MgO	0.52	0.28241724
CaO	0.20	0.110270376
Na_2O	0.17	0.077027825
P_2O_5	0.07	0.097411561
MnO	0.02	0.012949572

The mean and standard deviation of the estimated silica content (Table 2-2) suggests that the Devon Ball Clay from Peter's Marland has a higher silica content than any of the sampled pipes or coal measure clay samples. However, until we have more data for the Devon Ball Clay, and preferably from other sources of pipeclay as well, we cannot say for certain that none of our pipes were made from this clay.

Table 2-2. Estimated silica content in pipeclay samples from the Severn Valley and Welsh Borderland.

Site	N	Mean	Standard Deviation
PA00/1	6	60.35	1.917527053
Ironbridge Gorge	1	63.05	----
BR00	6	64.10	1.748310613
Easthorpe Wood	1	64.41	----
Broseley 7583	2	66.35	0.270821897
PA02/1	6	67.26	1.614633085
28/79	6	68.23	2.897298167
PA95/2	23	70.03	2.08808036
Hopton Bank 1	1	73.79	----
Hopton Bank 6	1	74.44	----
Maryland	2	75.63	0.05939697
Hopton Bank 3	1	75.84	----
Maryland S. River	1	79.52	----
Peters Marland	2	79.90	1.209152596
Entire sample	59	68.55923729	4.948602326

Multivariate analysis of the oxide data, using the factor analysis module from Winstat for Excel (Fitch, 2001), shows that there are two major factors in the dataset. Factor 1 (F1) has high weightings for Iron and Manganese while Factor 2 (F2) has high weightings for Potassium. The full list of weightings is given in Table 2-3. A plot of the F1 against F2 scores for the 59 samples shows that individual waste groups tend to have oxide compositions more similar to themselves than to other groups. Furthermore, the Ironbridge Gorge clay sample has similar scores to those of one of the groups of waste from Broseley, and all of the Broseley samples plot in the same area of the diagram, together with one of the Pipe Aston waste groups. The latter group is the earliest analyzed from Pipe Aston and visually has the abundant clay pellets which typify some coal measure clays. It seems, therefore, that the earliest pipemakers at Pipe Aston, in the mid seventeenth century, obtained their clay from Ironbridge Gorge/Broseley, a distance of about 25 miles as the crow flies.

The three clay samples from Hopton Bank, a much closer source to Pipe Aston, do not match with any of the sampled pipes, nor do the Peter's Marland or Maryland samples. However, as a side observation, both samples are not that dissimilar, a measure of how the weathering processes involved in the production of pipeclay homogenize raw materials from differing sources.

Table 2-3. Factor analysis weightings for major elements in a set of pipeclay analyses from the Severn Valley and Welsh Borderland.

Element	Factor 1	Factor 2
Al_2O_3	-0.059703779	0.206505249
CaO	0.543639077	0.025184575
Fe_2O_3	0.945668632	-0.016342298
K_2O	0.146884037	0.77955969
MgO	0.639281363	0.440353857
MnO	0.915408785	0.040159826
Na_2O	0.145216787	0.646013648
P_2O_5	0.11452253	-0.031132997
TiO_2	-0.078914736	0.553789068

As Figure 2-3 shows, F1 is poor at discriminating between different pipe groups and indicates that some samples have much higher Iron and Manganese samples than others from the same group. This is probably due to both the inclusion of Iron/Manganese-rich fragments in the clay and the contamination of the samples after burial by groundwater, often indicated in the field by a visible brown to black staining. However, F2 is much more effective in distinguishing groups and this probably reflects variations in the frequency of micas and feldspars. Those groups with higher F2 scores tend to be those with a less silty texture and a low estimated silica content. Yet, as Figure 2-4 shows, the differences in F2 scores are not simply due to fluctuations in estimated silica content. The Gloucester samples, for example, have a similar estimated silica content to those from Roy's Orchard, Pipe Aston (PA95/2) but have much higher F2 scores.

Figure 2-5 shows the results of factor analysis of the minor element data, where three major factors were found. Individual groups can be distinguished in this diagram, particularly the Gloucester samples. However, there is even less sign of any underlying patterning which might reflect differences in composition by source. For example, the Maryland samples plot in the same part of the diagram as the Pipe Aston and Broseley pieces. The third factor distinguishes the Ironbridge Gorge, Broseley and mid-seventeenth-century Pipe Aston samples from the remainder, mainly through a high Scandium weighting. This is therefore a reflection of the lower estimated silica content of these pipes, as Scandium is concentrated in clay minerals.

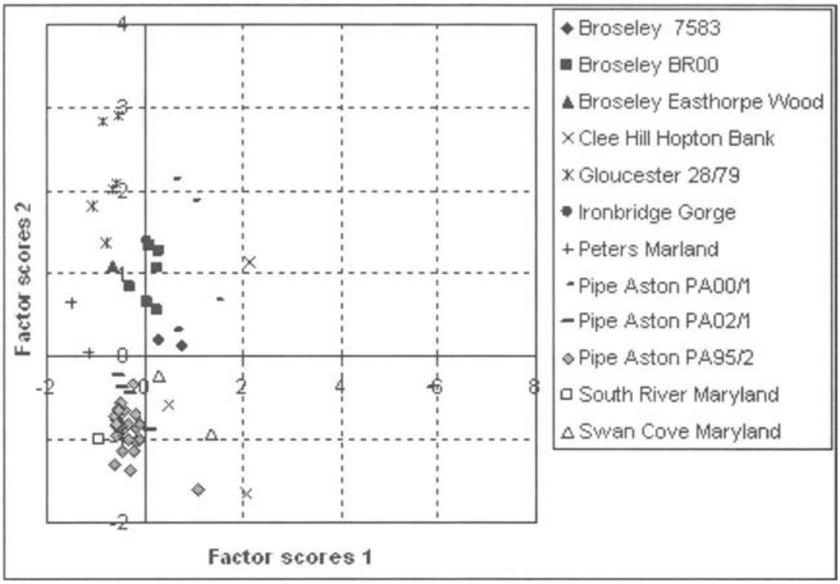

Figure 2-3. A plot of Factor 1 against Factor 2 scores in a set of pipeclay analyses from the Severn Valley and Welsh Borderland (major elements).

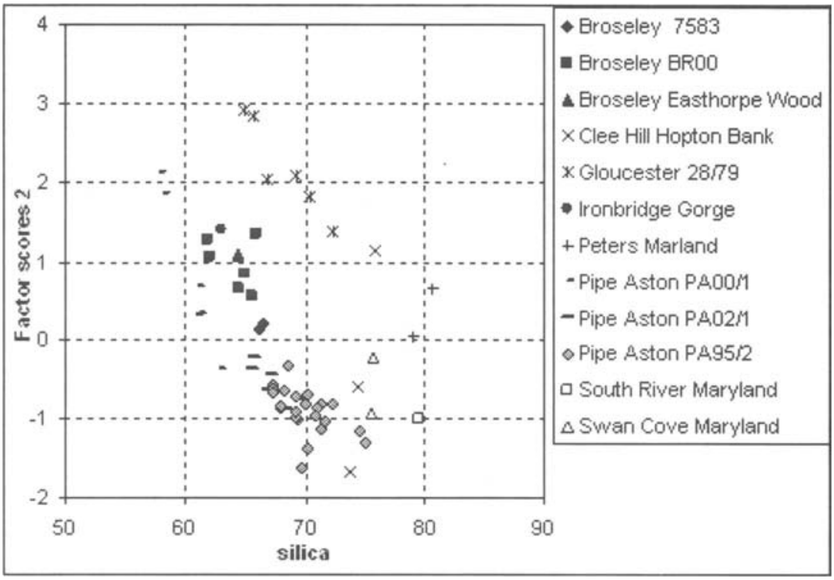

Figure 2-4. A plot of estimated silica content against Factor 2 scores in a set of pipeclay analyses from the Severn Valley and Welsh Borderland.

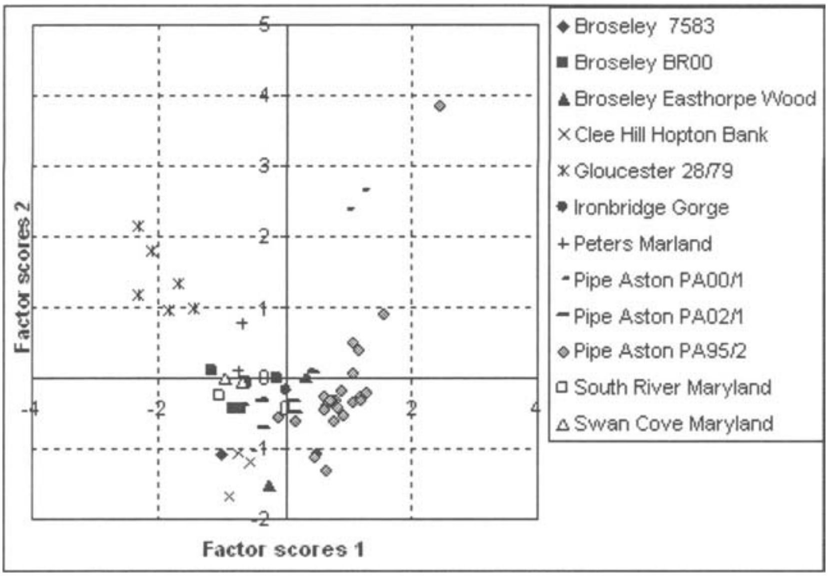

Figure 2-5. A plot of Factor 1 against Factor 2 scores in a set of pipeclay analyses from the Severn Valley and Welsh Borderland (minor elements).

As a tool to characterize pipeclays, chemical analysis (or at least this particular technique) suffers from the same problem as the others – the process of pipeclay formation leads to the removal of distinguishing features present in the original sediments which were themselves determined by the source of the mineral component of the clay. This is shown most clearly by the fact that the Maryland pipes and clay sample are not dramatically distinguished from the English samples. Even elements, such as Titanium and Zirconium, which occur in resistant minerals and which therefore survived this pedogenesis best, fail to differ markedly in their frequency in these pipeclay samples.

However, the failure to find marked differences in the composition of pipeclays of different geological age or from outcrops in different parts of the world, does not mean that chemical composition contains no interesting patterning. Because of the homogeneity of pipeclays, the pipes made in a single batch of clay tend to be similar to each other. We have used this fact to demonstrate that the unmarked wig curlers found on the Roy's Orchard Site at Pipe Aston were made from two batches of clay and that pipes with stamps of different makers tend to have different compositions. We hope to use these differences to help reconstruct the work practices employed at the Roy's Orchard Site.

The presence of waste pipes from several different makers, all apparently operating in the same short period of time at the turn of the eighteenth century, can be interpreted in several ways. For example, it may be that certain pipemakers were supplied with pipeclay but produced their pipes at home, bringing the finished pipes back to Roy's Orchard to be fired. However, the detailed analysis of pipe stamps and molds suggests that some pipemakers were working in the same workshop, or at least passing their molds between each other. By the selection and analysis of the appropriate samples, it should be possible to distinguish these two modes of production.

As proof of principle, we have taken samples of pipes from a site situated across the road from Roy's Orchard. Here, two types of pipe were found, one stamped with a rose and crown and the other unmarked. Both appear to be of similar date, but the plain pipes occur mostly in a lower layer than the stamped pipes, and have a texture that is siltier at 20x magnification. However, silt content can be affected by levigation and it might be that the same clay was being used for both types. Six samples were taken for chemical analysis and differences between the two groups were found. However, because of the difference in texture, these do not necessarily show that different clay was used and, in the factor analyses previously described, all six pipes have similar scores, showing that there is more similarity between the two pipe groups than between the pipes from this site and others.

Given the small number of samples from this excavation and the difference in date between these pipes and those from the other sampled sites at Pipe Aston, we cannot produce a single interpretation of the data. Furthermore, if we normalize the data to Aluminum, to take account of the variations in silt content, there are fewer differences between the stamped and unstamped pipes. We might therefore be dealing with a pipe workshop where a single consignment of clay was delivered to the workshop and the difference in texture was introduced by treatment on site. Or, we may be looking at a gradual shift in clay composition from a single clay pit. Or, it may be that sampling errors with such a small sample have produced random differences between the two groups and that a larger sample would show that they are chemically and texturally indistinguishable. Whichever interpretation is correct, our initial study suggests that there is sufficient variability in clay composition for these and similar questions to be posed with some hope of a clear result.

7. INTERNATIONAL COLLABORATION AND ONLINE ARCHIVING

Pipeclays and similar fine-textured, white-firing clays, were used over a wide area of Europe and, it seems at least in some parts of North America. They were used in some parts of Europe in the Roman period and the artifacts made included figurines and pots, which were transported over long distances. There are, therefore, good reasons to try to characterize these clays as a means of studying their trade and use. Furthermore, we have documentary evidence for the long-distance transport of Tertiary ball clays from southern England from the seventeenth century onwards.

Any such studies require comparative data, preferably undertaken using similar methods and calibrated using the same standards. They also require that the data are published in their raw form, not in summary and not left in gray literature in museum and laboratory archives. We have made all of our analyses available online using a map-based interface (Figure 2-6). Copies of the lab reports are also available for several of these analyses in PDF format.

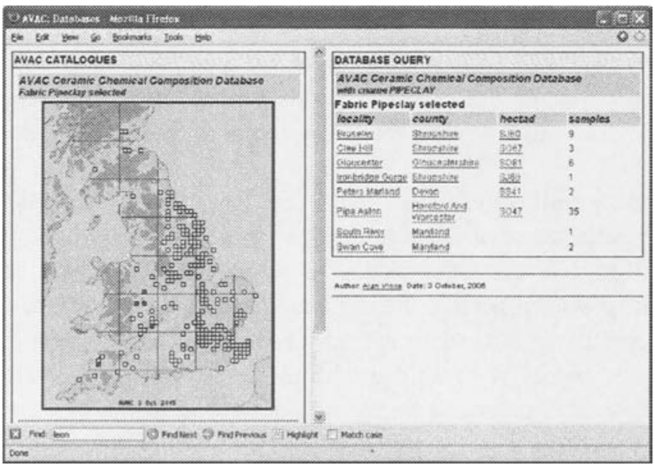

Figure 2-6. Map-based interface for online archiving of chemical analysis of pipeclay (and other ceramic) samples (http://www.avac.uklinux.net/potcat/db.php?db=potcat).

8. DISCUSSION

Our study of the pipeclays used in a small region of England in the seventeenth and eighteenth centuries suggests that it may be more difficult than one might imagine to distinguish pipes made from Devon Ball Clay from those made from locally-available coal measure clays. However, the most likely interpretation at present is that all of the pipes we have examined to date were made from coal measure clays and that the Titanium content is the distinguishing feature of the ball clay samples. We cannot as yet either prove or disprove the hypothesis that in the later seventeenth and early eighteenth centuries, pipes in our study region were made from a mixture of ball clay and local coal measure clay, but our data suggest a gradual shift in composition rather than a sudden one.

However, we have found that there are significant differences in composition between pipes made in different places and can probably conclude that mid-seventeenth-century pipes from Pipe Aston and pipes from three separate groups of waste from Broseley were made using clay from the Broseley area and are indistinguishable from our one clay sample from the area collected at Ironbridge Gorge. This is in itself a useful conclusion in that it discounts one possible reason for the emergence of the Pipe Aston industry – the availability of pipeclay locally. It is also remarkable, if true, in that it would mean that the Pipe Aston pipemakers ignored the closest known supply of white-firing clay, at Caynham, which was only seven miles to the east. Instead, they seem to have used clay which must have been transported about 28 miles, all over land and only accessible by passing within a mile of Caynham.

Our future work will include further testing of this conclusion. First, it is possible that the clay outcrop we sampled at Hopton Bank differs in composition from that at Caynham. The three Hopton Bank samples themselves are distinguishable in chemical composition and it is quite likely that the Caynham clay or other outcrops of pipeclay around Clee Hill are different and more similar to those in the Ironbridge area. The easiest way for us to test this, since no clay from Caynham is available for sampling, is to take products of pipemakers who operated at Ludlow and Cleobury Mortimer, situated to either side of the Caynham clay source and analyze them.

Furthermore, differences in texture between the earlier and later pipes from Pipe Aston suggests that levigation may have been introduced there during the late seventeenth century and this provides an explanation of the change in composition over time in Pipe Aston products. However, there is no similar change in the composition of Broseley pipes, which ranged in date from the 1640s or earlier to c.1680-1700.

All of the pipe making sites in Pipe Aston produced fragments of coal, and coal can outcrop in the same localities as pipeclay (not all seatearths actually have coal seams above them). Coal can be characterized more closely than pipeclay, since there has been considerable work on the paleobotany and mineral composition of coal outcrops. However, such characterization is expensive and has not been attempted at Pipe Aston. It is likely that the coal and pipeclay were obtained from the same source. The discovery that coal was being used for fuel, despite the wooded nature of Pipe Aston removes another possible explanation for why pipe making developed in the parish rather than, say, at Caynham. Furthermore, the local towns, which were most easily accessible from Pipe Aston and which one would imagine to be the main market for its products, have their own pipe making industries at least by end of the seventeenth century. Ludlow pipemakers are documented by 1636 and Leominster (ten miles south of Pipe Aston) had pipemakers by 1662. However, in the 1620/30 period, when the Pipe Aston industry was founded, there was no known competition nearby, Broseley and Bristol being the closest known.

Our investigations have, tentatively, shown the source of at least some of the clay used at Pipe Aston and have inadvertently raised a question: Why did pipemakers move to Pipe Aston in the first place? They did not use local clay and supplemented local wood with coal, which had to be brought to the site. Perhaps in its earliest phase, Pipe Aston makers supplied a much larger market, which was gradually eaten into until, finally, the industry died out in the 1740s. In the later eighteenth century, Herefordshire and South Shropshire were supplied from a few larger industries: Worcester, Gloucester, and Broseley, all, perhaps significantly, located on the River Severn, which was probably used to supply ball clay and distribute the finished pipes. We suggest that proximity to Ludlow was a factor in the emergence of the industry, but cannot find any advantage that Pipe Aston possessed and which other parishes in the area did not. Perhaps, then, Pipe Aston was simply chosen by chance and not for any specific advantage that the locality afforded.

Whether the circumstances of the West Midlands, with its numerous outcrops of coal measure clay and its easy access by water to Devon, will be applicable to other areas and other countries is uncertain, but it is clear that because of the circumstances of formation, pipeclays will always remain difficult to provenance using thin section and chemical analyses. One way for this study to progress would be for all laboratories engaged in the analysis of pipeclays to archive their data online.

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Chapter 3

THE INTEGRATION OF HISTORICAL CARTOGRAPHIC DATA WITHIN THE GIS ENVIRONMENT

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Abstract: The application and integration of historical cartographic data in GIS has received much recent attention. This chapter discusses the current status of the use of such data in the larger GIS environment, and presents three case studies where such data are being used in France, Central Africa, and North Carolina. A new technique for georegistration of historical maps is presented. A brief discussion of the issues involved in incorporating such data is discussed, along with some consideration of future directions.

Key words: Archaeological predictive modeling; cartography; Cassini maps; geomatics; georeference; georegistration; GIS; maps; historical cartographic data.

'Hic sunt dracones' (here be dragons)

1. QUESTIONS OF SPACE AND TIME

There is a popular myth that early English maps had the phrase '*hic sunt dracones*' (here be dragons) placed at the edges of the known world. The Lennox Globe (ca. 1503-07), in the collection of the New York Public Library, does have "HC SVNT DRACONES" located at the eastern coast of Asia, but this is the only known example. But the idea of dangers at the edge of our knowledge is universal, accurate, and relevant. This warning can be applied to the incorporation of historical cartographic data within the larger domain of geomatics and GIS as well. Most archaeologists know very little of the sources of early maps, the techniques of their construction, or even the reasons for their creation. Historical maps are vital sources of historical, cultural, and archaeological data, but the questions regarding scale, precision, accuracy, methods and reasons for creation are such that their utilization in the larger GIS context has lagged behind other data sources. There are also specific technical issues of incorporating historical map data into the GIS environment that are unique to this category of data.

The incorporation of historical cartographic data into the GIS environment for long duration environmental and cultural analysis is receiving much recent attention (Gregory, 2002; Knowles, 2002). The Knowles (2002) volume, the first dedicated to the subject, contains eleven case studies, primarily from the United States and Great Britain but also including the classical ancient world. The first chapter provides an excellent overview of the state of the art in this area (Rumsey and Williams, 2002). The Gregory (2002) work is a small but useful guide for historians in the use of GIS and incorporation of historical maps and data.

Historical GIS has been demonstrated to be a functional foundation for the analysis of a variety of regional and temporal issues (Healey and Stamp, 2000). The 1837 *Atlas to Accompany the Second Report of the Irish Railway Commissioners* contained what can be argued to be the very first useable GIS; a series of maps that were all co-registered, depicting a variety of natural resource, environmental, and demographic data (Harness, 1837). While there was no real indication of doing GIS-style overlay analysis, the atlas was clearly a decision-making aid developed to assist in the management of the railway system. It fell to Ian McHarg (1920-2001) to define the specific techniques of cartographic overlays, georeferencing, and deconstruction in his seminal *Design with Nature* (McHarg, 1969), and the rest, as they say, is history.

Historical GIS is a rapidly maturing field, and major projects are underway or have been completed for research in the ancient world (Smith et al., 2000; Elliot and Talbert, 2002), Belgium (Vanhaute, 1994), Canada (Louis, 1993), China (China Historical GIS project, 2002), England (Gregory, 1998; Galloway, 2000), France (Madry, 2005), Central Africa (Steklis et al., 2005), Ireland (Kennedy, 1999), Japan (Siebert, 2000), the Netherlands (Boonstra, 1994), and the United States (Adams et al., 2004; Madry, 2005). In the U.S., the National Historic Geographic Information System is a five-year project funded by the National Science Foundation and housed in the Minnesota Population Center at the University of Minnesota. This project will result in a comprehensive census database, at the tract and county level, for both geographical and attribute data from 1790 to 2000 (Adams et al., 2004). The breadth and diversity of these recent activities show that the incorporation of such data is possible, but there are significant challenges.

Any application of historical cartographic data in GIS must consider the characteristics of both domains, plus the added dimension of time and the nature of temporal change. All maps are conscious and unconscious compromises of purpose, generalization, scale, cartographic accuracy, state of technology at the time, vertical and horizontal datum (if any), projection, and cultural context. We must also add the current condition of these old maps in terms of damage, shrinking, or other spatial changes. Maps are made for a purpose, which is often deeply imbedded into the culture and politics of the time; and maps can be made to enhance specific interests (Pickles, 1995). This can be more or less overt, or even unconscious. The old saying that 'all maps lie, because all maps lie flat' is true and must be kept in mind when considering the incorporation of historical cartographic data into a GIS. No historical map can be considered to be the truth. While most modern GIS data started out as cartographic maps, the power of GIS analysis relies on the ability to accurately georeference all layers from whatever sources with a precision equal to the intended analytical purpose. The old GIS adage of 'garbage in-garbage out' references what questions we can, or should, ask using specific data in a GIS, and these issues play a major role in defining the potential that geomatics technologies have to provide us with insight or answers to specific research questions. It is within this gray zone of the interface between historic maps of different eras, the requirements of GIS, and the meaning of temporal change that our dragons lay.

The vast majority of phenomena in our world change with time. Clearly, the farther back in time we go, our ability to see 'through the glass darkly' is diminished. Our conundrum is that, quite often, it is precisely these older maps that provide the most interesting information for research. The farther back we can work through time the greater the potential for discovering patterns of continuity and change. But we also want to be able to move smoothly through time, even when our analysis is based on data of different scales that were created for different purposes and with different levels of cartographic technology, in order to view and understand temporal processes and their meaning for broader cultural understanding.

The current state of GIS technology is very good at managing spatial aspects; the X and Y of things. They also work very well in labeling spatial features with specific attributes, such as soil properties, land ownership, or topographic variation. It took several years, and several generations of hardware and software, to become comfortable with Z (elevation); first through vector TIN models and later with raster DEMs for the 2.5D view, and more recently using Voxels for the true third dimension (Levoy, 1988) made popular in applications such as medical imaging.

But time, the fourth dimension, has always been much more difficult to represent in GIS. The GIS environment really is all about space, and managing spatial attributes, but we are still struggling with the temporal dimension in terms of acquiring, storing, manipulating, and analyzing spatio-temporal data (Langran, 1992). There have been numerous attempts to develop a temporal data model in GIS (Nadi and Delavar, 2003) but none of these has yet broken into the mainstream. Temporal data are commonly stored as an attribute in a relational database, although other representations such as object oriented systems have also been proposed (Wachowicz, 1999). Time is often currently represented spatially as a visualization or something as simple as a moveable .gif in a PowerPoint presentation, but the potential, and the need, is for much more.

As archaeologists, we are specifically concerned with both the dimensions of space *and* time, and we require robust tools to manage and analyze these within the integrated geomatics environment. This desire for a longer perspective, and for placing the current situation and future modeling within the context of time, is much overdue in GIS. Recent improvements have made incorporation of such data more practical, but much work remains to be done at both practical and theoretical levels. This paper provides a brief introduction to the current state of incorporating historical GIS data, and will present three case studies of the potential for inclusion of historical cartographic data for GIS research in France, central Africa, and the eastern United States. There are dragons at the edges of our knowledge, but the first step in facing them is to understand their nature and our ability to confront them with our current technology.

2. CASE STUDY 1: REGIONAL ARCHAEOLOGICAL RESEARCH IN THE ARROUX VALLEY, FRANCE

The author has conducted long-term research in the Arroux Valley of Burgundy, France for over twenty years. This work has primarily been focused on the application of advanced spatial techniques for regional archaeological and cultural research (Madry and Crumley, 1990; Madry and Rakos, 1996; Madry, 2005), and has been conducted within the context of a much larger, interdisciplinary research program (Crumley and Marquardt, 1987, 1990). A significant collection of historical cartographic products have been acquired over the years in support of this project. These include original copies and reproductions of the following maps:

- 1631 Willem J. Blaeu map of Burgundy (original, black and white, scale not indicated).
- 1659 Nicolas Sanson d'Abeville map of Burgundy (original, black and white, scale not indicated).
- 1759 Cassini map of the Arroux Valley region Autun and Charolles (IGN reproductions, two maps sheets, blank and white, 1:86,400)
- 1841 and 1848 Carte d'Etat Majeur: Autun #156-1848 and Charolles # 147-1841 (IGN reproductions, two map sheets, black and white, 1:80,000)
- 1847-1854 Victor Levassuer map of Saône-et-Loire from the *Atlas National Illustré des 86 Départments et des Possessions de La France* (original, color, scale not indicated)
- 1895 Carte de la France, dressée par ordre du Ministre de L'Intérieur Feuille XX-22, Gueugnon (original, color, 1:100,000 scale)
- 1950-1990 Multiple modern Institut Géographique National (IGN) maps (color, originals, 1:100,000, 1:50,000, and 1:25,000 topographic maps)

The history of French cartography is a fascinating and well documented subject (Konvitz, 1987). Nicolas Sanson d' Abeville, royal cartographer to the King of France (*geographe ordinaire du roi*), was the founder of the French school of cartography. He created over 300 maps and a family cartographic dynasty that lasted over 100 years. He created a French world atlas between 1630 and 1670 at a scale of 1 to 1 million, as well as a variety of regional maps of France and atlases of the four known continents. The 1659 map of Burgundy listed above is an excellent example of his work and the state of cartography in the seventeenth century. It contains a wealth of detail, but is very difficult to work with in a GIS environment due to the lack of constant scale and precise mapping techniques. An attempt was made to georeference the scanned map, but the data simply are not spatially accurate enough to integrate into the GIS environment.

Under Colbert, the French Academy decided in 1668 to create a more accurate map of France, which brings us to the famed Cassini family. The Cassini family contained four generations of cartographers and scientists who revolutionized cartography in France and throughout Europe. Jean Dominique Cassini (1625-1712, known as Cassini I) was born in Italy, and was a famed astronomer and the first Director of the Paris Observatory. He discovered several smaller moons of Saturn and the gap in the rings that bear his name. He was involved in major research questions of the day, including the exact shape of the Earth to prove or disprove Newton's theory of gravity; mostly, for the French, to disprove it, and the measurement of exact

Figure 3-1. A small segment of the 1659 Sanson d' Abeville map of Burgundy, showing a section of the Arroux River flowing south into the Loire. Forest patches, roads, and towns are also depicted. Mountains and terrain are depicted as 'mole hills' seen in a perspective view, a very early form of topographic representation. The area is approximately 15 km wide. North is at the top. Map from the author's private collection.

distances between the planets and the Sun within the solar system. These required simultaneous observations from around the world, and the measurement of extremely small angles, as well as detailed measurements of the Earth itself. Cassini was involved in laying out the French portion of a new and more accurate baseline between the Paris and Greenwich observatories for simultaneous observations and celestial measurements. He began, in 1672, to investigate techniques to improve cartographic precision using techniques developed for precise measurement of minute angles for astronomical observations, and in 1679, he began creating a precise set of datum points throughout France using a combination of celestial observations and terrestrial triangulation techniques. It was the Dutch mathematician and astronomer Gemma Fresius (1508-1555) who first proposed in 1533, in his work *Libellus de locurum,* the theory of trigonometric surveying of the land.

Cassini's son, Jacques Cassini (1677-1756, Cassini II) followed in his father's footsteps as Director of the Paris Observatory, and undertook the first triangulation survey of a nation in history. This was an enormous work requiring many years of effort and the development of new techniques of surveying and triangulation. This first map was completed in 1693. The French king later remarked that Cassini cost him more land that he ever acquired by war, as the precise national survey showed France to be considerably smaller than thought, some 40 km less distance from Paris to the Atlantic Coast.

In 1747, Louis XV ordered César-François Cassini (1714-1784, Cassini III) to map the whole of France using the new triangulation method at a scale of 1 *ligne* to 100 *toise*, or 1/12 inch on the map to 100 fathoms (600 feet) on the ground, or 1:84,600. The great work was begun, but only two maps were completed upon his death in 1784. The massive project was to be completed under the direction of his son, Jacques-Dominique Cassini (1748-1845, Cassini IV) using the Borda repeating circle, the first modern theodolite capable of measuring angles with a precision required for modern cartography. The field surveys were carried out between 1756 and 1787 and the 181 maps were completed between 1756 and 1815. It was Napoleon Bonaparte who ordered the map set to be published in its entirety in 1815.

These maps are properly referred to as the 'Cartes de l'Académie,' but are universally known as the 'Cartes de Cassini.' These beautifully finished maps provided the first cartographic representation of an entire nation at a detailed scale with the precision of modern trigonometric triangulation techniques. Each map contained a detailed key, showing all the various categories of types of roads, bridges, mills, structures, and individual categories of buildings. They are a beautiful and rich source of historical information.

In 1808, Napoleon Bonaparte decided to create a new and updated set of national maps. Les Cartes d'Etat-Majeur were the next generation of French national maps, created by the French Army to update the Cassini series. The surveys were begun in 1818 and were completed in 1866 and the publication was completed in 1880 with a total of 273 maps at a scale of 1:80,000 produced. One major feature of these maps is the use of 'hachure,' or hatching, to denote topography. The use of contours to denote topography was not in general use until later, although it was first used by Pieter Buuinss in 1584. In hachure, differences in elevation were represented on the maps by lines of varying length and thickness running perpendicular to the modern elevation contours (i.e., running up and down hill). The steeper the slope, the thicker and longer the lines. One major problem with this technique is that, in steep areas, the maps are almost completely black and other details are very difficult to see.

Figure 3-2. A portion of the scanned 1759 Cassini map. This area shows the same general region as Figure 3-1, around the ancient Iron Age hillfort of Mont Dardon (at right, center). The walled medieval town of Issy L'Eveque is at upper left. A major road through the region runs east/west. Various categories of towns and structures are shown. Structures with flags are property of nobility. The very large number of artificial dams and water mills (stars at the bottom of the dams) in the area is evident. Forested areas are clearly marked. The area is approximately 10 km wide. North is at the top. Map courtesy IGN, Paris.

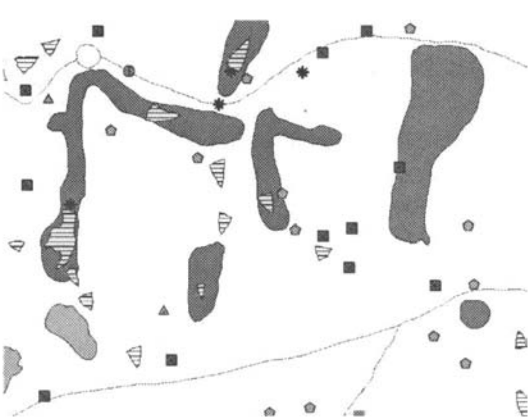

Figure 3-3. Digitized Cassini GIS data. This figure shows the same general area as the Cassini map in Figure 3-2 above. The different categories of landcover and various structure types are shown in this image. Different categories of structures area identified by individual symbols. Striped areas are artificial lakes, those with stars have grist mills. Vector hydrology was captured but is not shown here. The area is approximately 10 km wide. North is at the top.

Figure 3-4. The 1848 Etat-Majeur map of the same area shown in Figure 3-2. The increase in detail over the Cassini map is evident, as is the hachure representation of topography. The improvement in cartographic detail, precision, and spatial accuracy between the three maps is striking. The area is approximately 7 km wide. North is at the top. Map courtesy IGN, Paris.

The goal of this aspect of our study was to incorporate these historical cartographic products into our extensive, existing GIS database (Madry and Crumley, 1990). Initial attempts to georeference the pre-Cassini maps were unsuccessful. The Blaeu and Sanson d'Abeville maps were scanned and georeferenced, but the results were poor. The Cassini maps #84 (Autun) and #85 (Chalon sur Saône) were surveyed in 1757 and created in 1759. These maps provide a wonderfully detailed picture of the region before the revolution, showing the last vestige of the ancient medieval landscape. The maps also have sufficient spatial precision as to be useful in a modern GIS environment. The two maps were scanned with a high resolution scanner and georeferenced. The goal was to create a complete GIS database dating from 1757 that was consistent with the existing, larger project GIS database of the region. Mylar overlays were created of five individual categories of data: roads, hydrology, structures, mills, and landcover, with sub-categories within each.

These data were manually extracted from the maps onto mylar separates, digitized, and georeferenced into the existing UTM-projected GIS database. Permanent locations, such as city and town centers, were used for georeferencing, as these have not changed. More ephemeral data such as rivers and roads were avoided if possible. Spatial errors were recorded, and varied spatially throughout the map.

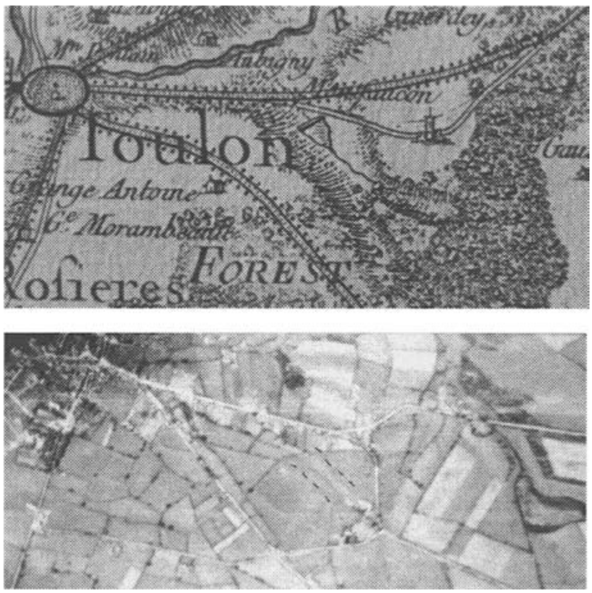

Figure 3-5. An enlargement of the 1759 Cassini map and 1944 aerial photos of Toulon-sur-Arroux, the ancient Gallo-Roman town of Telonnum. This town is listed in the Peutinger table, a fourteenth-century copy of a third-century AD Roman map. At top is the area on the Cassini map. An old road segment is clearly visible in the aerial photo at bottom and can be identified on the map as well. This segment was later located on the ground and mapped into the GIS using GPS. The area is approximately 4 km wide. North is at the top. Map courtesy IGN, Paris. Aerial photo courtesy US Air Force Archives.

The incorporation of the Cassini map data into our GIS provided an important window into the pre-revolutionary landscape. The general process of analysis included an integrated analysis of field surveys, aerial surveys, analysis of archival modern aerial photography (1944), and GIS analysis, including predictive models for the major cultural periods of interest (Iron Age, Gallo-Roman, Medieval, and the Modern era). Anomalies located on aerial photographs were compared with modern maps, the predictive models, and the historical map data. Potential features of interest were recorded on forms and used for future review and analysis in the field. The same process was conducted in the analysis of the Cassini map data. The maps were visually reviewed and segments of older roads, ruined structures (as of 1757) and other interesting features were recorded for comparison with the other data sources. Future fieldwork was guided by the results of these cross-indexed laboratory analyses, including downloading of locations of interest into GPS units for future foot and aerial survey.

Another successful example of this approach was the location and field verification of several sections of Roman roads clearly marked on the Cassini maps. Several segments are located on the maps, and we conducted an analysis of the modern maps, archival aerial photos, and our GIS database. One new segment was identified and located on archival aerial photographs and later located on the ground (Madry, 2005).

A major focus of interest has been the change in land use and land cover over time in the region. This region of Burgundy is a study in continuity and change across thousands of years of human occupation. Our long duration, interdisciplinary study of this area has brought together researchers from multiple disciplines and interests (Crumley and Marquardt, 1987). The interaction of human cultures and the environment has been a constant theme throughout our 25 years of work. The changing nature of forest cover is one measure of this interaction that can be measured using our historical and modern GIS database. Modern satellite images were acquired from 1972 (Landsat 1), 1986 (SPOT 1), and 2002 (ASTER), and these were classified into land use and land cover categories, including forest cover. Once the Cassini vegetation data was extracted, it could be compared with the modern forest cover data derived from SPOT satellite imagery in 1988 and ASTER data from 2002.

Figure 3-6 shows a comparison of these data for one area. The outline of the original size of this single, eighteenth-century forest is displayed over the current forest data. The decrease in forest cover is evident, and is consistent throughout the region. Modern small forest patches are clearly remnants of the much larger, single forest. We are currently digitizing a total of seven historical maps (1757, 1848, 1895, 1950, and 1975) and four remote sensing data sources (1944, 1972, 1986, and 2002) to create a diachronic analysis of the alteration in forest cover in the entire river valley.

A future area of research is in the pattern of water mill sites throughout the area. A quick look at the Cassini map shows a very large number of these artificial dams and mills, of which only a few are still extant. An initial field analysis was conducted using GPS, and the remains of a large number of the mill dams, races, and mills were identified. The placing of these mills on the landscape, and their relationship to agricultural land use, population centers, markets, and topography is an interesting area for future research using our multi-temporal GIS.

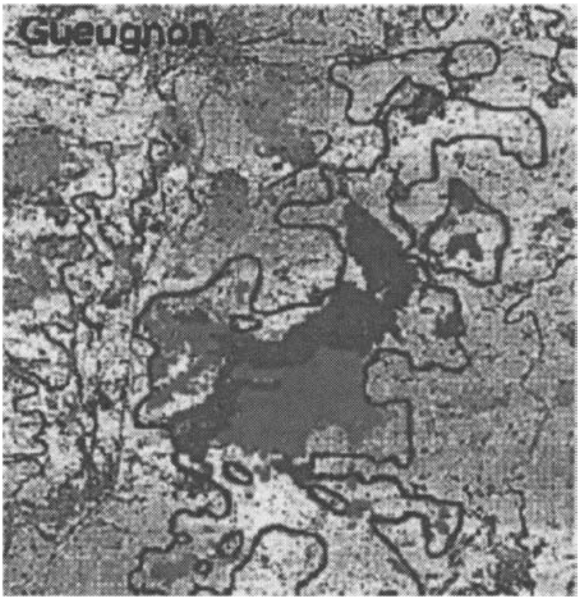

Figure 3-6. Combined image of 1759 Cassini and 1986 SPOT imagery forest cover. The dark outline shows the extent of this single, large forest patch in 1757 (when the area was surveyed for the map), the dark areas within it are the current forest areas as of 1988. The area is approximately 20 km wide. North is at the top.

Efforts are now underway to digitize the Etat Majeur maps in the same way as the Cassini maps, to create another historical timeframe of the multi-temporal GIS database. We will then move on to the other maps in our collection to continue to fill in gaps in time.

The acquisition, digitization, and integration of historical cartographic data of the region has provided new insight into the changing patterns of land use and population in the region. We have created a separate GIS sub-database from the Cassini map data that reflects the environment and settlement pattern of 1757. We are in the process of doing the same with the next set of maps from 1848, and will continue this work with early twentieth-century maps. Analysis has been conducted which, to date, has uncovered new archaeological resources and has improved our understanding of the changing nature of human interaction with the environment. When this work is completed, we will have a detailed view of the changing patterns of settlement and land use over a two hundred and fifty year period, all integrated into the same GIS environment.

3. CASE STUDY 2: HISTORICAL CARTOGRAPHIC RESEARCH FOR MOUNTAIN GORILLA HABITAT RESEARCH IN THE VIRUNGA MOUNTAINS OF AFRICA

For over ten years, an interdisciplinary team of researchers, including the author, have been conducting research on the habitat of the endangered Mountain Gorilla (*Gorilla berengei berengei*) of the Virunga Mountains of the western rift valley of Africa (Steklis et al., 1887). One aspect of this research has been in the application of advanced spatial technologies, including GPS, GIS, and remote sensing for primate ecology (Steklis et al., 2005). The Mountain Gorillas of the Virungas are one of the most highly endangered species on the planet, with only some 380 surviving. Much of our research has been dealing with emergency issues such as poaching, illicit park cultivation, refugee camps, and deforestation; but our long term focus is on the ecology of the gorillas and their habitat use. The Virunga Reserve is entirely surrounded by a densely populated region of intensive agricultural use, and the Reserve is constantly under threat of habitat encroachment, poaching, refugees, and military activity. The original reserve was significantly larger in the past, providing significant viable habitat for the gorilla population. The modern transborder reserve is in a very mountainous region, and consists of portions of the border regions of Rwanda, Uganda, and the Democratic Republic of Congo (formerly Zaire). It was designated a United Nations World Heritage Site in 1979 and in 1994 was listed as being in danger.

The inaccessibility of this remote area is compounded by the fact that the Reserve contains portions of three modern states which are often in turmoil and conflict. Civil strife, refugees, war, volcanic eruptions, and poverty have combined to create a crisis situation in the area for decades. When this research began, we simply wanted to create a single topographic and vegetation map for the Reserve, but even this simple goal has proved to be extremely difficult. Modern maps and aerial photos of DR Congo are forbidden, and the colonial-era maps of Rwanda (made by the French) and Uganda (made by the British) are over forty years old, use different map datums, and features simply do not align. It was for this reason that I first began researching available historical cartographic maps of the region. I was able to locate a 1:100,000 topographic map at the Belgian Royal Museum for Central Africa that was created by the Belgian Colonial Service in 1938 (Figure 3-7).

Figure 3-7. A section of the 1938 Belgian Colonial Service map of the Virunga Volcano region of Central Africa. The international border is shown by a dotted line. Contours, place names, roads, and hydrology are also shown. The area is approximately 20 km wide. North is at the top. Map courtesy of the Royal Museum for Central Africa, Tervuren, Belgium.

This map covered the entire region and served as the base map for much of the GIS database and research on this project. The elevation contours and other features, such as roads, hydrology, and settlements, were manually digitized and a digital elevation model (DEM) was created. Gorilla movements tracked by GPS are analyzed to monitor patterns of habitat use, along with data collected by anti-poaching patrols in the park. This 1938 map was the most recent map of the Virunga Reserve transborder area until 2005, when a new 1:50,000 map was created through a joint activity by the European Space Agency and UNESCO. This new map was produced specifically to support Mountain Gorilla research in the area (ESA, 2005).

One aspect of this research has been to use historical maps and records to trace the origins of the Reserve and to track the changes in the Park boundaries over time. The Virunga Gorilla Reserve is Africa's first national park, established on April 21, 1925 as the Prince Albert National Park of the Belgian Congo. It was created to protect the (even then) highly endangered gorilla population. Carl Akeley, the American naturalist, explorer, and sculptor, requested, after a visit to the area, that the Belgian King Leopold create a protected reserve for the Mountain Gorilla population. In 1927 and again in 1929, the Park was extended, but the Park has significantly decreased in size since then. In 1957, some 10 square km in Rwanda were given to farmers, and an additional 98 square km were later turned over to an agricultural program to grow pyrethrum, a natural herbicide. Encroachment continues, with a recent attempt to put a portion of the DRC section in agriculture in 2005, destroying over 15 square km of natural vegetation within the park.

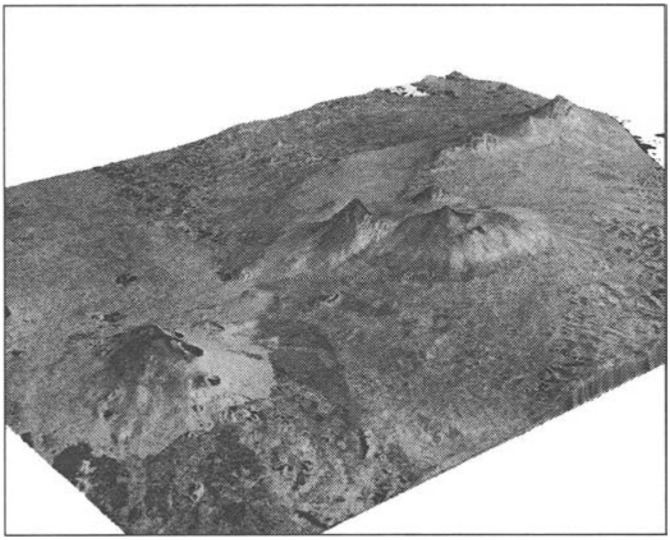

Figure 3-8. Virunga Volcano region shown in three dimensions using 1939 elevation data, looking southwest. The area is approximately 35 km wide. North is at the top.

The Mountain Gorilla was only 'discovered' by western science on October 17, 1902 by German Army Captain Robert von Beringe, who was surveying the Virunga Mountain region of the western rift valley, which was a contested border area between colonial powers Germany, Great Britain, and Belgium. Because the area was contested by these nations, there were multiple early surveys conducted as part of the border negotiations. These provide a surprisingly rich source of historical cartographic data for such a remote and inaccessible area.

A small project was begun in 2003 to study the origins of the Park, and to track the changes in Park borders, vegetation, and human settlement over time. Inquiries were made to the British Museum and British National Archives, the Belgian Royal Museum for Central Africa, the U.S. Library of Congress, and others. Visits were made to London and Tervuren, Belgium in 2003 and 2004 to view the archives, and a total of 36 maps, dating from 1899 to 1942, were identified as relevant (14 British and German, and 21

Belgian). The British collection included a variety of German maps in addition to maps from the British Colonial Office, Foreign Office, and British Army. One additional German map, the original map created by von Beringe in 1899-1900, was also located through his family. These historical maps, and a variety of supporting documents, papers, and notes, provide a fascinating glimpse at the "Great Game" of European colonialism in Africa, including handwritten notes, signatures, and penciled-in boundary lines. These maps show the location of villages, vegetation communities, crops planted, and other detailed features in the Park region as early as 1899, providing an excellent view into the pre-modern gorilla habitat and the density of human population at the turn of the century.

These maps were scanned, georeferenced, and the Park boundaries were digitized into the ArcGIS environment for inclusion in the larger project database. Figure 3-9 shows the 1929 Park boundary, with 561 square km in five new individual sections added since 1925. Most of this consists of lower lying areas around the central original Park. This created a park containing just over 107 square km.

Our GIS analysis shows this 1929 configuration was two and a half times the size of the current Reserve. The current Reserve contains a total of only 42.5 square km, with 12.5 square km in Rwanda, 2.9 square km in Uganda and 27 square km in DRC. Large areas of prime Mountain Gorilla habitat have been given over to agriculture and human use over time, leaving the much higher, steeper, colder and wetter areas for the modern gorilla reserve. The gorillas have been forced up into the colder and higher slopes of the mountains, and this has had a significant impact on the health and welfare of the gorilla population.

This analysis has put the current Park into its proper historical perspective, and has provided important insights into the quality and quantity of the gorilla habitat that was originally set aside. It is clear that the current Reserve is less than half the size of the 1929 Reserve, and that only the most mountainous and steep terrain remains. There has been significant vegetation change within the Park as well, with large areas of bamboo forest (a prized seasonal gorilla food) being replaced by haigania and mixed forest zones. One aspect of this work has been to identify historical portions of the Park with a view towards, in the future, reacquiring sectors when it becomes politically feasible to do so.

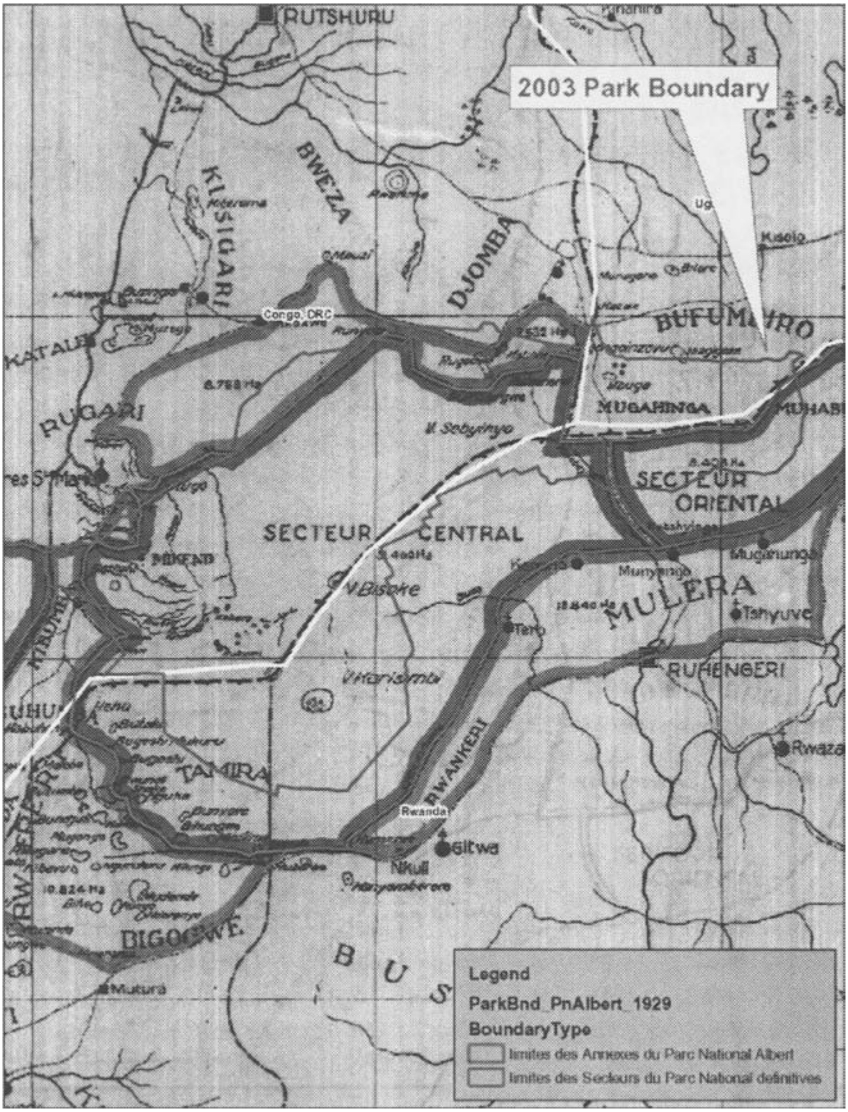

Figure 3-9. Parc National Albert Kivu-Ruanda delimitation 1929, produced by the Belgian Colonial Service, scale 1:200,000, north is at the top. The enlarged 1929 Park boundary is shown, with all of the individual sections that were added. The modern Park boundary is shown in white. This original Park was over twice the size of the current Reserve. Map courtesy of the Royal Museum for Central Africa, Tervuren, Belgium.

4. CASE STUDY 3: INCORPORATION OF HISTORICAL CARTOGRAPHIC DATA IN A STATE-WIDE ARCHAEOLOGICAL PREDICTIVE MODEL AND DECISION SUPPORT SYSTEM (DSS) FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)

From 2001 through 2005, the NCDOT contracted with Environmental Services, Inc. (ESI) to develop a series of GIS-based archaeological predictive models for the entire state of North Carolina, and to create an internet-based Decision Support System (DSS) for NCDOT use in planning new highway alignments in the state (Madry et al., 2005). This project, for which the author has acted as Principal Investigator, is funded by the Federal Highway Safety Administration and is an outgrowth of the successful MnModel Project in Minnesota (Hudak et al., 2002). MnModel was the first operational state-wide GIS archaeological predictive model developed for a Department of Transportation. It was developed to improve the consideration of cultural resources in the transportation planning process. This project cost over $5 million over 5 years, but savings over the last four years have been documented at $3 million per year since the model has been used in planning new projects. The total cost of the project was recouped in only two years (Hudak et al., 2002).

The MnModel Project, as are most archaeological predictive modeling projects, was explicitly focused on prehistoric site locations, and did not include any data after 1837. Our project sought to include historic site data, as highway planning activities impact all cultural resources, including historical resources. We proposed to create a separate historical site predictive model, but this was dropped due to funding constraints. A limited but still useful plan was adopted, which included the scanning, georeferencing, and feature extraction of a large number of historical maps of the state, and incorporation of these data into the DSS environment. The various maps could then be viewed along with the prehistoric predictive models and other GIS data for use in the planning process.

As a part of this work, we have converted North Carolina Office of the State Archaeologist (OSA) data for over 26,000 archaeological sites into a single Microsoft Access database. Of these, over 6,500 historical sites are included, with over 3,000 containing both historic and prehistoric components.

We conducted a search of historical map holdings, and received permission to scan original historic maps held by the North Carolina Department of Archives and History and other sources. These maps were scanned using a large format, high-resolution color scanner at the OSA office in Raleigh in November of 2002. A total of 421 maps were scanned, consisting of 553 individual scans (several maps had multiple panels). These included out-of-date USGS 15-minute maps, 1800s vintage county soil maps, a variety of county- and state-wide maps dating back to the 1700s, and a set of county soil maps ranging in dates from 1878 to 1920 that provided significant detail.

We developed an end-to-end standardized procedure to scan, georeference, and extract cultural and environmental features from these historical maps into the GIS environment. The maps were scanned in color at a resolution of 200 DPI. This is less than the maximum resolution of the scanner, but a test was conducted to determine the required resolution for this project, in order to balance the need for visual detail and file size. The resolution was sufficient for our needs, and significantly reduced the file size and data processing requirements on the project. File size is an important factor, as a major aspect of the project is the development of an ArcIMS web-based user interface, sending map data over the internet. A total of 26 potentially useful county maps, ranging in dates from 1875 to 1938, and 18 potentially useful statewide maps, ranging from 1773 to 1862, were selected for further geoprocessing.

As stated in the literature, and through personal experience on other projects, a first order rectification process is seldom adequate for historical maps (Dangermond, 1990; Fisher, 1991; Heuvelink, 1999). While there has been some attention to addressing this problem through advanced techniques such as fuzzy logic and probability theory (Plewe, 2003), there are no practical solutions readily available. We attempted a first order georeferencing process, but as expected, this process was not successful, and accuracy varied significantly by map and by areas within individual maps. The overall spatial errors generated were not compatible with the scale of analysis required by NCDOT for their planning purposes, so we determined that an improved process was required for this project.

A new technique was developed that permitted accurate georeferencing of the maps and extraction of cultural features into the GIS environment with a spatial error consistent with the scale of analysis required by the NCDOT. This utilized a manual transcription process using semi-transparent modern USGS quad maps and a light table. The county soil maps, dating from 1870 to 1920, were processed first, as the general order of work was to move from the most recent and detailed scale maps to the oldest. The original scans of the soil maps were first reproduced as color hardcopy at a scale of 1:24,000. A small portion of a map (each map measured many meters on a side at this enlarged scale) was placed on a light table and a black and white mylar transparency of a modern USGS 1:24,000 quad map was placed over the light table. This is a form of manual registration and tracing, where the transcriber aligned the modern quad map with a small section of the soil map. This was done by identifying multiple common points that were permanent features in both maps. Railroad lines and downtown street grids were commonly used, with the assumption that these locations have not changed over time. An effort was made not to force features, especially modern roads, but it was often obvious when a modern road segment, structure, or bridge was a segment of the same, historical feature. Our working assumption was that the road and settlement patterns of the early twentieth century were a recognizable artifact of the earlier systems, and that we could use these soil maps as the bridge to extraction and georectification of older maps.

All features were transferred in various colors onto the black and white modern mylar quad maps. A notebook was used to document the process. Each quad was done in turn until all seven counties, representing a total of 114 quad maps, were completed.

After quality review, the mylars were scanned and features were georeferenced and digitized into the ArcGIS environment. RMS results varied from less than two meters to, in a few cases, ten meters. Each individual feature was then digitized and labeled according to the standardized key. Once all of the soil maps were processed, we proceeded back to the older maps using the same process.

A product of this work was a comprehensive 30-page procedural manual that details the entire procedure, including multiple tracking forms, decision trees, and quality control processes (Madry et al., 2004). This manual was developed in order to provide NCDOT with a detailed document of how the process was structured if, in the future, they are able to extend the current work to other parts of the state. This process significantly reduced the potential of error propagation into the GIS environment, a serious problem in working with historical cartographic data in GIS (Heuvelink, 1998). All work was thoroughly documented, including the creation of appropriate ArcGIS metadata.

Figure 3-10 shows digitized and georeferenced road and structure features from the 1833 MacRae-Brazier map (top left), 1878 Wake County Map (top right), 1914 Wake County soils Map (bottom left), and Lake Wheeler 1:25,000 USGS (1993) with 1914 features displayed (bottom right).

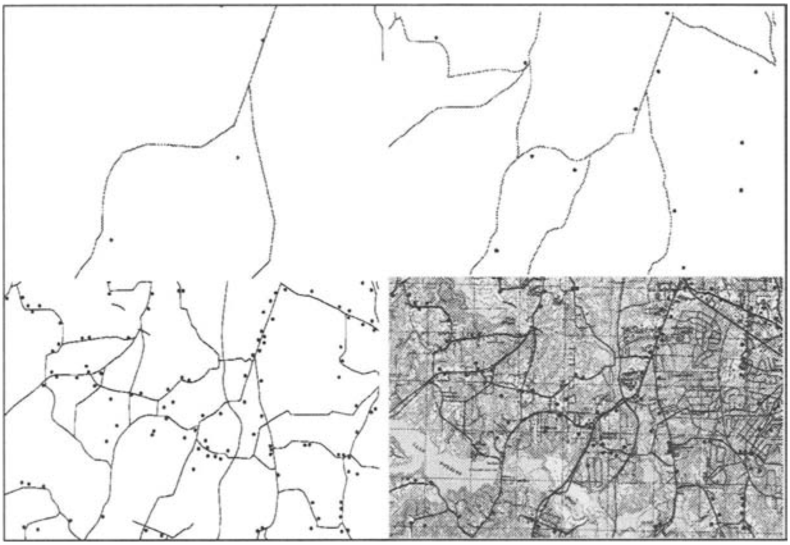

Figure 3-10. Results of the process of digitizing historic maps in North Carolina. Four different maps of the same area showing historical roads and structures are shown. All maps are georeferenced. The area is approximately 10 km wide. North is at the top.

A total of 421 original North Carolina historical maps were scanned. Seven county maps dating from 1910 to 1933 and several county maps dating from 1878 and 1880 were georeferenced using a new, manual transcription method that significantly reduced the total spatial error of the data (between two and ten meters RMS). Historical features were extracted into the GIS environment. Two statewide maps were subjected to the same process, also with acceptable results. The new method provided improved spatial referencing, and was conducted in a reasonably time-efficient manner. This method can be adapted for virtually any similar project and is an improvement over the simple georegistration commonly used.

The georeferenced historical raster maps and extracted GIS data are being incorporated into a much larger, enterprise GIS database containing over 300 environmental and cultural layers, including Digital Raster Graphics (DRG) of the state's master archaeological site maps, digital orthophotos (DOQ), elevation, slope, aspect, hydrology, various NCDOT highway data, and others. The database also includes all known prehistoric and historic archaeological sites recorded by the OSA and all previously surveyed areas in the state. This will be used by the NCDOT for front-loading cultural resource preservation in future highway alignment planning and analysis work.

These data are also being entered into a Decision Support System (DSS) based on the ArcIMS Internet Map Server system. This will make the data available (with password protection) to NCDOT and OSA users using only a personal computer with high speed internet access and a web browser. Specific analysis and printing functions were developed for this system. The much larger archive of 421 scanned historical maps is also available in the ArcIMS environment as non-georeferenced .jpgs for review and analysis, but outside the georeferenced ArcIMS GIS environment. Having the entire cartographic history of the state scanned should open up new dimensions in education and research in a variety of contexts beyond the scope of this project.

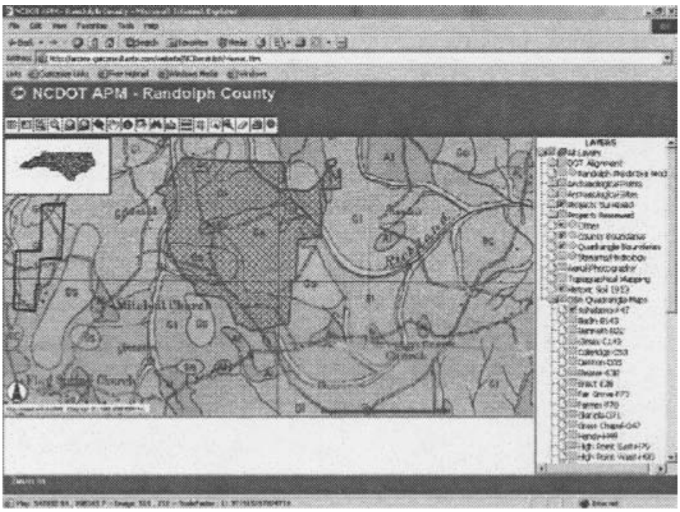

Figure 3-11. ArcIMS Internet Map Server screen of a scanned and georectified 1913 soils map, archaeological sites, and a previously surveyed area (cross hatched area at center).

Figure 3-11 shows an example of the ArcIMS Internet Map Server screen. Available layers are shown at right, and available tools at top. These tools include printing, creating buffer zones, area measurement, and determining the number of sites in a given area. Historical map data, archaeological sites, surveyed areas, and other GIS data are available for viewing, analysis, and printing over the internet (with appropriate password) using only a java equipped web browser and high speed internet connection.

5. CONCLUSION

These three projects demonstrate some of the potential of incorporating historical cartographic data into the GIS environment, and show some of the potential diversity of applications. The recent publications focusing on this topic also serve as guideposts to successful work (Knowles, 2002); but, as always, we see only the successful projects and, even in those, we rarely hear about the difficulties, problems, false starts, and failures. How useful a journal of failed GIS projects would be! Buckminster Fuller used to start his lectures with a statement that the only reason he was on that side of the lectern was because he had failed so many more times than his students. Failure was a valuable learning experience to him, and it should be for all of us; but we rarely learn by failure in GIS, except perhaps quietly behind closed doors.

Several factors influence the current and future utility of using historical data in a GIS context. The primary issues are access to original maps and quality scanning systems, precise georeferencing techniques, a thorough understanding of the cartographic techniques used by the cartographers, the cultural, political, and technological context within which the maps were conceived and produced, and the data formats, analysis, and visualization functions currently available in GIS. All of these should be driven by the analytic requirements of the specific research or management needs. One must manipulate these data with care, and always be aware of potential problems in GIS, such as using data of different scales, error propagation, spatial autocorrelation, the ecological fallacy problem (King, 1997), and the modifiable areal unit problem (Gregory, 2002:50), among others. We must be even more careful with the questions we ask of our GIS and the conclusions that we draw from our analysis. The new georeferencing technique developed for the NCDOT project is an improvement over traditional methods, and can be incorporated into other projects to significantly reduce the spatial error in data extracted from historical maps.

The relational database format currently used in GIS is relatively inarticulate in handling spatio-temporal data, and there needs to be continued research into more flexible and appropriate data structures for temporal data. We need continued interaction with developments in the computer science world that can improve our ability to manage temporal data. There is no doubt that spatio-temporal data will become more commonly incorporated into the GIS environment, but it is unclear what directions these developments will take. Issues of measurement and analysis of temporal change, temporal modeling, temporal graphical display, and new temporal data structures will become more intimately integrated with other GIS data over time. Major software vendors need to consider these issues as well, and they need to incorporate improved capabilities for working with temporal data.

The role of the Internet and web browsers cannot be understated. The David Rumsey Map Collection's online capacity for browsing, viewing maps, viewing georeferenced maps in a GIS context, and even viewing maps in 3-D overlaid over a DEM is a taste of things soon to come (Rumsey, 2003), as is the GIS and web-based Decision Support System developed for the NCDOT that incorporates georeferenced historical map data. The new volume by Rumsey and Punt (Rumsey and Punt, 2005) is an outgrowth of the massive David Rumsey Map Collection. The book is a study in American history through the developments of cartographic techniques, and includes a wide range of historical maps of different periods. It includes an interesting chronological image bibliography that gives a reference number for each map reproduced in the book. This connects with its location in the online collection, an interesting hybrid link between traditional publishing and an online accessible catalogue.

I can foresee a time when virtually all of the world's cartographic history will be available to researchers in easily searchable, georeferenced, and electronic format over the web, perhaps in a much improved application like the popular Google Earth that was launched in June 2005. Ancillary data, such as historical census data, will become readily available as well, and be directly linked to appropriate cartographic products. It is not too ambitious to expect that, in the not too distant future, historical digital maps will be searched for and accessed over the web, integrated with remote spatial tools from multiple archives around the world, then downloaded to a mobile GPS/GIS analysis and visualization devices in the field in near real time. It is very likely that we will see these developments in our working lives. What lies beyond this limited view will certainly be amazing.

Dragons in the misty distance there will always be, but the GIS dragons of the future will be very different from ours, and they will be unfamiliar to our generation. These new dragons will be for our students, and their students, to struggle with while they smirk at our quaint but earnest efforts. Perhaps they will see us in the same way that we look back at the early great cartographers like the Cassinis, with mixed feelings of intellectual admiration and technological superiority. Time will tell.

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Chapter 4

SALOONS IN THE WILD WEST AND TAVERNS IN MESOPOTAMIA

Explorations along the timeline of public drinking

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Abstract: Two serendipitous occurrences occurred during a comparative study among the archaeological ruins of a handful of diverse, nineteenth-century boomtown saloons in northern Nevada's Virginia City. The first involved an experiment to retrieve DNA from a tobacco pipestem recovered from one of these establishments; the pipestem is associated with late nineteenth-century stratigraphic deposits from an African American saloon. The DNA profile indicates that a woman used the pipe, evoking questions about gender roles in Virginia City's saloons. The second incident involved an examination of an image from a Near Eastern cylinder seal from the third millennium BC. The image depicted men and women taking part in communal drinking and presents some of the earliest recorded forms of drinking in ancient Mesopotamia. Other, second millennium BC documentation from that region describe laws associated with women and drinking houses in urban centers such as Babylon. This influenced interpretations about the various levels of interaction between men and women in public drinking over the course of literate history. These events – one based on scientific methods and the other based on a text-aided approach to archaeology – induced a gender-based research agenda that complements studies of the antiquity of public drinking houses. This paper describes that agenda, presents case studies that represent different points on the timeline of public drinking, and advocates an archaeological approach that fuses scientific and humanistic research methods.

Key words: African American archaeology; cylinder seals; DNA; gender; historical archaeology; Laws of Hammurabi; public drinking; saloons; taverns; text-aided archaeology; Virginia City.

1. INTRODUCTION

Archaeological investigations of nineteenth-century saloons in Virginia City, Nevada provide a fresh view of those icons of the "wild" West. While an inherent part of the history and folklore of that region, the saloon did not originate in the American West. Rather, saloons had precursors that date from ancient "Old World" settings, a fact that encouraged studies about public drinking over a longer span of time and over a wider geographical range than the American West. A consideration of such a broad historical context required an examination of the temporal bounds of historical archaeology.

A number of studies encourage that in certain circumstances, those bounds can be extended beyond the past five hundred years, implying that any post-prehistoric topic is fair game for historical archaeology (e.g., Mrozowski, 1988; Knapp, 1992; Andrén, 1997; Funari et al., 1999; Hardesty, 2001; Orser, 2004). Such treatments suggest that historical archaeology can be linked with any period associated with literate history, whether that history involves nineteenth-century census records or the second millennium BC Babylonian Laws of Hammurabi. Historical archaeology can subsequently be characterized as an international phenomenon that is not necessarily limited to the age of European colonialism. Rather, it is "one of many possible historical archaeologies, including classical and medieval archaeology," with "much to be gained from a reunification of these fields within the broader discipline of archaeology" (Funari et al., 1999:i,7). Despite the existence of such flexible definitions, perusals of published and gray literature indicate that an abundance of historical archaeologists focus their research within the post-Columbian world. Such investigations utilize a rich collection of documentary records that allow archaeological examinations of humanistic topics often difficult to extract from mere physical remains, a phenomenon that has encouraged vivid presentations about specific events (e.g., Shackel, 1996; Hardesty, 1997; Mullins, 1999; Fliess, 2000; Lawrence, 2000; Praetzellis and Praetzellis, 2001; Layton, 2002; Lewis, 2006). While these and other similar projects aim to link explicit events with broad interpretations of human behavior, discussions among principal scholars imply that historical archaeologists need to produce more research reflective of their anthropological roots by linking local, event-centered studies with broad statements about patterns of human behavior (e.g., Cleland, 2001). In other words, historical archaeologists need to recall their social scientific roots and the bigger picture of anthropology, while reaping the historical record's specific chronological and cultural details about their subjects.

As a remedy to this situation, Hardesty (2001:24) recommends that we should develop closer working relationships with other text-aided fields in archaeology, such as Assyriology and Egyptology, due to our shared "methodological strengths" of complementary data sources. This would encourage long-term examinations of historical topics and foster studies that delve into shared traits among complex societies. For example, Mrozowski (1988) challenged historical archaeologists to address major research issues, such as environmental history and world urbanization, with the latter representing a trait that complex societies have shared over a broad temporal range. Mrozowski (1988:18) noted how historical archaeologists, with their consistent experiences in historical, urban settings, could "breathe life" into the makeup of urban places like the ancient Near East and Mesoamerica. Indeed, it is Eurocentric to examine topics associated with complex societies without acknowledging their place on the human timeline. Additionally, it is possible for historical archaeologists to incorporate any form of documentary data into their research, whether that data is hundreds or thousands of years old.

The idea of studying "similar historical situations" across complex societies over vast periods of time may seem problematic because of the potential for such narratives to homogenize "past societies in their grand unifying visions" (Praetzellis and Praetzellis, 2001:652; see also Hodder, 1985:3-4). Heeding such caution, there are clearly many gaps between saloons of the American West and the earliest recorded drinking establishments, such as taverns in the ancient Near East (Roth, 1997). Even so, this chapter merely sets out to present a starting point for a research agenda dedicated to placing saloons and public drinking in as broad a temporal context as possible. Gosden (2004) has done this with the subject of colonialism, examining it as a phenomenon of the past five thousand years in response to the more traditional, Eurocentric treatments of colonialism. After examining nineteenth-century saloons in the western boomtown of Virginia City, Nevada, it became apparent that the story of those establishments could be supplemented by examining public drinking in a broad, global context. This undertaking merely intends to suggest possibilities for research directions in historical archaeology, and is not necessarily advocating rigid approaches to analysis.

2. PUBLIC DRINKING: DISCUSSIONS FROM THE RECENT AND THE ANCIENT PAST

Founded in 1859, northern Nevada's Comstock Mining District yielded millions of dollars in gold and silver. Within two years of the initial discovery, the community's success rapidly transformed a camp of dispersed tents into a booming city. Virginia City was the heart of the Comstock Mining District (e.g., James, 1998). Brimming with fortune and excitement, Virginia City's urban landscape bustled with an assortment of businesses. Saloons tended to outnumber all other retail establishments in mining boomtowns, with an estimated 100 drinking houses operating in and around Virginia City during the 1870s (Lord, 1883; Dixon, 2005). Well-established cities, like Virginia City, supported saloons that provided various services, such as billiards, cigars, dancing, female entertainment, dog fights, and coffee, among others (Virginia City *Territorial Enterprise*, August 7, 1966, January 1, February 7, and April 7, 1867 and September 19, 1877; *Virginia Evening Chronicle*, November 1872; *Daily Stage*, September-October 1880). This diversity was the result of shrewd business people filling niches in such a saturated industry, creating a range of what might loosely be considered class-based distinctions among these establishments: "saloons of all descriptions, from the spacious rooms furnished with walnut counters, massive mirrors, and glittering rows of decanters, to the cheap pine bar with its few black bottles, were to be found on every street land and corner" (Lord, 1883:93). Virginia City had ample clientele to support the classier establishments, as well as the more sordid places (Hardesty and James, 1995). Many of these upscale drinking establishments also offered "secluded" rooms for the town elites so that these "gentlemen ... might relax with their own kind ... free from the noise and confusion of the streets ... and the unwashed masses" (West, 1979:40-41). Other niches included various types of female companionship, from dancing partners to more intimate forms of leisure (West, 1979).

In addition to providing an array of entertainment forms, these places also catered to and were segregated according to ancestral and cultural backgrounds. Among a handful of nineteenth-century Virginia City saloons excavated by archaeologists, the Boston Saloon was an African American establishment that operated between the 1860s and 1870s (Dixon, 2002). This is the only known excavation of an African American saloon from the American West's historical period (Figure 4-1). Contemporary sources described the Boston Saloon as "the popular resort of many of the colored population," and African American writers lamented the loss of "a place of recreation of our own" in Virginia City after the Boston Saloon closed

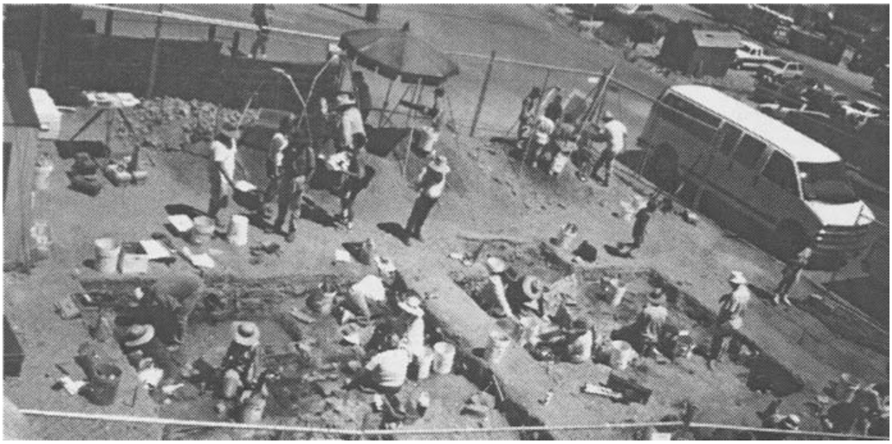

Figure 4-1. Overview of excavations at the Boston Saloon, Virginia City, Nevada, 2000.

(*Territorial Enterprise*, August 7, 1866; *Pacific Appeal*, October 26, 1875; Rusco, 1975:56). The archaeological remains of the Boston Saloon were compared with three other contemporaneous Virginia City saloons, including a German-owned opera house saloon, an Irish-owned (Hibernia) brewery, and a combined saloon and shooting gallery.

For the most part, this commenced like a traditional archaeological comparative study incorporating the results of faunal and artifact analyses. In short, the results of this research indicate that the opera house saloon (known as Piper's Old Corner Bar) and the Boston Saloon sported higher relative quantities of upscale foods and furnishings than either the Hibernia or O'Brien and Costello's Saloon and Shooting Gallery (Hardesty et al., 1996; Dixon, 2005). Other objects recovered from these establishments are reminiscent of the complexities of western saloons, including an ornate water filter, Tabasco sauce bottles, an aquarium, piano keys, a trombone mouthpiece, and elaborate decanters.

As part of the analyses of the Boston Saloon's remains, a forensic-influenced experiment involved a microscopic inspection of a white clay tobacco pipe stem marred with teeth clench marks (Figure 4-2). For the most part, tobacco pipes are simply associated with tobacco use. It is possible to carry this interpretation a bit further, however; because tobacco pipe use is frequently considered a male-specific activity, as in most cases those objects were likely associated with men more than women (Beaudry et al., 1991:167-168; Hardesty, 1994:137). Yet, testing on that tobacco pipe stem from the Boston Saloon provided an example of an exception to this rule. One DNA profile was lifted from that object, and it was from a woman (Dixon, 2006).

Figure 4-2. Tobacco pipestem with teeth clench marks recovered from the Boston Saloon. Photo by Ronald M. James.

This ignited a discussion about the potential of forensic applications to historical archaeological investigations and fueled research questions about gender roles in the saloon place (Dixon, 2006; Schablitsky et al., 2006; see also Connor and Scott, 2001). While the presence of women in western saloons is not necessarily news (e.g., West, 1979; Hardesty and James, 1995; Hardesty et al., 1996; Murphy, 1997; James, 1998; James and Raymond, 1998; Spude, 2005), it did move our archaeological investigations of saloons to focus more closely on gender roles. Up to that point, rather than specifically seeking out gender-based interpretations, these investigations initially attempted to focus on rather general comparisons of the various Virginia City saloon collections, with race (the socially constructed category), ethnicity, class, and gender serving as rote research issues for this project (e.g., Scott, 2004). Until the DNA evidence became available, however, it was difficult to unequivocally discuss the presence of women directly from the artifacts. The artifacts from each establishment were more amenable to socioeconomic comparisons, signifying that there were marked differences between each saloon's décor (Dixon, 2005). While this provided grounds for discussion about the class-based differences between Virginia City's drinking houses and also suggested how the Boston Saloon's fine furnishings combated racist assumptions about African American drinking houses (e.g., Hoff, 1938; Duis, 1983), the presence or absence of women was, admittedly, a superficial part of this comparison.

DNA evidence, together with a collection of decorative buttons and beads representing women's clothing accoutrements, became complementary data sets that furnish compelling evidence of women's presence in the Boston Saloon. The empirical evidence associated with the DNA results provides an example of how scientific experiments can provide archaeologists with unequivocal interpretations about the people who handled and used the artifacts they excavate. In other words, these techniques facilitate determinations of sex [and possibly ancestry, e.g., Schablitsky, 2006] from mass-produced artifacts without speculation. As a result, DNA analyses can help archaeologists say whether relatively commonplace objects, such as tobacco pipe stems or other personal objects, were used by someone of a certain sex. This scientific foundation became a gateway for conducting more humanistic, gender-based examinations of women's roles in drinking houses (Dixon, 2006), reflecting on the niches filled by saloons that offered various types of female companionship (West, 1979). This fusion of scientific methods and humanistic interpretation underscores historical archaeology's portrayal as a humanistic science (Orser, 2004).

While relevant to the Virginia City saloon investigations, the integration of race, class, ethnicity, and gender represents core research issues in historical archaeology at large, (Little and Shackel, 1989; Rothschild, 1990; McGuire and Paynter, 1991; Ferguson, 1992; Mrozowski, 1993; Wall, 1994; Hodder et al., 1995; DeCunzo and Herman, 1996; Mrozowski et al., 1996; Shackel, 1996; Jones, 1997; Burke, 1999; Mullins, 1999; Tarlow, 1999; Wurst and Fitts, 1999; Delle et al., 2000; Jamieson, 2000; Brown, 2001; Praetzellis and Praetzellis, 2001; Davidson, 2004; Galle and Young, 2004; Spude, 2005). This focus on class, gender, and race and/or ethnicity has valorized the role of marginalized people in our recent past, building upon the complex facets of our modern and ancient histories (e.g., Wolf, 1982; Deagan, 1991).

In this case, the public drinking house provides the medium to examine gender roles. The world's earliest historical references in the ancient Near East indicate that people have been sharing drinks together for thousands of years. For example, Mesopotamian cylinder seals, over 4000 years old, depict men and women sharing communal drinks. These objects were made of materials such as shell, lapis, hematite, and serpentine and were engraved with scenes and symbols used to authenticate written clay records, letters, and proprietary rights (Ward, 1910). The artistic carvings that personalized each seal were a graphic response to the world, becoming valuable visual records for us today, and demonstrate the antiquity of many activities, such as social drinking (Buchanan, 1981). Some of those carvings illustrated ritual banquets, which appeared on cylinder seals, plaques, and friezes in Mesopotamia by about 2340 BC. In many of these artful banquet scenes, participants used long straws or tubes to drink beer from large, communal vessels that sat on the ground (Figure 4-3). People used the straws or tubes to reach the ale that lay beneath the scum on the beverage's surface, the usual manner of enjoying beer in the ancient Near East (Wiseman, 1958). Metal strainers fitted into the bases of the tubes and straws; archaeologists have discovered these while working in Mesopotamia, Syria, and Egypt (Frankfort, 1939).

Figure 4-3. The design in the upper left portion of the cylinder seal imprint portrays a pair of seated individuals drinking from a large vessel through pipes or straws, 3000 BC. ©Copyright The Trustees of the British Museum.

While beer served many purposes, its imbibement was, for the most part, a social activity in ancient Mesopotamia (Sumer and Akad), as shown in texts and artistic representations. People consumed beer in private households and in public spaces, including taverns deep within the maze of streets and alleyways of ancient Mesopotamian city centers (Neumann, 1994). Like western saloons or even today's pubs, taverns in ancient Mesopotamian society represented the "classical places for drinking and conversing"; however, they were also reportedly plagued by "ubiquitous flies ... rendering them less than appealing" (Neumann, 1994:325-326). There were some who were nevertheless drawn to these places of drinking and annoying flies: these ancient taverns were associated with the underworld, with conspirators, and with shady individuals (Neumann 1994). Some of the ancient Laws of Hammurabi, compiled during the reign of the 6th ruler of the 1st Dynasty of Babylon (1792-1750 BC), suggest that legal action had been taken to deal with taverns.

Ancient taverns also served as houses of prostitution, with the tavern-keepers doubling as madams; representations on clay plaques depict men and women having sex while the woman drinks beer (Michalowski, 1994). Prior to the reign of Hammurabi, the brewer's art and the selling of beer appears to be associated with women (Michalowski, 1994; see also Beaulieu, 1950; Hartman and Oppenheim, 1951). Outside of wife and mother, this appears to be the major vocation associated with women in the ancient Near East (see Michalowski, 1994).

Women figure prominently in the brewing of beer in that region, with a variety of references, from gods to mortals, suggesting this connection prior to the end of the Babylonian period. Brewing was the only profession in Mesopotamia that was protected by a female deity: Ninkasi the goddess of beer and brewing; and also by Siris, who watched over those involved in beer production (Hartman and Oppenheim, 1950; Kramer, 1950). It appears that professional female brewers held a high social status (e.g., Stol, 1994).

Yet this did not endure, as suggested by death and other punishment threats for women in taverns described in the Laws of Hammurabi; originally inscribed on black stone stelae, this code is the longest and best organized of the law collections from Mesopotamia (Roth, 1997; Van De Mieroop, 2005). The laws related to tavern activities include references to women, suggesting that the gendered association with public drinking endured until this time (1792-1750 BC). One law links taverns with the underworld: "if criminals [conspirators] plot in a sabitum's (i.e., a woman tavern-keeper's or inn-keeper's house) and she does not arrest those criminals and bring them to the palace, that tavern-keeper shall be put to death" (Law 109 in Roth, 1997:101). The female form of the third person pronoun, "she" in Hammurabi's code of laws opens up the floodgates for a discussion of gender roles in public drinking houses. By implication, female tavern-keepers were common; they operated under restrictions punishable by death; and they could expect (people defined as) criminals to meet in their places of business. The female form, sabitum, appears in other laws also related to taverns and tavern-keepers. For example, Law 108 states that if a sabitum does not accept grain according to its gross weight in payment of drink/beer and the price of the drink is less than that of the grain, they shall charge and convict that sabitum and they shall cast her into the water. In addition, Law 110 indicates that certain women were not allowed in places of public drinking: if a priestess/nun should open a tavern door or enter a tavern to drink, she shall be burned (Roth, 1997:101).

By the end of Hammurabi's Dynasty, textual references to sabitum ceased (Hartmann and Oppenheim, 1950). At that time, if a woman was running a tavern, she did so because she was the slave of a family who owned the tavern (Stol, 1994). While female slaves and female workers still participated in the brewing process up into Neo-Babylonian [626-539 BC] times, women no longer controlled beer production as they had before Hammurabi's Babylonian reign (Ibid.). The disappearance of the sabitum during the dynasty of Hammurabi seems to indicate a change in the region's social structure that "took the brewer's craft out of the hand of women" (Hartmann and Oppenheim, 1951:12). A text-aided archaeological study of women's roles in public drinking houses elsewhere in this region could provide a broad range of gender-based interpretations of those places.

Although it is difficult to determine how women's roles were shared over time and space in that region, drinking techniques were relatively similar. For example, strainers associated with tube-style drinking have been found in ancient Egypt and Mesopotamia. Egypt had its own selection of public drinking houses, known as "houses of beer" or "beer halls" (Hackwood, 1909; Protz, 1995; see also Budge, 1894). A study of women's roles in Egypt's ancient taverns could build another chapter to the story from neighboring Mesopotamia. General information suggests that men and women freely interacted with each other in ancient Egypt's houses of beer. Like in drinking houses of the modern world, "harlots" were among the women associated with those places, and the drinking activities therein often led to singing, dancing, and gaming late into the night (e.g., Brewer and Teeter, 2001; Lichtheim, 1980). Text-aided archaeology could enhance the details of gender roles in ancient Egyptian taverns, as well as the taverns, or *tabernæ*, which sprang up along Roman roads throughout Europe and which reached England during the first century AD (Hackwood, 1909). Across the Atlantic, by the American revolutionary and early Republic period, taverns provided meals and lodging for travelers and isolated residents in rural areas; they solely became places for social drinking in American cities (West, 1979). These taverns were far more than places to imbibe, as they became places for men to read newspapers and discuss political or public issues (Waldstreicher, 1997). Respectable women were not associated with those places, encouraged by a middle class ideology of domesticity to spend their leisure time in the home (Barney, 1987).

As the United States expanded into the American West, drinking houses migrated as early as the first settlers' arrival in that region. These drinking houses offered diverse forms of amusement, including various levels of female entertainment. The four Virginia City, Nevada saloons previously noted were all owned by men. While women were unequivocally present in the Boston Saloon, their roles and positions of power remain speculative. A historical study dedicated to women and leisure activities in another mining center, Butte, Montana, in the American West, indicates that issues of gender segregation and power accompanied public drinking in that region (and also in America) during the nineteenth and twentieth centuries (Murphy, 1997).

For example, although women were involved in the business side of public drinking in the United States during the early nineteenth century, this became one of the most gender-segregated activities by the late nineteenth and early twentieth centuries (Murphy, 1997). Men initially patronized the home or "kitchen grog shops" commonly owned by widows, and, from a functional perspective, provided a way for the community to support a "charity" without the widow feeling like she was taking hand-outs. Eventually, those shops were closed down due to license restrictions, and men gradually began to "go out" into licensed public saloons during their free time (Ibid.).

The increase in working class income, coupled with the increase in free time, paved the way for the massive popularity of saloons as places to spend leisure time and money; as a result, men began to enjoy this type of public drinking more frequently, while women stayed at home. This caused the widows and other women who relied on the earnings from the "kitchen grog shops" to lose that income. In addition, women also lost the companionship of their husbands and male neighbors, as the men went out and the (respectable) women stayed at home. In Butte, Montana, the women who actually patronized saloons were thought to be either prostitutes at worst or "loose" at best (Murphy, 1997:43-44). The form of leisure embodied in social drinking therefore became divided by gender, a phenomenon observed elsewhere in the United States in the late nineteenth century (Rosenzweig, 1983). Women gradually became a part of the public leisure sphere again during the United States' Prohibition era, patronizing speakeasies and taking part in more heterosocial settings in places like Butte (Murphy, 1997).

Archaeological investigations have not been carried out in Butte to examine the material manifestations of these gender divisions, or related ethnic or economic separations.

The archaeological remains of Virginia City, Nevada drinking houses provide examples of the complex material expressions to be found among the ruins of western saloons. The DNA evidence and the array of decorative clothing accoutrements suggest that women were more prevalent in the Boston Saloon than in the other three contemporary establishments in that community. Indeed, women were not necessarily visible in all Virginia City drinking houses. If they were associated with such places, it is difficult to discern from the archaeological record how their roles involved various levels of power. Even so, an instance of an African American saloon owner, Amanda Payne, provides a unique example from the historical record. Payne owned her own boarding house and restaurant in Virginia City and also went into business as a saloon owner on D Street for a short time (Langley, 1871). Additionally, it appears that William Brown, the owner of the Boston Saloon, was working either for or with her in the saloon business (James, 1998). While her presence and power are suggested in historical records, it is not possible to state unequivocally that the fancy clothing accoutrements found in the Boston Saloon can be directly associated with her. However, as a successful entrepreneur, she could have been the owner of dresses graced with such accessories. Such accessories would have set her apart from Virginia City's more commonly-dressed women. These accessories might have been symbols of her success and power in that community' business district.

3. CONCLUSION

The licensing laws in Butte, Montana and the more threatening consequences spelled out in Hammurabi's ancient code of laws each involved issues of power and gender associated with purveyors of alcoholic beverages. It may be possible to explain these events in a framework of power struggles which have permeated human history and which link the modern with the ancient world (e.g. Praetzellis, 2000). Men and women maintain different roles in society, and these are often linked with divisions of labor, as well as divisions of authority and power (McKee, 2004). An analysis of gender's "influence in any kind of social analysis" is necessary to develop an understanding of the social activity associated with that analysis (McKee, 2004:288).

While they have yet to be presented in detail, there are certainly countless events and examples of power and gender roles associated with drinking houses over time and space. Those discussed here are examples poised at either end of the timeline of recorded public drinking, with countless gaps in need of filling between them. Questions about power are merely one aspect of the story behind our extensive relationship with places of public alcohol consumption. Furthermore, scholarship related to the public sphere reminds us to consider public celebrations, print media, coffee houses, and saloons as backdrops for power struggles between various classes (Waldstreicher, 1997; Brooke, 1998; see also Habermas, 1989). Surely there have been struggles between men and women in the public sphere which could add to this story, given the instances of women being involved with and then pushed out of the beer brewing and serving business. It is difficult to ascertain issues of power from the artifacts recovered from Virginia City saloons. Rather, it seems that those materials strongly indicated women's presence in places like the Boston Saloon, fueling a gender-based examination of drinking houses over time. At this point, historical records provide the primary insights into issues associated with power and gender roles in those establishments.

Even so, the interpretive strength of this preliminary study stemmed from a fusion of science and the humanities. This influenced an agenda for a comparative, text-aided archaeological examination of several different drinking houses over space and time to try to flesh out associated histories of gender roles and to determine whether and how it sheds light on feminine and masculine power struggles in those settings. Although our charter as historical archaeologists seems to be healthily limited to the modern world, we do not necessarily have to disassociate ourselves from Classical Archaeology, Assyriology, Egyptology, and other text-aided fields. Rather, we can use our finesse with synthesizing texts and artifacts to apply anthropological perspectives to sites and artifacts representing different places and times associated with literate history. In this case, a study of gender roles in public drinking places is one example of a topic with many precedents along our global, human timeline. By recognizing this, it is possible to link historical archaeology of the modern world with ancient, literate societies to shed light on the intricacies of the human condition in complex societies.

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Chapter 5

THE LIFE AND DEATH OF A HOME

House history in a subsurface feature

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Abstract: In this chapter, the authors take a high resolution multi-evidentiary approach to examine a single stratified feature from a seventeenth-century house lot in meticulous detail. In doing so, the possibility of interpreting detailed issues of site, structure and landscape are demonstrated; far beyond the capabilities of a standard, rote artifact analysis of the same feature. It is argued that in such contexts weighing alternative data categories, such as botanical and micromorphological evidence, equally with conventionally-recorded artifact and stratigraphic evidence, can yield detailed new lines of inquiry and far more rigorous interpretations.

Key words: Archaeobotany; Chesapeake; historical archaeology; landscape change; methodology; microstratigraphy; paleoethnobotany; phytoliths; seventeenth century; soil micromorphology; root cellars; stratigraphic analysis.

1. INTRODUCTION

Archaeologists have, by way of rote behavior, inadvertently ingrained weighted meanings to particular classes of material evidence, as well as particular narratives, when dealing with routinely-encountered archaeological features common to seventeenth-century colonial domestic structures. Whether termed "root cellars" or "sub-floor pits," the importance of subterranean features constructed beneath dwellings and other structures has been recognized for well over twenty years in the American Southeast (Kelso, 1984). These features have led to important debates and insights concerning identity, slavery and resistance in African and African-American communities in the New World (Sanford, 1991; Mouer, 1991, 1993; Yentsch, 1991; Chambers, 1992; Neiman, 1997; Samford, 2000). In lieu of engaging with the traditional debates and narratives prevalent in discussion of these features (typically, ideology, domination, and resistance), we herein weight archaeological evidence generally considered as *supplementary* categories (phytoliths, microstratigraphy, and macrobotanical evidence) as the *primary* drivers of the narrative we construct about a feature, as well as the house and landscape it documents. We would like to refocus attention to the importance of excavation methodology and analysis as it relates to the recovery and creation of data from these features, and how such techniques may be used to develop a new avenue of interpretation for these resources. Root cellars can constitute a palimpsest record of the life history of a structure, from construction through destruction. Most archaeological features are passive in the sense that once established (e.g., a posthole) they are rarely and minimally modified during their use-life. Root cellars, however, are both actively and passively transformed by humans throughout their use-life, and, in this case, serve as a repository for post-abandonment processes on-site. In this chapter, we attempt to reconstruct such a life history of a dwelling and the surrounding landscape through a detailed excavation and analysis of a single root cellar from a seventeenth-century site in Tidewater Virginia.

Traditionally, root cellars have been excavated and analyzed as single contexts. That is, these features have been treated as if their contents represent a single capsule of data that relates directly to the use-life (occupation) of the feature. However, excavations of a large root cellar at the Atkinson Site, a late seventeenth-century farmstead located within the former Martin's Hundred Parish in James City County, Virginia, has allowed us to reassert the importance of formation process in interpretation of such features, and also question the situational utility of the standard artifact categories used in creating interpretations in historical archaeology.

Initially discovered during an archaeological survey in 1991 (Moodey, 1992), the Atkinson Site (McCartney, 2002; see also Kostro, this volume) was excavated from 1998 to 2002 as a mitigation measure for the future development of the property. The fieldwork eventually revealed an arrangement of five structures, a variety of fence lines and ditches, and several sub-surface pits (Figure 5-1). Deposits across the entire site were heavily sampled for macro- and microscopic archaeological and archaeobotanical remains.

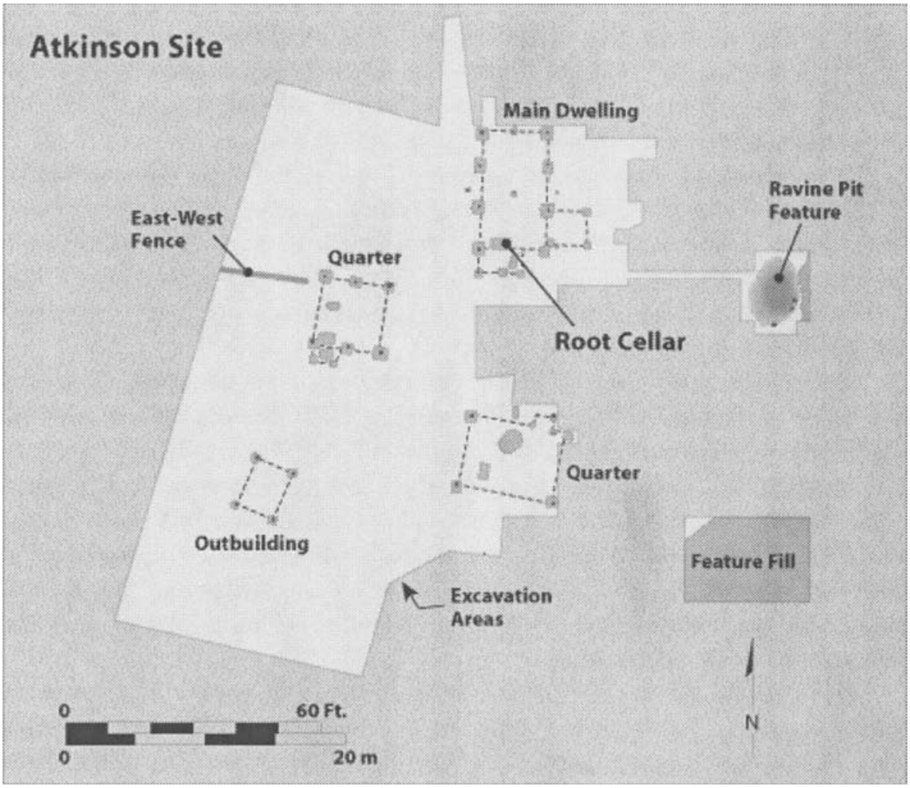

Figure 5-1. Plan of the Atkinson Site.

The Atkinson Site had been repeatedly plow-disturbed from the eighteenth century onward, homogenizing the upper layers of the site. Additionally, very few features yielded any complex stratigraphy beneath the plowzone. The exception to this was a presumed root cellar in the largest of the five excavated structures. While quite artifact-poor in comparison with an adjacent, large, but poorly stratified refuse feature (noted as "ravine pit feature" in Figure 5-1), the root cellar was, by comparison, *contextually* rich in the sense that multiple depositional events spanning the life of the household were represented in this feature.

2. EXCAVATION

Upon removal of the plowzone overburden, this feature appeared in plan view as a dark black, charcoal-rich rectilinear stain in the surrounding subsoil, oriented perpendicular to the central axis of the primary dwelling. The feature measured slightly less than 1.5 meters from east to west and slightly less than 0.75 meters from north to south and reached a depth of close to 0.5 meters. The feature was located directly in front of the interpreted hearth and chimney structure of the building.

Each excavated deposit was given a context number under Colonial Williamsburg's single-context recording system, consisting of a site and area designation, in this case "50-AP," followed by a unique individual number for cut, fill, or arbitrary levels within fills. For the remainder of this discussion, we will use the abbreviated three- or four- digit context number in reference to each deposit.

The feature was bisected along its east-west axis in order to reveal internal stratigraphy within the cellar (Figure 5-2). The uppermost layer of thick, apparent destruction fill was subdivided into three arbitrary layers at 10 cm intervals to permit more detailed comparison and ensure tight chronological control of the deposit. The total feature fill was clearly stratified with several layers of fill that could be distinguished on the basis of color and texture. In total, eight strata were defined within the feature. All soil from each individual context removed from the initial bisection of the feature was saved for flotation.

From the exposed profile of the feature, phytolith samples were removed from every identified stratum. In addition to these microbotanical samples, archival soil samples for additional kinds of testing were also taken from each stratum. Finally, three block samples, crosscutting strata, were cut into the profile and taken for micromorphological analysis (Figure 5-3) of the deposits and their interfaces. The remaining soil in the feature was stratigraphically excavated and also processed by water flotation. No soil was screened on-site.

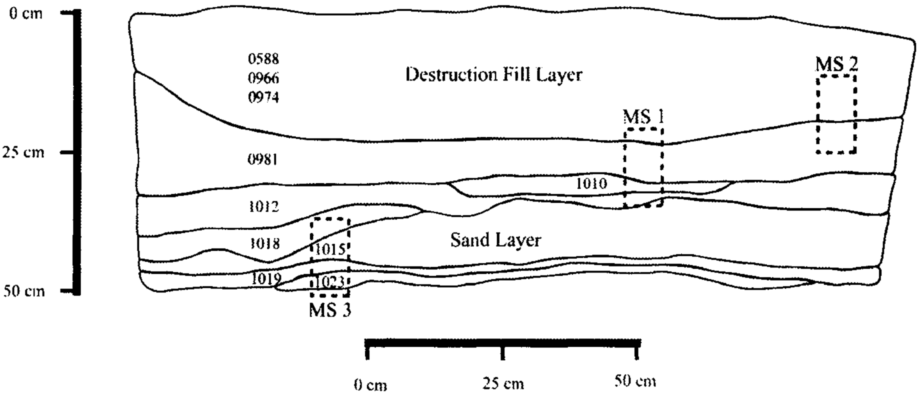

Figure 5-2. Profile illustration of bisected root cellar, looking North, showing context designations and micromorphology block locations.

Many archaeologists might also sample responsibly during excavation in a comparable manner, but rarely do these 'specialist' analyses take primacy over the artifacts, architecture, or other 'familiar territory' for most historical archaeologists. In the following discussion, the alternative, or less-commonly used data sources from this root cellar (phytoliths, microstratigraphic and macrobotanical evidence) are asserted as the core data of our interpretation of the house and landscape. We construct a narrative of the site and dwelling by juxtaposition of these lines of evidence – evidence which often speaks to different questions of the archaeological record than are commonly posed and reworked by considering 'comfortable' data such as artifacts or architecture. What follows is a brief summary of how the phytolith, microstratigraphic, and additional data were generated, as background information for the subsequent narrative concerning the primary building and landscape constructed from the analyses.

3. ANALYTICAL METHODS

3.1 The Phytolith Data

Nine samples from the root cellar were selected for phytolith analysis. Samples were collected from the north-facing profile, in accordance with standard procedures for pollen and phytolith samples outlined in Piperno (1988) and Pearsall (2000). Two samples from thin strata, where adequate volume could not be obtained from the profile, were collected from the excavation of the north half of the feature. Phytoliths were extracted from sediment samples using an unpublished protocol developed by Lisa Kealhofer (cf. Sullivan and Kealhofer, 2004), which is slightly modified from Piperno (1988). The protocol modifications include size fractionation into two (rather than three) groups, an A/B fraction consisting of phytoliths between 2 and 53 microns, and a C fraction of phytoliths between 53 and 250 microns. Sodium Polytungstate was used as the heavy liquid flotation solution. The A/B fraction contains the vast majority of phytoliths, and all data in this article are based on A/B fractions. A 200 diagnostic form count (broadly, grass short cells plus a range of arboreal/dicot forms) was the target value for each sample. Of the processed samples, only one context (Context 1024/Subsoil) did not produce enough phytoliths for a standardized 200 diagnostic form count. All counts were between 190 and 207 forms. The counts of individual forms were grouped by taxonomic affiliation, and then converted into percentages for ease of comparison.

Phytolith assemblages from archaeological sites are nearly always dominated by the silica-accumulating grass family (Poaceae), the Atkinson Site being no exception. The large grass family, Poaceae, is taxonomically divided into several subfamilies. Five primary subfamily groupings are used in this analyisis: Pooidae, Panicoideae, Bambusoideae, Chloridoideae, and Arundinoideae. Each of these five subfamilies produces distinctive phytoliths, as has been known since the first major phytolith studies (e.g., Twiss et al., 1969). The frequencies of these subfamilies in an archaeological phytolith sample give an indication of the proportion of these grasses in a given environment, in this case, the combined cultural and natural detritus accumulated in the root cellar fills.

Individual form (morphotype) counts from the archaeological samples were grouped into the following taxonomic categories: Pooid Grass, Panicoid Grass, Chloridoid Grass, Arundinoid/Other Grass, Arboreal/Dicot, Asteraceae, and *Zea mays*. Asteraceae and *Zea mays* phytoliths were given their own category because the diagnostic phytoliths are taxonomically more specific than the general groupings (i.e., *Zea mays* is technically a Panicoid grass, and Asteraceae is a dicotyledonous family). These phytoliths were far less represented than the grasses and the grouped arboreal/dicot categories. The counts are summarized in Appendix I.

For this analysis, the phytolith counts from individual contexts were compared using correspondence analysis as overall assemblages in a simple graphic showing relationships in lieu of exhausting variable-by-variable comparisons. Using the CANOCO 4.5 statistical package (ter Braak and Smilauer, 2002) and the associated CANODRAW graphic program, a correspondence analysis scattergram was generated from the phytolith data, and follows later in the discussion.

3.2 The Microstratigraphic Evidence

Three bulk blocks were taken from across the bisected root cellar profile for microstratigraphic analysis (Figure 5-3). The sampling locations were chosen to include as many interfaces as possible, as well as a small section of the underlying subsoil for comparative purposes. Blocks were taken following procedures outlined in Courty et. al. (1989), using a 137 mm x 75 mm template. Blocks were sent to a petrography laboratory for resin-embedding and thin-sectioning. The petrography laboratory was unable to prepare large format thin sections, so smaller, paired microstratigraphy slides, each pair representing one excavated block, were created. Due to a laboratory error, one block was sectioned perpendicular to the others, yielding a north-south rather than east-west view of the stratigraphy. In some cases, not all the stratigraphy from a particular block was included on the slide pair. However, despite these problems, several notable observations could be drawn from the microstratigraphic analysis.

Analysis was carried out according to Bullock et al. (1985), using the terminology adopted by Courty et al. (1989). MacKenzie and Guilford (1980), and MacKenzie and Adams (1994) were used as aids to mineralogical identification. Each slide was catergorized into a number of clearly defined units. The slide pairs and units are shown in Figure 5-3.

From the base of the root cellar profile to the top; MS3 A and B cover the lower subsection of the east to west profile and include Contexts 1024, 1023, 1019, 1015 and 1018. MS1 A and B were sampled from a middle subsection of the east to west profile and include Contexts 1012, 1010, 981, and 974. MS2 A and B cover an upper subsection of the east to west profile of the root cellar and include Contexts 981, 974, and 966.

Working from the base of the slide up, the fabric of each of unit, the character of the unit boundaries, and the nature of various inclusions were described and discussed in terms of mineralogy, sediment classification, pedality, packing, orientation, distribution, grain structure, coarse/fine limit and fraction, particle shape, and sorting. Inclusions of anthropogenic material (e.g., charcoal, glass, pottery, metal fragments) were described and counted for each unit, along with a record of any other specific organic inclusions which might provide some indication of environment, provenance or anthropogenic activity; the content and composition was evaluated in relation to the relevant macro layers. These data are summarized in Appendix II.

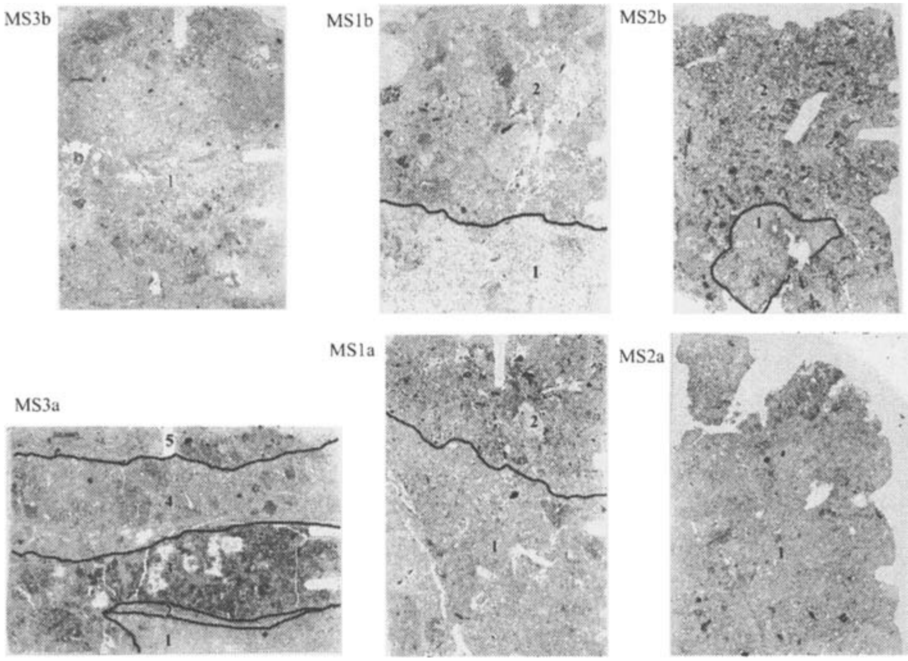

Figure 5-3. Micromorphology slide pairs.

3.3 Supplemental Evidence: Artifacts and Macrobotanical Remains

Flotation samples were analyzed from each layer within the root cellar. All artifacts from the root cellar were recovered via flotation in the heavy-fraction component of the samples as no material was screened. The Flote-tech machine used in processing (Hunter and Gassner, 1998; Rossen, 1999) theoretically recovers all non-buoyant artifacts greater than 1 mm in diameter, greatly increasing the recovery standard over the general on-site norm of ¼-inch hardware cloth screens. Nonetheless, the artifact assemblage from the root cellar was disappointingly sparse. Botanical remains were sorted and identified from the flotation samples using generally accepted methods (e.g., Hastorf and Popper, 1988; Körber-Grohne, 1991; Pearsall, 2000). Wood charcoal was the overwhelming component of these samples. No statistically meaningful numbers of seeds or other plant parts were recovered from any of the samples, although there were some intriguing presence/absence occurrences as noted in the following discussion. Two contexts which became particularly important in the interpretation were selected for a specialized wood identification study, wherein 50 fragments of wood charcoal greater than 2 mm in size were examined to create species distributions for the two contexts. Fragments were randomly selected from Context 966 whereas the entire assemblage of > 2 mm fragments was used from Context 1010. Identifications were made using a combination of reference keys (Core, Côté and Day, 1979; Wheeler et al., 1986; Hoadley, 1990) and comparative material from the University of California at Berkeley Paleoethnobotany Laboratory and the Colonial Williamsburg Archaeobotanical Laboratory.

4. CREATING A NARRATIVE OF DWELLING AND LANDSCAPE

Two major phenomena are simultaneously visible in the data from the root cellar: the life cycle of the house, primarily affected by cultural practices; and, the life cycle of the surrounding landscape, which evidences deliberate as well as secondary and unintentional transformations of the ecology of the site area.

The phytolith correspondence analysis and the basic observed stratigraphy served as the starting point for explaining the life cycle of the main dwelling at the Atkinson Site. The most easily interpreted deposit observed in the excavation was the uppermost layer of probable destruction fill, rich in charcoal and architectural debris (consisting of arbitrary Contexts 588, 966, and 974). Underneath the destruction layer were a series of continuous and discontinuous fill deposits of highly variable composition (Contexts 981, 1010, 1012, 1018, 1015, 1019, and 1024), clearly representing some intermediate stages of deposition between the construction of the cellar and the eventual destruction of the house structure (Figure 5-2). Yet, the contexts subtending the destruction layer yielded very few artifacts or other obvious visual cues as to their origin.

The Atkinson Site is a single-component site, occupied between the last half of the seventeenth century and the first quarter of the eighteenth century. Because well-known (if incompletely understood) major biotic changes occurred in the Chesapeake as a result of colonization during this time period (Cronon, 1983; Silver, 1990; Curtin, Brush, and Fisher, 2001; Bowen, 2002), the root cellar presented a contextual opportunity to relate culturally-induced ecological changes directly to the interpretation of this site, without interpretive "noise" from earlier or later occupations.

To create an interpretive contextual framework for the meaning of the observed frequencies of phytoliths in the root cellar layers, it was necessary to look at overarching patterns of taxonomic occurrences of grasses in the region, drawing distinctions between pre- and post-contact vegetation. Using published data from Harvill et al. (1986), and the United States Department of Agriculture (USDA), (http://plants.usda.gov), data was compiled on present-day distributions of grass species occurring on the James-York Peninsula. From these distributions, the subfamily attribution of each species and the native or introduced status of each taxon were noted.

For the purposes of this analysis, the most significant distinction in the data is the high percentage of Pooid subfamily grasses in the combined pool of grass species introduced from the Old World to Virginia. Pooid grasses occur in much lower frequency in a hypothetical aboriginal vegetation (modern species minus introduced species), prior to the contact period. While Pooid grasses comprise only 24% of the native taxa, this subfamily accounts for almost 65% of introduced species. The dominant subfamily in the native grasses is the Panicoid group (Figure 5-4).

Many of the introduced Pooid subfamily grasses are economically important crops and pasture grasses from Europe, such as wheat, barley, rye,

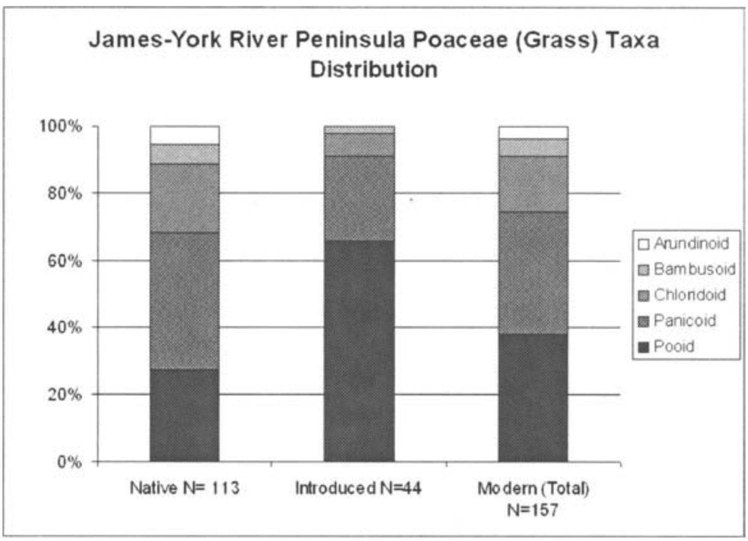

Figure 5-4. Modern grass subfamily distributions on the James-York peninsula of Virginia.

timothy, and common bluegrass, as well as their weedy associates. It is likely that this simple, admittedly blunt analysis of modern presence/absence data in fact underestimates the abundance of Pooid subfamily grasses correlating with European settlement, in part because each species, rare or common, is weighted equally on a presence/absence basis, irrespective of a given taxon's true frequency distribution. Also, later, post-eighteenth-century introductions are included in this data set, as introduction dates are impossible to accurately gauge for the entire data set.

The ratios of Pooid to Panicoid taxa in the regional grasses helps to interpret the correspondence analysis scattergram of phytolith data from the sequence of strata in the root cellar. Higher frequencies of Pooid grasses indicate, in this situation, a stronger signature of an environment altered by the addition of Old World botanical components.

The correspondence analysis scattergram (Figure 5-5) is a field of two types of points, each can be thought to exert a "gravitational pull." Phytolith samples (circles) most similar to each other will cluster together, as will frequently co-occurring taxonomic groupings (triangles). Moreover, the phytolith sample points will also be pulled towards the taxonomic grouping points with which they associate.

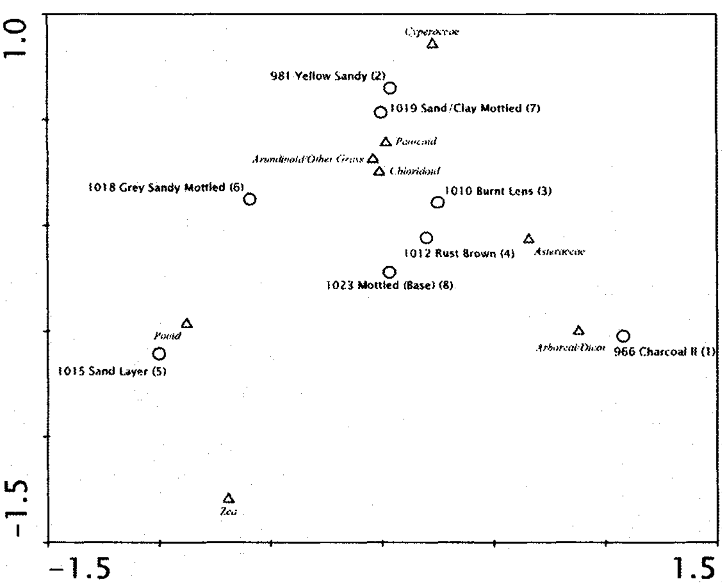

Figure 5-5. Correspondence analysis scattergram of phytolith assemblages from the Atkinson Site root cellar. Numbers following the context description indicate their sequential positioning from top to bottom in the feature.

The plot shown is a graph of the first and second eigenvalues generated by the correspondence analysis. Eigenvalue one, plotted on the X axis, explains 67.5 percent of the variance between samples. The Y axis, the second eigenvalue, explains an additional 19.3% of the data. In very general terms, then, the scattergram might be considered an 86.8% accurate representation of the overall variation between samples.

The close association of one stratum, the "sand layer" (Context 1015), with the Pooid grass data point is very striking. Many of the other strata tend to cluster with the Panicoid/Chloridoid data points. It is assumed in this analysis that the Pooid grasses represent a kind of "European footprint" maintained through the duration of the occupation of the site. This footprint is caused by human activities, which encourage the growth of imported vegetation, such as crops and fodder, and, at the same time, overwhelm the native species in the area.

Our working model is that the Atkinson Site, as a local landscape, went through a cycle of environmental transformations related to the activities of its inhabitants. Starting from a native grass assemblage pattern, with a strong Panicoid component prior to settlement, the site became a heavily manipulated, Pooid-dominated environment through the course of its occupation. The environment was manipulated by a variety of factors, such as the cultivation of European cereal and fodder crops and their byproducts (e.g., straw), the deliberate planting of fallow field species, and the presence of domestic animal dung around the site. Cessation of these activities reduced the primary presence of Pooid grasses around the site as well as the secondary conditions necessary for Pooid taxa to thrive in the landscape without human intervention. When the site was abandoned and the activities that maintained Pooid grasses in the landscape ceased, the site experienced a "rebound" of the native grasses, with their natural advantage of adaptation to the warmer, wetter climate, again taking prominence (albeit reduced) in the landscape. This model seems to explain a great deal of the variability in the root cellar strata and allows us to begin to temporally sequence the strata in relation to this cycle.

Using this "phytolith chronology," the sand layer (Context 1015), which corresponds most closely to the Pooid data point, appears to be affiliated with the peak of occupation in terms of the local grass environment. Moreover, we suggest that this deposit of sand is not only temporally associated with the occupation, but was in fact a functional component of the root cellar during its use-life. The sand was deliberately placed in the root cellar, probably as a means to regulate temperature and moisture for the items stored within. This pure sand deposit is texturally unlike any other deposit on the site. The micromorphological slide samples showed unusual sorting, as if the sand had been separated into medium and finer fractions, and then mixed roughly back together; possibly the result of sieving the material to remove larger inclusions. This hypothesis is given particular credence in that the observed size sorting applied also to included fragments of debris such as charcoal. Moreover, the observation in the slides of the mineral glauconite, which only occurs in marine sediments or rocks formed in a marine environment, suggests a distinct source location for this material, possibly from outside the immediate site area.

In addition to inadvertent introductions, the heavy Pooid grass component of the phytolith assemblage from this layer could also derive from cultural practices, such as straw purposefully mixed with the sand to provide additional aeration (e.g., Bubel and Bubel, 1991). It should also be noted that this context was practically devoid of artifacts. Aside from one worked flint core and a large iron nail fragment, the assemblage was highly fragmented and consistent with detritus that would unintentionally become incorporated in the layer during its use-life. The cumulative evidence from phytoliths, micromorphology and artifacts suggest that the sand that makes up this layer was intentionally placed and served a functional purpose for the intended use of the feature. During its use-life, this deposit was continually reworked and kept "clean" of refuse.

Another aspect of the phytolith data that works in tandem with the grass patterns is the information gained from looking at phytoliths derived from trees and other dicotyledonous species. The "arboreal / dicot" taxonomic group in this data set mostly derives from wood, in the form of silica inclusions in cells and silicified vascular tissue ("sclerids"). Note the strong association of the destruction fill layer (Context 966), with the arboreal/dicot taxonomic point (Figure 5-5). This is something of a "no-brainer" given the obvious visual evidence from the excavation that the deposit is largely composed of charcoal. Yet, phytolith data may determine the presence of wood even in instances where the wood was not burned, but rather decayed, as both of these processes will deposit phytoliths, while only burning will leave an obvious visual trace. Rather than being simply redundant analysis, it is possible to use the phytolith data pattern from the destruction fill layer as a comparative sample to determine the presence of wood elsewhere in the feature where its deposition may not be so visually evident.

The two thin layers at the base of the feature, Context 1019 and Context 1023, are strongly differentiated from the overlying sand layer (Context 1015) by the increased presence of Panicoid grasses. Looking at the grass components of the phytolith assemblage from Context 1023, the layer is almost perfectly positioned between the arboreal, Pooid, and Panicoid points on the scatterplot. The inference is that the construction episode, which created the feature, incorporated pre-settlement soils, which naturally included higher frequencies of Panicoid grasses, as they were deposited prior to extensive modification of the surrounding landscape. The micromorphological evidence from slide MS3a supports this interpretation with direct evidence of the entrainment of natural peds of the underlying pre-settlement soils included in the two thin layers at the base of the feature.

With the previously discussed phytolith data from the destruction layer Context 966 in mind, the layer at the base of the feature, Context 1023, is remarkable. Although no visible charcoal was noted in the excavation and the flotation produced only a few scant fragments of wood charcoal, Context 1023 has a surplus of arboreal phytoliths. From this data, it would seem that the feature had a wooden platform or lining at its base that rotted, rather than burned, away. The micromorphological evidence complicates this assumption. The presence of charcoal was noted in both units of MS3a thought to be associated with Context 1023. Though only present as small fragments, these appeared to have some parallel alignment to the base of the feature, hinting perhaps at in situ burning. This may further be supported by an observed red coloration of the sediment. If this is a true indication of burning, it may relate to an earlier use of the pit with subsequent removal of most of the carbonized material and may post date any pit lining. There is certainly not enough charcoal present to indicate in-situ burning of a pit lining itself unless the majority burnt to ash which was subsequently removed by dissolution to leave the phytoliths. Alternative hypotheses for the red coloration suggest that it represents a concentration of amorphous organic material relating directly to the rotted pit lining, or the presence of iron oxide which may have been derived from nails holding the lining together. Both of these alternatives are more in line with the phytolith evidence and correspond well with the artifactual evidence.

While no artifacts were recovered in Context 1023, a few artifacts were recovered from the closely associated overlying Context 1019. Two large iron nail fragments stand out markedly from the scant assemblage, which otherwise consisted of highly fragmented pieces of pipe bowls, coarseware pottery, bottle glass and flint debitage. The nails may have been part of the former platform or lining of the pit, while the remaining artifacts from this context represent household detritus that accumulated during the use-life of the feature. Continuing to use phytoliths, micromorphology and artifacts, it is possible to interpret the root cellar strata in terms of their deliberate construction elements as well as their position within a broader environmental chronological cycle.

The sand layer (Context 1015) is sealed by Context 1018. While this context does not form a continuous stratum above the sand layer, the analysis of phytoliths and artifacts from this layer provides us with a distinct break for the deposition and, presumably. the use of the feature as whole. Context 1018 is strongly associated with the Pooid pattern and, therefore, the occupation of the house. However, the phytolith assemblage also shows an increased correspondence towards the Panicoid grasses. In terms of its phytolith assemblage, this layer may represent a transition away from the occupation of the dwelling and the maintenance of an environment amenable to the Pooid grasses. In light of this data, it is interesting to look at the artifact assemblage, which exhibits a marked distinction from the previously discussed context.

As opposed to the sand layer (Context 1015), Context 1018 shows an increase in artifacts and a noticeable trend toward larger artifacts, (i.e., less likely to 'accidentally' end up in the feature unnoticed). While the overall number of artifacts remained low, the diversity of artifacts increased. Context 1018 is the most recent context in the root cellar containing both window glass and pipe stems. This context is also distinct in that it is the only context in the entire feature that had no flint debitage. While we cannot determine the depositional history of this context, Context 1018 does appear to represent a transition between the occupation of the dwelling, or at least the active use of this feature, and the eventual abandonment and destruction of the dwelling, and the infilling of this feature. The micromorphological evidence for this layer also provides supporting evidence for a transition towards abandonment and destruction, with an inclusion content that mirrors the artifactual evidence.

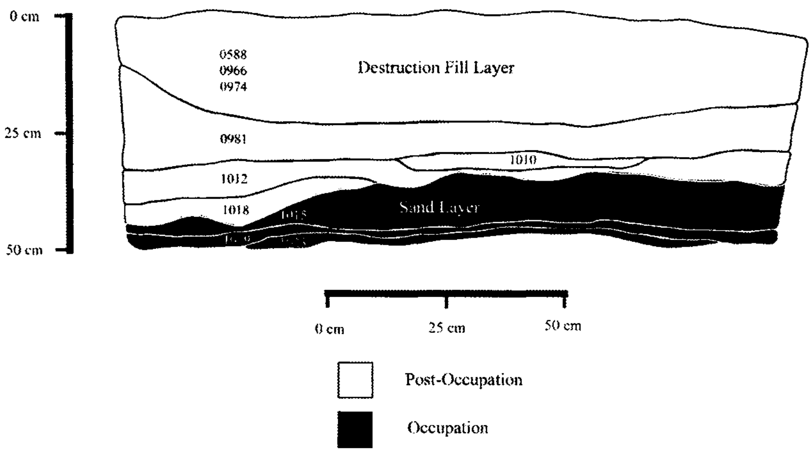

Figure 5-6. Profile of root cellar showing primary contexts vs. abandonment/post-abandonment fills.

The foregoing argument sets up an important cautionary tale when developing social interpretation based on the artifacts and other contents of root cellars. In this instance and probably many others less critically examined, only a small portion of the total feature fill directly relates to the construction and occupation periods of the dwelling, or is "primary" refuse using Schiffer's (1976; Rathje and Schiffer 1982) terminology. Of the 662 liters of soil that comprised the feature, only 56 liters, or 8.5%, of the total volume of feature deposit, represent the active use-life period of the root cellar (Figure 5-6). These 56 liters produced the least amount of artifacts in comparison to the overlying layers. The remaining 606 liters, or 91.5%, of the deposit actually chronicle the abandonment, post-abandonment, and destruction of the dwelling. Looking at these remaining layers, we can begin to piece together a history of this structure in the time following its abandonment.

Continuing with our analysis, Context 1010 and Context 1012 have similar arboreal/dicot phytolith signatures to Context 1023 at the base of the feature. However, in the case of these more recent contexts, wood charcoal *was* noted during the excavation and is also present in moderate amounts in flotation samples. Context 1010 and Context 1012 show evidence of burning, yet they are sealed by Context 981, which does not show evidence for burning and separates Context 1010 and Context 1012 from the destruction fill layer (consisting of arbitrary Contexts 588, 966, and 974). It is uncertain whether these contexts indicate some kind of destruction and abandonment of the structure prior to the final, and presumably, catastrophic conflagration evidenced in the brick and charcoal rich destruction fill layer. With this in mind, Context 1010 is particularly intriguing.

Context 1010 is a discrete burnt lens that is visually distinguished from Context 1012 below and Context 981 above. The wood charcoal (see Appendix III) recovered from the flotation of this context exhibited a good deal of homogeneity. The assemblage yielded no identifiable seeds other than a nutshell fragment To augment our interpretation of Context 1010, all fifty fragments of wood charcoal larger than 2mm were examined for species identification. In comparison with the uppermost destruction fill, in which a diversity of local woods is represented, the wood in Context 1010 is almost entirely homogeneous. With the exception of a few softwood fragments, it appears, despite some ambiguity related to preservation, that the deposit is composed almost entirely of white oak (*Quercus alba*). This would seem to represent a discrete temporal event rather than a gradual accumulation of fuel wood or garbage. In addition to this wood charcoal data, the artifacts from this context also provide evidence of a unique event. In comparison to all contexts from the feature, Context 1010 has the greatest density of nails and nail fragments, tobacco pipes, and flint debitage by volume.

Prior to the completion of the microstratigraphic analysis, we posited a number of scenarios for Context 1010, including: a smaller, but incomplete destruction event (i.e., fire) that damaged the overlying structure leading to its abandonment; or, alternately, a reuse of the feature as an impromptu fire pit in an abandoned, crumbling structure. While the microstratigraphic evidence is not conclusive, its addition renders some scenarios less plausible. The basal boundary of Context 1010, as observed in micromorphology slide MS1a is sufficiently defined to convey a separate phase of deposition for the overlying unit, yet it lacks the strength of definition which might be expected from in situ burning. There is no evidence of heat alteration at the top of Context 1010, and no alignment of the overlying charcoal to suggest that the cellar may have been used as a deliberate fire pit. The charcoal is mixed in with the soil and broken up, also suggesting it is not in situ. The presence of root channels and mite droppings in the underlying unit could explain some of the hypothesized mixing, as could some type of deflation process as ash was removed from the deposit via soil solution. From the available microstratigraphic evidence, it appears more likely that fire debris has fallen or been swept in to cover the exposed surface of the underlying layer. As always, the 'why' and 'how' is open for interpretation.

Context 981 seals Context 1010. The phytolith assemblage of Context 981 reflects an increased Panicoid presence in the landscape, which is drastically different from the sand layer (Context 1015) that is evidently the only in situ layer that represents the original and intentional use of this feature as a storage pit. It is during the deposition of Context 981 that we infer the structure stood abandoned and this feature accumulated sediment no longer overwhelmed by the Pooid grasses maintained by its original occupants. Without the presence of the occupants to cultivate Pooid grasses, or at least to create an environment in which Pooid grasses could thrive, the environment returned to one more dominated by the Panicoid grasses native to Virginia and better adapted to its climate. Yet, although the intensity of human activity upon the landscape may have shifted, there was still a human presence evident at the Atkinson Site. The artifacts from Context 981 are also different than those that came before and after. While the numbers of tobacco pipes remain consistent with the post-occupational layers of the structure, the amount of ceramic sherds increases and the sherds become less fragmented. The only large fragment of wine bottle glass in the feature comes from this layer. This context also has the highest amount by volume of lead casting waste and lead shot. All of this evidence hints at the possible use of the structure as a temporary shelter or a place that was infrequently visited even after the landscape had stopped being cultivated. After its abandonment as a dwelling and prior to its final conflagration, this structure continued to be a "place" upon the Virginian landscape.

While the phytolith assemblage from the destruction fill layer (the last deposit to be added to the feature) is overwhelmed by wood phytoliths, the botanical assemblage from flotation provides a few scant clues as to the existence of this “place” upon the landscape just prior to its destruction by fire. Similar to the phytolith assemblage, the macrobotanical remains are dominated by wood. Yet, the next most represented botanical remains aside from wood fragments are maize cupules. The burned cupules were eight-row type maize, similar to prehistoric maize recovered from sites in eastern North America. The cupules were also collapsed upon themselves, which suggests that the kernels were shelled before the cob was burned. These cupules were from cobs that were thrown away after processing. In addition to the maize cobs, the destruction fill layer also had nutshell and acorn cap fragments. Very little “accidentally charred” or stored food residue in the form of edible grains, seeds, fish scale, or well-preserved tuber fragments are present in any layer of the root cellar, which is in contrast with other areas of the site where such remains were more abundant. The only macrobotanical remains that ended up in the root cellar, during and after occupation, appear to be accidental inclusions, such as acorn caps and pinecone fragments, or the inedible by-products of edible plants, as demonstrated by the nutshell and maize cob fragments.

The artifact assemblage from the destruction fill primarily speaks to the destruction of this building. The layer was dominated by architectural artifacts: bricks, nails and window glass. Some of these nails had been preserved from decay by the high temperatures of the fire that consumed this structure. Evidently, some of the superstructure of the building ended up in this pit after collapsing in a final conflagration.

At this point, the story of this dwelling ends. Not so much because it stopped being a “place” in the landscape, but because the site has since been plowed and erosion has removed the uppermost layers of soil. It is quite possible that the pile of burned rubble, likely remembered locally as the former home of Thomas Atkinson, continued as part of the landscape for some period afterward, although any evidence has long vanished.

5. CONCLUSION

The integration of archaeobotanical data, microstratigraphy, and artifact analysis creates a powerful hermeneutic interpretive spiral. Recognition of the complexity of these deposits forces re-evaluation of more traditional analyses of root cellars that treat these features as single contexts, merely representing the period of occupation of a dwelling. While microstratigraphic analysis and supplemental evidence allowed for an extra high resolution approach to examining the full life history of the site, phytolith analysis was innovatively used to identify a pattern of occupation and abandonment for the structure that revealed broader changes in the surrounding landscape.

Within this single feature, the dramatic biological changes in the landscape that accompanied colonial life were clearly evident. Critical thinking about the implications of landscape cycles fortuitously sparked the notion of using a "phytolith chronology" to relatively sequence the layers, and confirm more definitively how much of the deposit represented post-occupation periods of abandonment. Phytoliths, micromorphology, and artifact analysis provided an idea of how the feature was originally constructed and kept "clean" during its functional use-life. Macrobotanical remains, microstratigraphy, phytoliths, and artifacts yielded pictures of the abandonment and redefinition of this dwelling as a "place" upon the landscape. The sum of the analyses bore witness to the dramatic end of this structure.

We hope the preceding discussion has provided several reasons for realigning the hierarchy of traditional data categories in archaeology. We believe this chapter demonstrates a number of important principles. Firstly, phytolith data should not be limited to off-site or 'paleoecological background' data. When framed with a critical eye, phytolith data can be meaningfully interpreted at site and feature level with sufficient sensitivity to demonstrate environmental change on an archaeological, human, single-generation scale. Secondly, formation processes, microstructure, depositional origin, and abandonment versus occupation fills must be considered when interpreting the contents of root cellars. Finally, and most importantly, we believe that placing such "niche" analyses in the foreground of interpretation is in many ways a critical step to a *better* mode and template for social interpretation. The first steps towards a more enriched anthropological understanding of an archaeological deposit begin with engaging new materialities that facilitate fresh and innovative interpretations.

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APPENDIX I: SUMMARY PERCENTAGES OF PHYTOLITH GROUPINGS

Phytolith summary groupings, percentages

	966	981	1010	1012	1015	1018	1019	1023
Panicoid	30.8	48	33.2	35.6	28.4	35.3	46.5	34.5
Pooid	7	14.6	13.7	18.3	46.1	31.9	16	22.7
Chloridoid	4.5	9.1	11.1	8.9	7.4	4.8	8	8.4
Arundinoid/ Other Grass	9.5	11.1	17.9	10.9	8.8	16.9	13.5	9.4
Arboreal/ Dicot	45.8	15.2	23.2	24.8	8.8	8.7	14.5	23.2
Asteraceae	1.5	0	0.5	1	0	1	1.5	1
Cyperaceae	1	2	0	0.5	0	1.4	0	0.5
Zea	0	0	0.5	0	0.5	0	0	0.5

Phytolith summary groupings, raw counts

	966	981	1010	1012	1015	1018	1019	1023
Panicoid	62	95	63	72	58	73	93	70
Pooid	14	29	26	37	94	66	32	46
Chloridoid	9	18	21	18	15	10	16	17
Arundinoid/ Other Grass	19	22	34	22	18	35	27	19
Arboreal/ Dicot	92	30	44	50	18	18	29	47
Asteraceae	3	0	1	2	0	2	3	2
Cyperaceae	2	4	0	1	0	3	0	1
Zea	0	0	1	0	1	0	0	1
Totals	201	198	190	202	204	207	200	203

APPENDIX II: SUMMARY OF MICROMORPHOLOGY UNIT DESCRIPTIONS

Slide / Unit	Interpreted Context Association	Boundary (length, form, sharpness, contrast)	C/F Limit	C/F ratio	Related Distribution
MS1A - U1	1012(?)	Diffuse, wavy, continuous, indicated by an increase in charcoal speckling	5 µm	70/30	Chitonic - r particles wholly or partially coated with finer material, grading to gefuric
MS1A - U2	1010	No boundary met	5 µm	60/40 more fine-organics and charcoal	Chitonic to porphyric, quartz grains surrounded by thin organic/clay coatings in some areas, in others imbedded in organic matrix
MS1B - U1	981	Undulating, diffuse, defined by change in microstructure - increase in fine material from clean almost pure sand, mixing evident	5 µm	95/5	Gefuric, very low quantity of bridging material
MS1B - U2	974	No boundary met	5 µm	60/40	Porphyric - r particles in a groundmass of finer material
MS2A - U1	974	Indistinct - discontinuous boundary defined by an increase in charcoal speckling and presence of clay coatings	5 µm	50/50	Largely single spaced porphryic, a range of unsorted clasts and organics in a finer groundmass, concentrations of organic, ferrous and various silt/sand groundmass

APPENDIX II (*cont.*)

Slide / Unit	Interpreted Context Association	Boundary (length, form, sharpness, contrast)	C/F Limit	C/F ratio	Related Distribution
MS2B - U1	981, 966, 974	Discontinuous curved, sharp boundary defined by an increase in charcoal content from c.5% to c.40% in some parts edged by decayed root channels	5 µm	40/50	Close porphryic to single spaced
MS2B - U2	981, 966, 974	No boundary met	5 µm	80/20 - 40/50 - variable through slide	Chitonic / close porphryic complex
MS3A - U1	1024 (Subsoil)	Clear and continuous, characterised by the edge of fine grained material of Unit 2	5 µm	40/60	Gefuric
MS3A – U2	Infilled root channel, no context	Undulose, diffuse	<2 µm	80/20	Monic
MS3A - U3	1019, 1023	Undulose, sharp, marked by a series of cracks and a decrease in clay in the overlying sediment, Clay alignment at base may be due to water permeation through cracks	5 µm	40/60	Porphyric
MS3A - U4	1023	Contrast defined by colour. Over lying unit is strong reddish colour	5 µm	40/60	Porphryic varying from single / double to open spaced. Apedal
MS3A – U5	1019, 1023	No boundary met	5 µm	50/50	Porphryic, single spaced
MS3B – U1	1015, 1019, 1018 (?)	No boundary met	5 µm	95/5	Gefuric

(*continued*)

APPENDIX II (*cont.*)

Slide / Unit	Microstructure Type	Void type, size, abundance, wall regularity	Void orientation (basic / referred)	Void distribution (basic / referred)	Groundmass - material type & arrangement
MS1A - U1	Inter-grain micro-aggregate grading to inter-grain vesicular pore structure. Apedal.	Complex packing voids 10%, some channels with serrate walls 20%	A degree of orientation with perpendicular cracks randomly arranged and distributed	Basic random, 2 channels, cracks have parallel orientation with one another	Sub-angular mineral grains, random arrangement and distribution
MS1A - U2	Apedal, Intergrain micro-aggregate, sand size grains linked by micro-aggregates of organic material to inter-grain vesicular pore structure	Complex packing voids, some channels, serrate walls, 10% channels, elongate to sub-rounded	Referred, unrelated	Basic, random	Clasts of sub-angular, poorly sorted mineral grains, random arrangement and orientation. Sand.
MS1B - U1	Single / bridged grain structure. Quartz grains loosely arranged with little fine material	Complex packing voids 10% - small gaps between clasts	Random, unrelated	Random	Sub-rounded quartz clasts, sand size, random arrangement
MS1B - U2	Inter-grain micro-aggregate to inter-grain vesicular pore structure	Few pores - no packing voids but some vughs, 30%, with serrate walls	Referred, unrelated	Basic, random	Sub-angular, poorly sorted mineral grains, random arrangement, sand size

APPENDIX II (*cont.*)

Slide / Unit	Microstructure Type	Void type, size, abundance, wall regularity	Void orientation (basic / referred)	Void distribution (basic / referred)	Groundmass - material type & arrangement
MS2A - U1	Complex microstructure accommodated aggregates, apedal, weakly developed sub-angular blocky peds with a wide range of sizes, seem to be associated with clusters of different material, varying Coarse fine ratio	Mainly vughs, 2 vesicular voids at top of unit, small channel voids, 20% abundant, partially accommodated, some where vegetation has rotted out. micro cracks, some with serrate walls, some slightly rounded.	Referred unrelated	Basic random	Sub-angular to angular poorly sorted mineral grains, some organics, 5% rotted not carbonised, unrelated orientation, random distribution. Clusters of included local material indicate mixing
MS2B - U1	Apedal, incomplete to weakly developed pedality in places	20% voids. Channels are lined with organic material and concentrations of crystals. Vughs are larger (900µm -70µm with serrate walls)	Referred unrelated	Basic random	Sub-angular serrate clasts of poorly sorted sand, unrelated orientation, random distribution
MS2B - U2	Apedal	25% voids including 1 of 1.5cm	Referred unrelated	Basic random	Sub-angular quartz clasts
MS3A - U1	Weakly developed pedality, poorly sorted compact grain structure	Complex packing voids, micro, 10% abundant, smooth walls, often where a clast has fallen out	Referred, unrelated	Basic, random	Randomly arranged quartz clasts, some feldspar

(*continued*)

APPENDIX II (*cont.*)

Slide / Unit	Microstructure Type	Void type, size, abundance, wall regularity	Void orientation (basic / referred)	Void distribution (basic / referred)	Groundmass - material type & arrangement
MS3A – U2	Massive structure	5%; All of these planer cutting down from overlying bed otherwise closely packed with no voids	Referred perpendicular	Referred perpendicular	NA
MS3A - U3	Possible semi-prismatic structure. Inter-grain micro aggregate structure with weakly developed pedality in places.	20% voids of these 50% channels, 50% vughs	Basic strongly orientated channels. Basic weakly orientated vughs	Referred perpendicular	Angular quartz silt, random arrangement
MS3A - U4	Inter-grain micro aggregate	10% voids of which 70% vughs, 30% plannar voids. Vughs un accommodated, planar voids accommodated	Vughs referred unrelated, planar basic, moderately orientated	Vughs basic, random, planar, basic, moderately orientated	Angular sand grains. Random distribution and orientation
MS3A – U5	Inter-grain micro aggregate. Pockets of well sorted homogeneous sand at top of unit. Red mottling, red/brown strong unusual colour.	10% vughs and cracks, both small and random	Random	Random	Angular sand grains. Random distribution and orientation
MS3B – U1	Pellicular grain structure, compact, apedal	30% total voids of which - complex packing voids 85% and vughs 15%	Referred unrelated	Basic random	Medium sand, Well sorted, interspersed with bands / pockets of finer, well sorted material

APPENDIX II (*cont.*)

Slide / Unit	Groundmass - fine material type & arrangement	Particle size min	Particle size max	Mineralogy (%)	Sorting
MS1A - U1	Clay/silt, micas show some alignment Round clasts, basic orientation, closely packed, not as coatings	Coarse: Sand Fine: Sand	Coarse: Silt Fine: Clay	75% quartz/feldspar 5% quartz rich rock clasts 15% biotite 2% glauconite 3% organic (inc. 1% brick, 3% charcoal 4% glass)	Poorly sorted
MS1A - U2	Organic, carbonised and other, 10% clay, silt, subangular	Coarse: Sand Fine: Fine sand	Coarse: Silt Fine: Clay	65% quartz/feldspar 30%organic, 2% rock 2% opaque material (inc. 2% brick, 2% iron/slag 25% charcoal)	Poorly sorted
MS1B - U1	Clay, silt, organic	Coarse: Sand Fine: Sand	Coarse: Silt Fine: Clay	95% quartz/feldspar 3% glaucontie 2% opaque material (inc. 1% bone, 2% iron/slag)	Medium (Coarse fraction well sorted)
MS1B - U2	Clay and organic	Coarse: Sand Fine: Fine sand	Coarse/fine: Clay	85% quartz/feldspar 10%organic 2% glaucontie 2% opaque material (inc. 1% bone, 2% iron/slag)	Poorly sorted
MS2A - U1	Dominantly clay / organic, ferric, some patches 90% clay, some r angular silt, moderately sorted, some local orientation of fabric in accordance with mixed lumps of material.	Coarse: Silt Fine: Clay	Coarse: Medium sand Fine: Very fine sand	80% quartz/feldspar 5% gluconite 5% opaque material 5% rock fragments 5% glass	Unsorted (churned up mixed deposit, no signs of natural depositional processes)

(*continued*)

APPENDIX II (*cont.*)

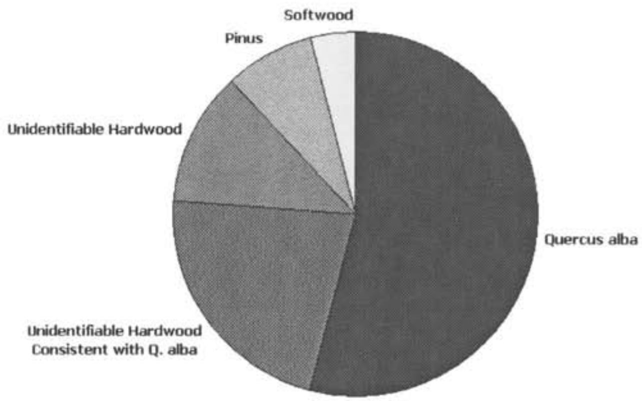
Slide / Unit	Groundmass - fine material type & arrangement	Particle size min	Particle size max	Mineralogy (%)	Sorting
MS2B - U1	Organic rich clay	Coarse: Silt Fine: Fine sand	Coarse: Coarse sand Fine: Medium sand	80% quartz/feldspar 2% clay 10% organics (inc. 30% charcoal)	Poorly sorted
MS2B - U2	Organic rich clay	Coarse: Silt Fine: silty clay	Coarse: Coarse sand Fine: Fine sand	70% quartz/feldspar 20% clay 10% organic (inc. 1% brick, 2% iron/slag, 3% glass, 50% charcoal)	Poorly sorted
MS3A - U1	Randomly arranged quartz clasts, some feldspar, silt and clay, some coating, speckled b fabric	Coarse: Silt Fine: Clay	Coarse: Sand Fine: Silt	55% quartz/feldspar 40% clay 5% organic	Poorly sorted
MS3A – U2	Banding in places , some alignment of biotite silt, seems to have been deposited as a single lens	Coarse / Fine Clay	Coarse / Fine Silt	80% quartz/feldspar 20% biotite	Well sorted
MS3A - U3	Clay, some alignment round clasts	Coarse / Fine Clay, some alignment round clasts	Coarse / Fine Medium sand	40% quartz/feldspar 60% clay	Poorly sorted
MS3A - U4	Silt and clay. Some alignment of clays around inclusions and in pockets	Coarse: Sandy clay loam Fine: Clay / silt	Coarse / Fine Sand	60% quartz/feldspar 40% clay biotite	Poorly Sorted

APPENDIX II (*cont.*)

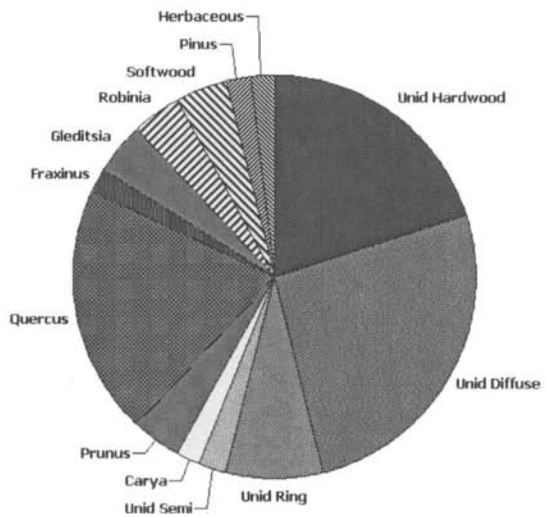
Slide / Unit	Groundmass - fine material type & arrangement	Particle size min	Particle size max	Mineralogy (%)	Sorting
MS3A – U5	Lenses but no banding	Coarse: Sandy clay loam Fine: Clay	Coarse / Fine Sand	70% quartz/feldspar 30% clay (inc. charcoal dust)	Poorly Sorted
MS3B – U1	Well sorted finer deposits roughly mixed with Coarser material, no indication of natural deposition	Coarse / Fine Silt	Coarse / Fine Sand	90% quartz/feldspar 6% glauconite, 2% opaque material (inc. 2% iron, charcoal dust)	70% well sorted, patches (30% - poorly sorted) Two well sorted deposits mixed

APPENDIX III: WOOD CHARCOAL IDENTIFICATION GRAPHS, CONTEXTS 1010 VS. CONTEXT 966

Context 1010 - Burnt Lens Wood Identification (N= 50 fragments)



Context 966 - Destruction Fill Wood Identification (N= 50 fragments)



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Chapter 6

ALTERNATIVES TO TRADITIONAL MODELS FOR THE CLASSIFICATION AND ANALYSIS OF PIPES OF THE EARLY COLONIAL CHESAPEAKE

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Abstract: The clay tobacco pipes known by such names as "Chesapeake," "terra cotta," or "Colonoware" (among others), have steadfastly resisted attempts by archaeologists of the early colonial Chesapeake to pin them down. There is no commonly agreed upon nomenclature, classification system, or interpretation for these intriguing artifacts, yet most efforts follow a predictable model centered on a traditional concept of typology. Here, the author discusses alternative analytical and classificatory strategies and their application to the problem of pipe production and distribution networks in and around Virginia's seventeenth-century capital at Jamestown.

Key words: Classification; clay tobacco pipes; production; seventeenth century; style; typology.

1. INTRODUCTION

Locally-made clay smoking pipes of the early colonial Chesapeake present an interesting puzzle to archaeologists. For over 50 years, we have used these artifacts to address a range of questions about life in the seventeenth-century tobacco colonies. Archaeologists have explored the range of variability in this tradition and compared this range with the contemporary clay pipe tradition of western Europe. American pipes have been primarily distinguished by their clay bodies, the color of which commonly ranges from pale yellow to dark brown, in contrast with the largely whiter and finer ball clay of pipes made in Europe and imported to the Chesapeake and other locations in the Atlantic world (e.g., Harrington, 1951; Henry, 1979; Crass, 1988). Particular attention has been paid to the wide range of decorative styles found embellishing these locally-made pipes (e.g., Emerson, 1999; Mouer et al., 1999; Monroe, 2002). The very question "How local is *local*?" has been broached as archaeologists have worked to determine the geographic extent of the tradition, initially identified in Virginia (Harrington, 1951), but later extended to the Greater Chesapeake, and possibly beyond (e.g., Magoon, 1999; Capone and Downs, 2004).

Archaeologists have also considered the timing of the tradition's introduction into the colonial Chesapeake, its florescence, and its eventual disappearance, all in the space of the "long" seventeenth century[1] (e.g., Deetz, 1993:91-102; Kelso and Straube, 2004:163-166). Hypotheses about the reason for this growth and decline are related to researchers' ideas about why the tradition existed in the first place: as an extension of the local Native American clay pipe tradition (e.g., Magoon, 1999; Mouer et al., 1999); as a stop-gap replacement for imported pipes (e.g., Henry, 1979; Miller, 1991); as a symbolically-charged alternative to European pipes for an increasingly African workforce (e.g., Emerson, 1988, 1999; Monroe, 2002); or as a form of independent craft production in an economy largely controlled by labor-owning elites (e.g., Agbe-Davies, 2004a).

If we think about this constellation of research questions in terms of the elements of a piece of investigative journalism: the who, what, where, when, how, and why of locally-made pipes, then this chapter emphasizes the how. How was this class of artifacts produced? How do the individual pipes differ and thence, how do assemblages of pipes differ from one another? How should we categorize the pipes in order to make sense of their diversity?

The emphasis of this paper is on the problem of classification. Fifty years into the study of locally-made pipes, there is no commonly agreed upon nomenclature or typology for these intriguing artifacts, but there have been standard or traditional ways of approaching them. I will discuss alternative analytical and classificatory strategies and their application to the problem of pipe production and distribution networks in and around Virginia's seventeenth-century capital at Jamestown.

2. CLASSIFICATION

Classifying, sorting, and grouping come naturally to us. Humans are classifying animals, but as social scientists, we have learned to be wary of

[1] For the "long" seventeenth century, see Wallerstein (1980).

accepting our culturally-specific categories as "natural" or universal. In the "typological debates"[2] of the mid twentieth century, researchers argued about the nature of archaeological classification systems. Should they be attempts to replicate systems of past societies, therefore the classifications must exist to be "discovered" by the analyst (e.g., Spaulding, 1953)? Or, are classifications a product of the analytical process itself, therefore their existence is contextual, to help the analyst make sense of the variability of a particular cultural phenomenon (e.g., Ford, 1954)? Weighing in on this debate, J. O. Brew (1971:105-106) famously remarked in his essay "The Use and Abuse of Taxonomy:"

> We need more rather than fewer classifications, always new classifications, to meet new needs. We must not be satisfied with a single classification of a group of artifacts or of a cultural development, for that way lies dogma and defeat. ... We need have no fear of changing established systems or of designing new ones, for it is only by such means that we can progress. ... We must recognize that any given system in its entirety will probably be applicable only to the given set of problems that it was designed to meet.

In other words, find a classification strategy that suits the problem at hand and do not be limited by the methods chosen by previous scholars. For the research discussed here, I was interested in identifying pipe production styles and comparing their distribution to elite social networks, as identified in the documentary record. However, I found that the usual means of classifying and analyzing locally-made pipes did not suit my problems or the dataset I had elected to study.

Let it be said that these locally-made pipes defy easy categorization. Traditionally, locally-made pipes have been classified into hierarchically-organized categories usually based on the use of molds, bowl shape, and decoration. Such classification schemes are called "taxonomies" (Dunnell, 1971:76-84; Adams and Adams, 1991:202-206). This kind of classification is familiar to us, even "natural," as with the Linnean taxonomy of species. Local pipe taxonomies have commonly been used to describe the appearance of pipes at a single site (e.g., Mitchell, 1983; Crass, 1988), or to compare the presence and absence of different pipe "types" across the Chesapeake region (e.g., Emerson, 1988). Figure 6-1 depicts the taxonomic organization of the classification scheme developed by Vivienne Mitchell for the identification of clay pipes from Nominy Plantation in Virginia. Taxonomies continue to be used effectively to create identification keys and standardized nomenclature for referring to assemblages of local pipes. A recent example (Gadsby and Sharpe, 2002) has the added interesting feature of a decimal

[2] For a concise summary of the typological debate, see Wylie (2002).

recording system, which would theoretically allow one to identify pipe fragments for which the higher-order attributes are missing, ambiguous, or indeterminate. Such a capacity gets around some of the problems with taxonomic classification in the following discussion.

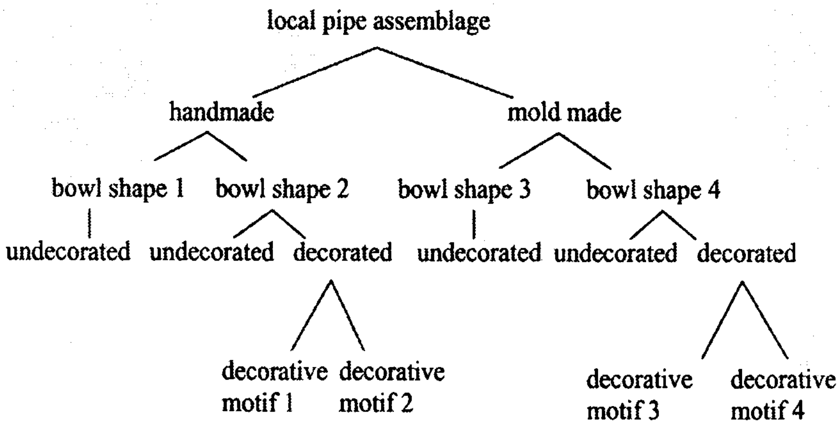

Figure 6-1. A hypothetical classification of local pipes, using the criteria specified in Mitchell (1983).

Another common method for making sense of these pipes uses contingency tables to examine the association of attributes, for example, bowl shape and decoration (Monroe, 2002), or pipe-forming technology and decoration (Henry, 1979). This method, sometimes known as "paradigmatic classification," identifies classes at the intersection of the relevant attributes (Dunnell, 1971:70-76). It has been used effectively to explore the range of stylistic conventions that governed the decoration of pipes manufactured in the seventeenth-century Chesapeake colonies. Table 6-1 depicts Susan Henry's paradigmatic classification of pipe fragments from the St. John's Site in Maryland. In this case, the study revealed the association between certain decorative motifs and mold-made pipes, with other motifs occurring on pipes formed without benefit of molds (Henry, 1979). Such findings may give archaeologists a window into the significance of the decorations or the principles governing their use.

Table 6-1. Association of bowl shape with surface decoration: Adapted from Henry (1979:31)

	Bowl Shape								
Design	A	B	C	D	E	F	G	H	I
1									
2		6	2	4	2				
3			4	1					
4			11	2					
5			6	8					
6			5	1					
7	1		1	1					
8			10	1	7	2	1	9	5
9								6	
10							1		
11								8	3
12								3	

However, taxonomies and paradigms are only two of several ways in which one could choose to understand local pipe variability[3]. Furthermore, both of these strategies have inherent weaknesses along with the strengths noted above. Taxonomic classification relies on a hierarchical principle. This means that without prior knowledge (or assumptions) about the relative inclusiveness of the attributes considered, the nature of the relationships among the classes is potentially ambiguous. For example, does the simple assemblage depicted in Figure 6-2 contain two classes with three subclasses, or three classes with two subclasses? It depends on the analyst's assessment of whether shape or shading is the more fundamental variable. Such seemingly arcane questions have increased significance when one begins to try to sort more complex assemblages, or cases for which some attributes are missing, or when a new combination of variables is discovered[4]. One also encounters problems if one uses non-mutually exclusive variables to distinguish among classes at the same hierarchical level. For example, if one class is identified based on the upright angle of the bowl, and another on the presence of facets, what does one do with the pipe depicted in Figure 6-3? Is it one of the former, one of the latter, or an entirely new class? Dilemmas such as these have led to the creation of some local pipe typologies with nearly as many as pipe classes as there are pipe specimens.

[3] For an extended discussion of kinds of classification and sorting, see Dunnell (1971).

[4] I am following the terminology used by Adams and Adams (1991:169-175). A variable (i.e., color) has multiple attributes (i.e., red, orange, etc.), of which a specimen may express only one.

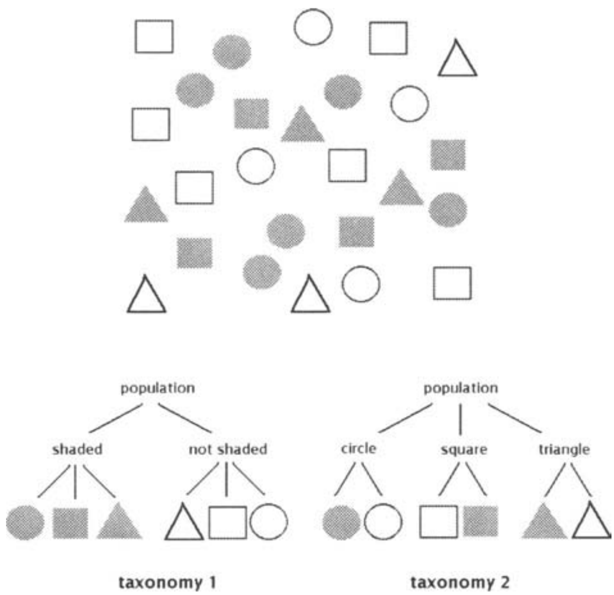

Figure 6-2. Problems arise with taxonomies when one does not have *a priori* knowledge about the relative position of variables within the taxonomic hierarchy.

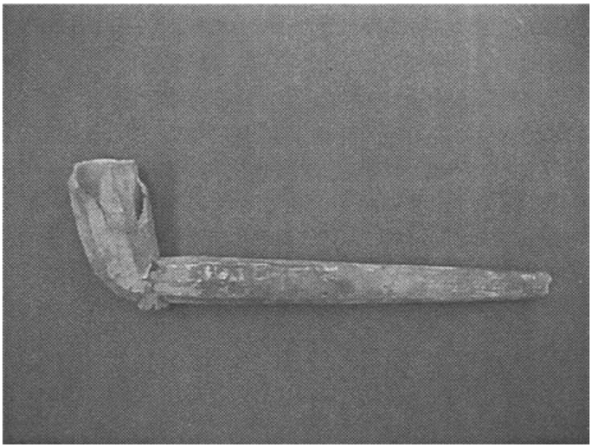

Figure 6-3. If "uprightness of bowl" and "faceted surface" are both positioned at the same level in a taxonomic hierarchy, this specimen presents an ambiguous case. And who is to say which variable (uprightness or faceting) should encompass the other? Photograph by the author.

Finally, we must acknowledge that the taxonomic method requires that the analyst decide in advance which attributes are most significant or of a higher order. This is because of the hierarchical nature of such systems. It is not always clear which variables should encompass or overarch others, so researchers often resort to the choices made by previous analysts. This is what I mean by "traditional" approaches to classification — the selection of variables and their placement within a taxonomy's hierarchy seems to depend more on what previous researchers have done than on the research question at hand, so the process of classifying becomes routinized, an artifact of archaeology's culture.

The inspiration for the use of taxonomic classification in early local pipe studies may have been the prevalence of the type-variety method of pottery classification in which one uses "ware to incorporate attributes of paste composition and surface finish, type to combine decorative techniques and vessel form, variety to differentiate within a type because of a new design style or a different temper ... and group to absorb those sherds that have a number of common attributes but cannot certainly be placed in a particular type" (Sabloff and Smith, 1969:279).

Following this system, one would have several "wares," each encompassing a range of "types," with any one "type" being broken down into a number of "varieties." But the necessity for "groups" indicates that the system is not a universal classification scheme that can account for all specimens. The analogues in the study of local pipes seem to be "ware:" white ball clay vs. red/yellow/brown local clay; "type:" mold vs. free-form manufacture; "variety:" bowl shape or other bowl attributes (i.e., heels) and surface decoration.

Archaeologists have used the paradigmatic strategy effectively to demonstrate the association of certain (primarily decorative) attributes found on locally-made pipes. I have already mentioned the effective correlation of certain bowl shapes with certain forms of surface decoration. However, there are several weaknesses in the paradigmatic approach as well. First, as practiced, paradigmatic classifications are often limited to relatively complete specimens, which, as I have shown elsewhere (Agbe-Davies, 2001a, 2001b, 2004a), are seldom truly representative of the variety present in local pipe assemblages. Furthermore, in cases where one wants to make comparisons between subsets, I have found that classes that rely on relatively complete specimens usually contain too few artifacts for statistical comparison (Agbe-Davies, 2004b). For example, one of the more common decorative strategies was to impress dentate lines at the juncture between the stem and the bowl of a pipe. However, Table 6-2 shows that there are not enough complete bowls to effectively demonstrate a statistically-significant association between this motif and forming techniques (i.e., shapes that appear to be free-form versus those made in molds) at the different sites. The expected (E) values for the chi-square table are so low as to be considered unreliable (Thomas, 1986:298). Yet, when all fragments can be taken into account (not just relatively complete bowls), the associations are much more clear. Rather than relying on bowl shape as an index of manufacturing techniques, Table 6-2 also shows the same decorative technique and its association (by site) with mold scars, which can be identified even on highly fragmented specimens.

Table 6-2. Problems with relying on more-complete specimens: The number of fragments that have the decorative trait studied *and* for which bowl forming can be assessed provide an inadequate sample for statistical comparison. The expected values (E) are such that the chi-square test is invalid.

Site	Free form	Mold made	Values
Drummond's Field	3	2	$\chi2 = 5.215$
Green Spring	10	9	df = 5
Jamestown	11	5	$0.5>p>0.25$
Page	3	0	
Port Anne	4	1	
Rich Neck	3	0	

Site	Without scar	With scar	Values
Drummond's Field	58	7	$\chi2 = 241.119$
Green Spring	39	51	df = 5
Jamestown	107	32	$p<0.001$
Page	41	0	
Port Anne	170	0	
Rich Neck	228	0	

Neither taxonomies nor paradigms are practical to use with large numbers of variables. Ordinarily, these methods use relatively complete artifacts and usually focus on a few what are often called "stylistic" variables. Much previous work in classifying locally-made pipes, whether taxonomically or paradigmatically, has privileged bowl shape and decoration. But, as we know, decorative style is marvelously malleable, and, to borrow a phrase, people are not photocopying machines (Lathrap, 1983:27). Decoration is an arena prone to innovation and idiosyncrasy as well as imitation. In fact, ethnoarchaeological and archaeological studies demonstrate the utility of considering technological style as well as decorative style (Lechtman, 1977; Sackett, 1990; Chilton, 1999). Because production methods are also socially learned and therefore subject to cultural forces (in addition to the limits imposed by materials or efficacy), they too may provide important information about production groups. Because the ultimate research questions for this project would address the distribution of different pipe production styles, it was important to use a classification technique that could accommodate a wide range of stylistic variables, not only decorative motif and bowl shape.

I found inspiration in the work of Irving Rouse (1939) and his concept of "modal analysis" or "analytical classification." First discussed in *Prehistory in Haiti*, modal analysis proceeds by sequentially sorting an assemblage according to a series of variables. The end result of modal analysis is not a single classification, but a series of cross-cutting groupings, each one based on a different attribute or "mode." Compare, for example, Figure 6-4 with Figure 6-1 and Table 6-1. The two modes in Figure 6-4 are not mutually exclusive alternatives to one another, which would force the analyst to decide which is best often without attention to the questions that the system is meant to address (cf. Brew, 1971). Nor are the modes an attempt to associate the two variables (shape and shading). Rather, the two modes are two different ways of viewing the same assemblage, both valid and both potentially informative. Unlike taxonomic or paradigmatic classification, modal analysis does not rely on *a priori* assumptions about the relative significance or inclusiveness of different variables.

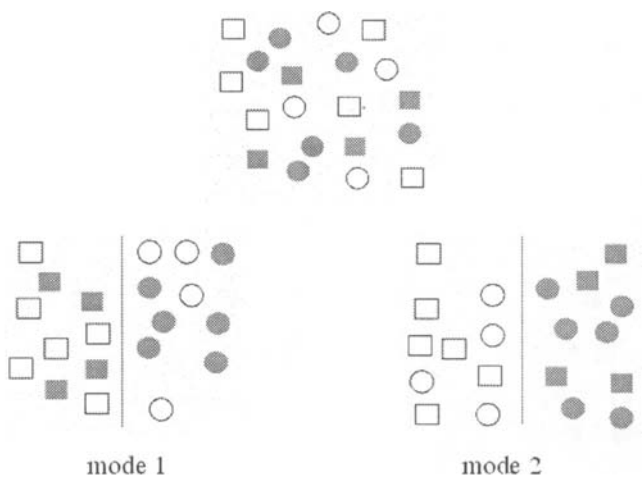

Figure 6-4. Modal analysis consists of a sequential sorting of artifacts, first according to one variable, and then another.

Another benefit of modal analysis is that it does not restrict the analyst to an overly narrow sample of the artifact assemblage. Most significantly, it does not privilege relatively complete specimens. Modal analysis is particularly suited for looking at fragments, since it does not require the co-association of traits or complete objects to derive groupings. It is also well adapted to the study of technological and manufacturing attributes — such as firing cores, fabric composition, and construction techniques — attributes that, incidentally, are more readily observed from fragments (Rouse, 1939:26, 139-140; see also Rouse, 1971). In his discussion of the classification strategies to apply to different archaeological problems, Rouse (1971:119) suggests that "modes are the best unit to use in studying cultural distributions. One may trace their persistence and their relative popularity through time ... or their diffusion from area to area," which is, of course, key to an archaeological study of production and distribution.

3. THE CASE OF LOCALLY MADE PIPES

Clearly, modal analysis has been around for a long time, but working with large assemblages and large numbers of attributes becomes much more feasible with the use of computerized databases and calculation techniques. The database I designed for the current research included information on over forty variables identified on locally-made pipes from eleven later seventeenth-century sites at and around Jamestown, Virginia (Agbe-Davies, 2004a:134-162). The variables are shown in Table 6-3 and Figure 6-5.

Table 6-3. Variables catalogued for each pipe fragment.

Variable	Comments
Bowl shape	with reference to Henry (1979), Oswald (1975), and Atkinson and Oswald (1969)
Fabric texture	at the break
Surface texture	
Visible inclusions	
Color	with reference to Munsell Color Company (1975)
Core appearance	with reference to Orton et al. (1993: Figure 5.3)
Firing cloud present/absent	
Striation type	with reference to Shepard (1956: Figure 13)
Bowl formation	i.e.: manner in which bowl rendered hollow
Pinching	i.e.: fingerprints or crushed while plastic
Multiple bores	
Lip formation	i.e.: manner in which lip finished
Mouthpiece	i.e.: manner in which mouthpiece finished
Bowl base	

Table 6-4. (*cont.*)

Variable	Comments
Scraped or knife-trimmed	
Painted / slipped	
Glazed	
Waster	
Nine metric variables	with reference to Harrington (1954), Alvey and Laxton (1974), Emerson (1988), D. Gadsby (pers. comm., 2001), and W.E. Pittman (pers. comm., 2001)
Motif name	shape of design
Motif method	mark left by decorating implement
Motif tool	kind of implement used
Motif location	
Mold scar treatment	e.g.: untreated, smoothed, etc.
Mold scar location	
Text mark	i.e.: manner in which text rendered
Text content	
Site name	
Site subset	
Completeness	
Mends	
Post-manufacturing modification	
Smoked	

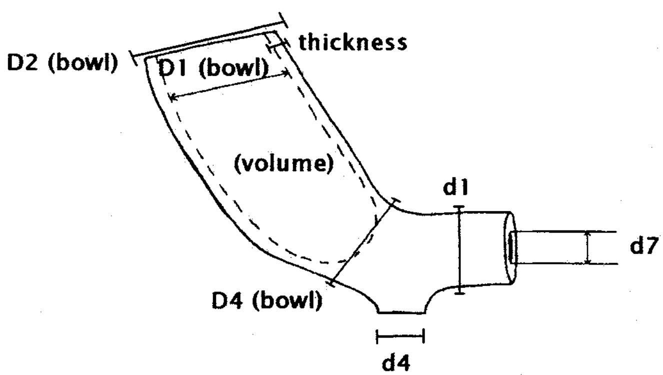

Figure 6-5. Measurements taken from the pipe fragments.

The eleven sites were carefully chosen for this analysis. Each of the sites has a unique history, yet the close social connections documented between the individual owners and occupants of the sites provide a baseline against which one can compare evidence for shared production styles and/or exchange (Agbe-Davies, 2004a:164-235, 269-284). The sites needed to be relatively close together, allowing for exchange, should that be a factor in the distribution of the pipes (Figure 6-6). Each of the plantation sites, and one (perhaps two) of the Jamestown sites, show evidence of ceramic production — whether it be pipes, pottery, bricks or tile. Finally, the analysis of any potential networks required a focus on a particular segment of time, and so I chose to deal with the latter half of the seventeenth century, a time during which both cooperative and acrimonious relationships among elites, as well as the tensions between elites and non-elites, were brought into high relief by an armed challenge to the social order — namely Bacon's Rebellion. The late seventeenth century was also a period during which the wealthiest households in the Virginia tidewater were shifting their investment in human labor from indentured servants to slaves (Morgan, 1975).

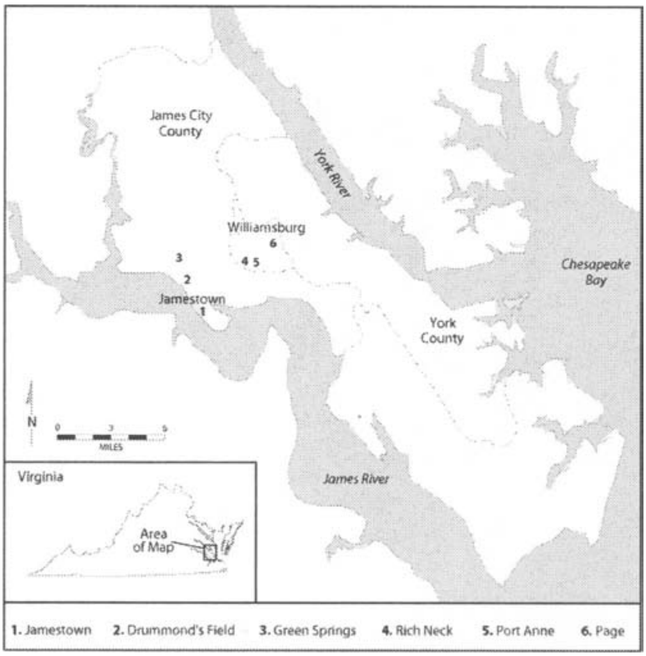

Figure 6-6. Map showing the location of the sites included in the study. Illustration by Heather Harvey.

Rather than creating predetermined classes within a taxonomy or a paradigm, and then recording the presence of these classes within the assemblage of pipes studied from each of the sites, every pipe fragment was catalogued, recording the chosen attributes individually so that each fragment could then be sorted (virtually) into modes by each of the relevant variables.

The analysis summarized in the remainder of this paper is based on the data I collected on the nominal variables associated with the nearly 5,000 pipe fragments catalogued in this manner. These variables were the modes that I then used to compare different batches of pipes. Much of this work was performed using one of the most basic and frequently used statistics in archaeology: the chi-square. Unlike its use in the identification of paradigmatic classes in which the association of traits is tested, I used the chi-square to determine the extent to which sites were representative or biased (i.e., distinctive) samples of the combined assemblage, and the degree to which sites differed from one another on a variable-by-variable basis.

For example, I tested the rate of mold scar occurrence at the different sites against that of the combined pipe assemblage[5]. I was able to identify six sites at which there were more than the usual number of pipe fragments with mold scars, and four sites at which there was a dearth of mold scars (Table 6-4). Several sites, notably Green Spring, and all of the Jamestown sites except Structure 127, had far more pipe fragments with mold scars than would be expected in a random sample from the entire population of pipe fragments studied. The other plantation sites, with the exception of the Page Site, had far more pipe fragments without mold scars. These facts suggest a very different mode of pipe production among those who are making the pipes found at Jamestown and Green Spring versus the techniques used by those making the pipes recovered from more remote plantations.

Table 6-5. Comparing assemblages with respect to the presence of mold scars: A "+" indicates more fragments with mold scars than the norm, a "*" indicates a higher than normal number of fragments with no scars.

Site	No mold scars	Mold scars present
Drummond's Field*	802	60
Green Spring+	439	162
Jamestown Str. 19+	163	58
Jamestown Str. 26/27+	70	38
Jamestown Str. 100+	191	42
Jamestown Str. 112+	211	55
Jamestown Str. 127*	81	2
Jamestown Str. 144+	317	61
Page	146	14
Port Anne*	505	12
Rich Neck*	1501	42
Population	4426	546

[5] "Mold scars" refer to the evidence of the seam left after forming the pipe in a two-part mold.

Another area of interesting variation is the manner of finishing the pipe lip. At some of the sites, there was more evidence of the use of a rotating tool that created an even and symmetrical lip profile (what I have called "tooling"), whereas at other sites, the pipe lips were more often cut straight across with a blade, or even pinched in a very irregular manner (see Figure 6-7a and b). Tooled lips were more prevalent at Drummond's Field, Green Spring, and Jamestown Structures 19 and 112. Jamestown Structures 100 and 127 were notable for the number of pipe lips that seem to have been cut, wiped, pinched, or otherwise formed by hand, rather than with a specialized implement. Again, suggesting that Structure 127 is odd-site-out when it comes to the Jamestown structures (for more examples, see Agbe-Davies, 2004a).

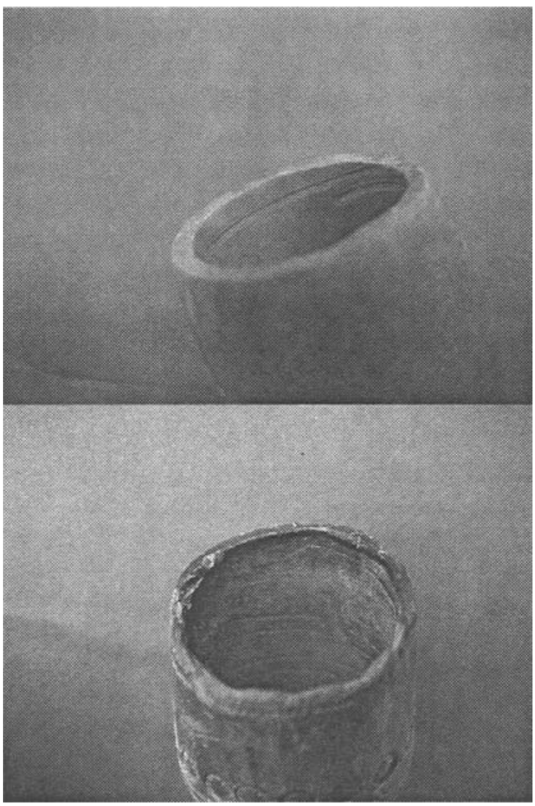

Figure 6-7. Pipes showing evidence of "tooling" (top) and a cut or carved lip (below).

It needs to be made perfectly clear, though, that these assessments are neither based on the simple presence or absence of these traits nor on a general sense of similarity based on simple counts or percentages. What I have been identifying are statistically significant differences that distinguish some sites from the combined assemblage. In other words, I am showing whether and to what extent the sites represent significantly distinct constellations of traits rather than randomly drawn samples of a heterogeneous population.

By assessing the degree to which and manner in which the site assemblages differed from the entire population of pipe fragments according to a wide variety of modes, I was also able to identify sites that consistently shared the same traits. For example, pipes from the site at Green Spring (home of Governor William Berkeley), shared many attributes with pipes recovered from a range of sites at Jamestown, the colony's capital. Most of the Jamestown structures, along with the Green Spring assemblages, stood out from the dataset as a whole along several variables that revealed similarities in terms of both decorative and technological style. The pipe surfaces were smoothed rather than burnished. Pipes had round rather than square heels[6]. Green Spring and Jamestown pipes tended not to show evidence of white slip, as is often seen on decorated local pipes. Many of the pipes showed mold scars as a result of having been formed in a two-part mold. The lips of the pipe bowls often showed evidence of having been shaped with a rotating tool rather than being cut with a sharp implement or pinched into shape. Finally, pipe fragments from Green Spring and Jamestown were more likely to reveal evidence of the bowls having been formed with a tool that was inserted and then removed straight out rather than rotated in place. Many of these attributes are consistent with the manufacturing processes used in industrial pipe making in England during the same time period (Agbe-Davies, 2004a).

Clearly, the sites differ from one another in a number of ways, but to what should we attribute this variation? I approached this problem by creating sub-assemblages defined by three different criteria: proximity; site type; and, social networks. In this way, I hoped to be able to identify the social processes and structures that shaped pipe distribution networks in and around seventeenth-century Jamestown.

The first structuring concept I addressed was proximity (see Figure 6-6). All of the sites are within six miles of each other. I grouped the sites that were closer together and well linked by known roads or waterways into "neighborhoods" (Table 6-5). The first set consisted of four neighborhoods:

[6] This was true of all of the Jamestown structures except Structure 127 and Structure 100.

all of the Jamestown sites combined; Drummond's Field and Green Spring; Rich Neck and Port Anne; and, the Page Site. The second set consisted of two neighborhoods, merging all of the sites on the western side of the project area versus those on the eastern side. I then compared the distinctiveness of these "neighborhood" groupings with that of the sites. In other words, I tested how well the neighborhood groups explained the variability of the pipe fragments they contained; as it happens, not very well.

Table 6-6. Geographical proximity among sites in the sample: The sites were grouped according to proximity (Neighborhoods I and II), and whether they were urban or rural, for the purposes of comparison.

Site	Neighborhood I	Neighborhood II	Site type
Drummond	Pasbehegh	West	Rural
Green Spring	Pasbehegh	West	Rural
Jamestown	Jamestown	West	Urban
Page	Page	East	Rural
Port Anne	Archer's Hope Creek	East	Rural
Rich Neck	Archer's Hope Creek	East	Rural

The neighborhood groupings were not as effective a means of explaining the assemblage variability as the site designations were. Variables that could be used to recognize significant differences among the eleven sites tended to be insignificant when comparing neighborhoods. Even those variables that showed significant differences at the neighborhood level, tended to be less well explained by that grouping. For example, the occurrence of multiple bores, which could be considered a barometer of pipemaker skill (or lack thereof) was differentially distributed across the eleven sites, but was not differentially distributed according to neighborhood. Likewise, bowl forming techniques were non-randomly distributed among the eleven sites, and distinguished the four neighborhoods from one another. But that variable was not useful in the east versus west comparison, and in the case of the four neighborhoods, amount of variability explained by the neighborhood sub-sets was weaker than that explained by the site sub-sets. Table 6-6 shows further examples of these comparisons. (Agbe-Davies, 2004a:303-305).

Table 6-7. Capacity for geographical proximity to explain variation: V is a measure of how well the variability among groups is explained by the groupings themselves.

	Site		Neighborhood I		Neighborhood II	
	Significant <0.05?	"V"	Significant <0.05?	"V"	Significant <0.05?	"V"
Scar presence / absence	Y	0.29	Y	0.24	Y	0.23
Firing core attributes	Y	0.09	Y	0.05	N	
Heel or spur presence / absence	Y	0.39	Y	0.28	Y	0.34
Heel shape	Y	0.28	Y	0.27	Y	0.09
Bowl forming technique	Y	0.19	Y	0.09	N	
Multiple bore presence / absence	Y	0.19	N		N	
Formed by pinching	Y	0.05	Y	0.04	Y	0.03
Presence of decoration	Y	0.14	Y	0.06	Y	0.07
Fabric texture	Y	0.09	N		N	

Next, I compared the modes identified on pipes from the sites at Jamestown against those identified at the other sites. I thought that there might be a distinction between the pipes from an urban site (insofar as one could call seventeenth-century Jamestown "urban")[7] and the surrounding rural plantation sites. Although there is archaeological evidence of specialized ceramic production at all of the sites studied, the documentary record indicates that throughout the seventeenth century, there were efforts to concentrate craft specialists in the capital (Horning, 1995). I thought that there might be recognizable differences between the decorative or technological styles of pipes depending on whether they came from urban or rural contexts (Table 6-7). Again, we see that the distinctions are less strong

[7] Horning (1995) and Bragdon et al. (1993) discuss the urban qualities of seventeenth-century Jamestown.

than those obtained when individual sites are compared. These discrepancies may reflect the peculiarity of Structure 127 and/or the tendency of the Green Spring pipes to closely resemble those from the Jamestown structures (excluding Structure 127) (see, for example, Agbe-Davies, 2004a:253, 301).

Table 6-8. Capacity for rural vs. urban distinctions to explain variation: V is a measure of how well the variability among groups is explained by the groupings themselves.

	Site		Rural vs. Urban	
	Significant <0.05?	"V"	Significant <0.05?	"V"
Scar presence / absence	Y	0.29	Y	0.17
Firing core attributes	Y	0.09	N	
Heel or spur presence / absence	Y	0.39	Y	0.32
Heel shape	Y	0.28	Y	0.19
Bowl forming technique	Y	0.19	Y	0.09
Multiple bore presence / absence	Y	0.19	N	
Formed by pinching	Y	0.05	N	
Presence of decoration	Y	0.14	N	
Fabric texture	Y	0.09	Y	0.03

These results also have a bearing on recent suggestions that the distribution of local pipe decorative styles indicates manufacture centered at Jamestown. Monroe and Mallios (2004:73) examined the presence and absence of local pipe decorative styles at sites along the James River and concluded that Jamestown was a center of pipe production and/or distribution based on the greater variety of pipes at Jamestown, with a drop-off curve showing less variety at sites further away from this center. However, given the measure used, it is difficult to assess whether this pattern indicates a Jamestown-centric industry or some other process. Jamestown, being the principal town and a place to which people ventured from all corners of the colony, could be the recipient of pipes brought in from a range of heterogeneous sources even for purposes other than redistribution or marketing (Hodder, 1979). Jamestown also could have a greater variety of pipe decoration styles because its occupation span encompasses the periods that are only partially covered by the plantation sites against which it was compared (Fraser Neiman, pers. comm. 2001). Finally, because the variables considered are primarily decorative as opposed to technological or isochrestic in nature, it is difficult to determine whether their distribution reflects the movement of items or the movement of ideas and/or symbols.

While the head-to-head comparison of all Jamestown sites with all plantation sites in my dataset failed to indicate sharp differences between urban and rural sites, there are nevertheless enough characteristics peculiar to several of the Jamestown sites (and to plantations closely linked to the capital) to suggest that Jamestown was not necessarily the source of the locally-made pipes found on contemporary colonial sites in its hinterland. For example, the Jamestown and Green Spring pipe fragments are distinct from Port Anne and Rich Neck and, to a lesser extent, Page in that they have surfaces that were smoothed rather than burnished, have round rather than square heels, have bowls and lips shaped with standardizing tools, do not have white slip or infill in the impressed or incised decorations, and have mold scars (Agbe-Davies, 2004a:301-302). All of these attributes can be associated with industrial (or mass) production of pipes, which, if anything, shows the Jamestown pipes to be part of a different kind of production regime altogether when compared with that seen in several of the other assemblages included in this study. Jamestown is therefore probably not the source of pipes for outlying sites.

It is likely that material examinations of the pipe fragments along the lines discussed by Vince and Peacey (this volume) would bring greater clarity to this question. In addition to Inductively-Coupled Plasma Spectroscopy, local pipes have been examined by X-Ray Diffraction (Moore, 1996; Key and Jones, 2000) and petrography (Capone and Downs, 2004). Indeed, results from the chemical analyses conceivably could be added to existing data, as additional modes for analysis.

Returning to the present results, modal analysis has been used to determine that the site assemblages were not randomly selected samples of the combined assemblage and were significantly different from one another. Even the Jamestown sites differed significantly, and predictably, from one another. Several of the sites shared traits, but these instances of sharing could not be completely explained by grouping the sites together according to their geographic location, or whether they were rural or urban sites. So, clearly the exchange networks that I was interested in were structured by additional factors.

Another possible explanation for the variation observed is that pipe production and exchange were directed by elite owners of labor and productive capital, and therefore organized along elite social networks. There is clear evidence for elite experimentation with revenue opportunities besides tobacco cultivation and political office, including small scale manufacturing ventures (Billings, 1996; Metz et al., 1998; Metz, 1999).

For this project, elite social networks were identified by examining the historical record for the years surrounding a period of intense conflict — Bacon's Rebellion. The identification was necessarily unsystematic, given the unsystematic preservation of seventeenth-century records for James City County. The purpose of this exercise was to characterize the relationships that existed between elite owners and occupants of the sites in the study population. Looking at the period from about 1650 to 1680, I identified site pairs for which I would be able to test the relative influence of proximity and social alliance on degree of similarity with the associated pipe assemblages (Table 6-8)[8].

Table 6-9. The intersection of proximity and amicability among owners / occupiers of the sites in the sample.

Amicable relations, distant sites	
Rich Neck	Green Spring
Str. 144	Rich Neck
Page	Str. 100
Page	Green Spring

Hostile relations, proximate sites	
Drummond	Green Spring
Drummond	Str. 144

Amicable relations, proximate sites	
Rich Neck	Port Anne
Green Spring	Str. 144

I compared the groups using modal analysis, determining which kind of site pair shared the most attributes. I found that sites where the owners or occupants were closely allied (or in some cases the same individual or family), and the sites were geographically close were most alike. For example, Green Spring and Structure 144 (an early statehouse at Jamestown, possible second residence of Berkeley, and one-time property of Berkeley's right-hand men, the Ludwell brothers) show the highest ratio of congruent attributes to significant differences. Sites where the owners or occupants had predominantly negative interactions, but where the sites were nevertheless close together, were the next most similar. For example, the long-term animosity that characterized Berkeley's relationship with William Drummond does not seem to have created a barrier through which pipes or

[8] The nature and extent of these relationships are discussed in detail in Agbe-Davies (2004a:269-284).

ideas about pipe making could not penetrate, as revealed on the pipe fragments recovered from their respective plantations. In fact, sites that were far apart geographically, but where owners were close in terms of social "space," differed the most. Though the Ludwells owned part of Structure 144 and were intimately involved in the administration of the colony, the lack of similarity between the pipe fragments recovered from Structure 144 and their own plantation, Rich Neck, suggest that there was little movement of pipes between the two locations (Agbe-Davies, 2004a:315-317).

These findings suggest that elite management was not a part of pipe distribution in Virginia's colonial capital and its suburbs. Elite conflict may have had a dampening effect on opportunities for pipe exchange, but elite friendships did not overcome the effects of distance when it came to fostering pipe exchange. Such insights have real bearing on the continuing discussion of the meaning of these fascinating artifacts. While it has been shown that locally-made pipes were consumed by non-elites (Neiman and King, 1999), the present research gives us greater reason to believe that the production and distribution networks for these pipes could also have been in the hands of non-elites. There are also ramifications for the ongoing discussion of the symbolism of the decorations found on local pipes. Confirming that the pipes were made not at the behest of planters, but through the initiative of other members of seventeenth-century Chesapeake society, gives additional credence to what had long been presumed: that local pipemakers and local pipe smokers were both operating outside of elite social and economic networks. It thus gives additional force to interpretations that emphasize the significance of these motifs for groups whose racial identity was both a product and a symbol of their disenfranchisement.

4. CONCLUSION

The last portion of this paper drifted away from the question of "how" and began to address "why" problems, but this was simply to show the application of the method and its use in the context of a particular archaeological problem. Modal analysis has proved a superior means of addressing a new question asked of a familiar dataset. Traditional methods, such as taxonomic and paradigmatic classification have their uses, but in this case, an innovative (if not new) approach was called for. As it stands, I will be able to use the data I collected about artifact modes and combine it in other ways, even using the modes as the basis for paradigmatic and taxonomic classes. But, by starting out with the recording and analytical strategy I have outlined, I was less limited than other researchers by received wisdom about what attributes to privilege and which artifacts and collections I could use.

I began this research with the idea of creating a generalized, universal typology, one that could be used as the basis for an identification key to account for every existing or potential pipe, along the lines of the taxonomic and paradigmatic systems described. But in working with the data, it became clear that these methods imposed serious limitations on the kinds of questions one would be able to ask and the artifacts and assemblages one could use. A critical focus on classification ensured that the categories I devised were suitable for the analytical methods I proposed to use and the problems I wished to address.

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Chapter 7

ARCHAEOLOGY AND THE ETHICS OF SCIENTIFIC DESTRUCTION

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Abstract: When archaeological research includes excavation, it is axiomatic that archaeologists engage in the destruction of the very truths they seek to discover. The means of such destruction have long been contested, but it is generally accepted that the industry standard is the stratigraphic method, by which deposits are excavated (destroyed) in the reverse order to their creation. The central system for recording that scientific destruction is also the stratigraphic method, intensively developed in archaeology over the last few decades. This chapter briefly discusses the stratigraphic revolution in archaeological methods ushered in by the invention of the Harris Matrix in the 1970s. It highlights the vital introduction of Geographical Information Systems (GIS) and computerized mapping. It concludes with a call for the introduction of detailed ethical standards for archaeological excavation and recording by professional archaeological organizations, such as the Society for Historical Archaeology, to name but one.

Key words: Archaeological documentation; ethics; GIS; Harris Matrix; single-surface recording; stratigraphic method; stratigraphy.

1. INTRODUCTION

Three decades ago (the passage of a classic generation that is sometimes required to effect change in scientific thought) the paradigm of archaeology changed with the invention of new methods of recording stratigraphic data on excavations. Yet, perhaps because archaeology is a discipline so rooted in the past, many in the profession have not assimilated that 'changing of the guard' or 'parting of the ways'. Three key ingredients have given archaeology the methods by which sites can be fully recorded, provided such sites are excavated stratigraphically. One was the introduction of the Harris Matrix, by which method the stratigraphic sequence of archaeological sites could be illustrated in a single diagram. That method caused the re-examination of recording systems and highlighted the overriding importance of surfaces in stratigraphic analyses. The recording of all surfaces became possible with the advent of GIS technology. These three items — the ability to see entire stratigraphic sequences, the recognition of the importance of surfaces in stratigraphic analyses, and the means to record fully all surfaces by GIS methods — have changed the paradigm of archaeology where it is engaged in the scientific study and often the destruction of archaeological evidence in the earth.

Using these methods, the archaeologist can fulfill the professional responsibilities that are accepted when an archaeological excavation is undertaken. For technical reasons, especially involving computerized recording systems, complete fulfillment was not possible in earlier generations. These methods provide for the translation of the physical evidence, which must of necessity be destroyed, into an archive of topographical and stratigraphic data that will meet a scientific evidentiary standard. Written ethical standards on archaeological methods of scientific excavation and recording have not kept pace with this paradigm shift and this oversight needs to be addressed by professional associations.

2. STRATIGRAPHIC REVOLUTION AND THE HARRIS MATRIX

Recently, a study of methods made its appearance on the archaeological stage, entitled *Critical Approaches to Fieldwork: Contemporary and Historical Archaeological Practice* (Lucas, 2001). Gavin Lucas, thoughtfully and extensively, reviewed aspects of archaeology, with particular emphasis on the development of the stratigraphic method. He notes the paradigm change, or revolution, brought in by the invention of the Harris Matrix in 1973, in a discussion on open area excavations versus those with retained baulks of unexcavated stratigraphic data.

> The combination of the matrix and single-context recording effectively meant that all baulk sections could be dispensed with... For the first time, stratigraphy became truly *independent* of the section. The basic conceptual difference between Harris's formulation of stratigraphy and

> that based on the section is that, for the former, *physical and stratigraphic relationships* are not conflated but distinct…
>
> Statements such as the following [published in 1974]…once uncontested, swiftly became untrue: 'The whole presentation of the excavator's stratigraphic analysis and hence his interpretation of the site has depended upon his sections, so they stand as the only record of that interpretation' (Lucas, 2001: 57, emphasis in original).

The Lucas volume should be required reading for archaeologists, but while ranging widely, he does not identify fully the other paradigm changes wrought by the Harris Matrix. Specifically, the Matrix changed the paradigm of stratigraphy in archaeology from the two-dimensional physical world of the section to its true nature as a four-dimensional entity, combining the three physical dimensions of stratigraphic units, plus the time dimension implicit in (but having to be interpreted from) the stratification of archaeological sites. It is ironic for a discipline that is so chronologically imbued, that the fourth dimension continues to be ignored in this context, with Matrix diagrams often described as representing only the three physical dimensions.

The Harris Matrix diagrams were eventually recognized for what they truly represent, that is, the stratigraphic sequence of archaeological sites. As time does not 'exist', it is given life and imagery in archaeology by the Matrix diagrams. In other words, the Harris Matrix made it possible, for the first time, for archaeologists to see the stratigraphic sequences of their sites. One might say that prior to this paradigm shift, archaeologists were working in the dark, especially on sites with hundreds and thousands of stratigraphic units.

This was the paradigm shift entirely missed by some critics of the Matrix, who were geologically oriented, but geology had not given archaeology any such method by which the stratigraphic sequences of archaeological sites could be seen and understood. It is this paradigm shift, combined with others, that, for the first time, gave archaeologists the means to record sites by established scientific (stratigraphic) standards, applicable anywhere in the world.

This paradigm shift has been otherwise recognized in another area of the discipline. In a chapter of the book *Medieval Archaeology* entitled "Breaking ranks: New ideas, new techniques…(1970–1989)," Christopher Gerrard states as follows, while also noting the advent of single surface planning:

> Previously, stratigraphic sequences had normally been displayed as sections, but this new technique forced excavators to define their contexts fully in plan on site and [to] display complete sequences on a single diagram. Since February 1973 the use of the matrix has spread right across the profession and was adopted by the former Department of Urban Archaeology at the Museum of London on rescue excavations in the City of London after 1975, initiating developments such as single-context planning and the use of computerised packages (Gerrard, 2003: 163).

It is assumed that Gerrard was referring to the world of medieval archaeology, for if the technique had spread across the entire profession, some of the comments made in this chapter would be unnecessary. His reference to the section as a stratigraphic sequence harks back to the section being the primary representation in the former stratigraphic paradigm in archaeology. However, sections, being only two-dimensional pictures of stratification, are not explicit stratigraphic sequences.

3. SURFACES AND GIS TECHNOLOGY

Following from the Harris Matrix, the changes effected by the adoption of single-context plans, or as would be preferred, "single-surface plans" (Doneus et al., 2003) as opposed to "phase plans" which record combined surfaces, meant that sites would be recorded in plan, as well as being excavated from surfaces downwards. Thus associated with single-surface planning are two paradigm shifts, one relating to excavation and the other to recording. Open area excavation heralded the irrevocable shift from an emphasis on vertical excavation and section recording to horizontal, or surface, excavation and plan recording.

While open area excavation had been the subject of much debate from the late 1960s and would eventually be paramount, the advocates of that excavation method did not fully appreciate that a similar paradigm shift also had to take place with regard to recording. Planning was to a great extent viewed as a matter of structural, or architectural, rather than primary stratigraphic recording. The importance of surfaces in stratigraphic analyses was first noted in the article "Interfaces in archaeological stratigraphy" (Brown and Harris, 1993).

In a recent paper on forensic archaeology, Ian Hanson (2004: 43) underlines the value of surfaces in a section on the "Loss of Evidence Through Destruction of the Stratified Sequence, and Non-Recognition of the Surface Interface:"

> For some archaeologists and anthropologists [the] surfaces between deposits are ignored... Many archaeologists outside Britain simply do not recognize the cut (and so the surface that represents it) as a significant stratigraphic entity (Lucas, 2001: 154). ... Some burial excavation techniques remove the backfilled soil within an identified grave as well as the surrounding stratified deposits through which the grave has been dug, as a single horizontal arbitrary unit ... [This method] destroys and ignores the stratigraphic sequence of the burial event, and additionally, the artifact retrieved often has no known stratigraphic origin other than that of the arbitrary unit.

Lucas (2001:54) notes that excavators at Winchester, England, introduced digging and recording by 'phase,' but this method in the end was a limiting factor in that it assumed that important phase, or period, surfaces could be identified during excavation and recorded in their entirety at that time. Hence other surfaces not in the phase surface were not recorded, and the phase plan that was drawn could not be changed after excavation. Under the 'phase plan' system, only surface units such as pits or postholes were seen as stratigraphic units and some attempt was made to isolate them in the record by a unique identifier number. The 'phase plan' recording system became as obsolete as the Wheelerian box with the introduction of single-surface planning in 1974. The system was tested shortly thereafter on a major site in the City of London and proved to be as efficacious and 'stratigraphically true' in practice, as this writer thought it to be in theory.

The stratigraphic paradigm shift from sectional views through deposits to an appreciation of immaterial surface units in stratification was absolutely necessary, for without giving surface units their full value in stratigraphic analyses, Harris Matrix or stratigraphic sequence diagrams could not be constructed that truly represented the stratigraphic history of the site. The reason for this is simply that surface units can be recorded in their entirety, whereas deposits can only ever be sampled. A section, by definition, can only be a sample, as it is a cut through but one plane of a given deposit. In addition, there are surfaces, such as the contours that on plan show a ditch or a pit, that have no associated deposits. Given the nature of archaeological sites, nearly all will have more surface units than deposit units.

Thus, surfaces are paramount in stratigraphic analyses and each and every one on an archaeological site must be recorded, individually, on a plan, with enough spot heights to allow for the formation of contour lines. Each surface unit must be numbered separately, including those that were formed by the making of a deposit. To do otherwise is to shorten and confuse the stratigraphic sequence of a site. Furthermore, it is the recorded definition of surfaces that defines the deposits of a site. The reverse, that is, the recording of surfaces by sections, cannot work, as sections are records of plane, not plan, views.

Recent work by colleagues at the University of Vienna, using GIS technology, identifies the way forward for archaeology in the recording of surfaces.

> [S]urfaces, the immaterial aspects of stratification, can be recorded entirely. Single surface recording provides the ability to virtually reconstruct the excavated volumes in three dimensions. Therefore, 3D recording of the top and bottom surfaces of any single deposit is necessary to fully reconstruct the part of the site that was destroyed during the process of excavation. The recording of a single surface can be done by giving it a unique number and documenting its boundary polygon as well as its topography ... a surface can be recorded in its entirety and that is the reason for its outstanding importance to stratigraphic analysis (Doneus et al., 2003).

By the Vienna Method, the upper surface is recorded, the associated deposit (so defined) is excavated, and the bottom surface of the deposit is also recorded. The two recorded surfaces fully represent the volume of the deposit, which can be 3D visualized in specific additional programs. In GIS at the moment only a 2.5D viewing of the data is possible. That means that a deposit can only be visualized by the two parts (top and bottom) of the whole, even though that is enough.

GIS enables single surface mapping, thus the graphical representation of the immaterial aspects combines with the descriptive information from the units of stratification, especially the deposits and finds. The GIS enables one to represent the data related to its true geographic position and perfectly combines planning with the descriptive record. Thus, the two surface records, through GIS computerization, can be combined to produce the hull, or physical capsule, that preserves the true volume and shape of the deposit. This cannot be done by section drawings, yet any number of section drawings can be generated by the computer if the surfaces are so recorded.

While GIS in itself does not represent a paradigm shift, its technology makes it possible, for the first time, for archaeologists to record all stratigraphic surfaces fully. By the same method, given such recording, it is also possible, for the first time, for archaeologists to reconstruct archaeological sites, not only what was built or accumulated there physically, but how, for much longer periods of time, the site was used on the immaterial surfaces founded on purpose-built strata or pre-existing stratification. Surfaces only exist and survive in their entirety in the completeness of stratigraphic recording. Deposits can only be sampled and must be destroyed if excavation is to proceed.

4. THE ETHICS OF ARCHAEOLOGICAL DESTRUCTION OF SCIENTIFIC EVIDENCE

Thus it is asserted that archaeology was irrevocably changed by paradigm shifts beginning with stratigraphic methods espoused in the 1950s and 1960s, open area excavation in the 1960s, and from 1973, with the Harris Matrix and associated concepts. The outcome of the paradigm shifts was straightforward and irrefutable: the only method that should be used to destroy archaeological sites, no matter their place or cultural period, is the stratigraphic method, now so well defined theoretically and supported practically by GIS technology.

This paradigm shift is somewhat overlooked by archaeological societies and professional associations, which have but generalized reference to the ethics of the matter in their bylaws or statements of standards. Books have been written and laws promulgated that pertain to archaeological ethics with regard to artifacts, but little is found that relates to the more important issue of the methods by which sites are destroyed by archaeologists. It is ironic that for all the emphasis that is placed on artifact ethics, artifacts survive the fact of excavation, whereas deposits and surfaces, the stratigraphic building blocks of the site, upon which so much of the meaning of artifacts depends, do not survive except in the records made during the excavation.

This is not to say that there should not be ethical standards for artifacts, but rather to demand that there should be such standards for the primary and fundamental scientific task of archaeological excavation. For an example of the generalized reference of the same, there is a statement by the Society for Historical Archaeology (SHA), recently published in its newsletter: "Members of the Society for Historical Archaeology have a duty to collect data accurately during investigations so that reliable data sets and site documentation are produced" (SHA, 2003:32). Under the ethics heading of "Responsibilities to the Archaeological Record," the Archaeological Institute of America (AIA) has no reference to the methods of data collection for excavations, an omission that is shared by other such societies. A glimmer of accountability seemed to appear in the 1995 code of the Society of Professional Archaeologists (SOPA), but it refers only to "Significant stratigraphic and/or associational relationships among artifacts, other specimens ... must also be fully and accurately recorded" (Vitelli, 1996:256; emphasis added). This does not address any requirement to record the stratification, all of which is significant for the compilation of the stratigraphic sequence, upon which all artifact analyses must rely.

The SOPA ethical statement is repeated without amplification in the guidelines of its successor organization, the Register of Professional Archaeologists (ROPA, 2000). The Institute of Field Archaeologists—the British equivalent of ROPA—skirts around the issue, noting that the "recording system used should be one that is appropriate to the requirements of the project in question" (IFA, 2001:7). Most other statements of ethics revolve around artifacts, so that the book, Archaeological Ethics (Vitelli, 1996), for example, contains no discussion of the scientific destruction of the stratigraphic record, a more fundamental ethical subject. Little mention is given to stratigraphic principles in the wide-ranging discussions of a Special Report of the Society for American Archaeology, namely *Ethics in American Archaeology: Challenges for the 1990s* (SAA, 1995).

Thus, this chapter calls for the introduction of ethical statements on this subject by professional archaeological societies and associations. These would state that archaeologists shall use stratigraphic principles on all excavations where loss of evidence can be prevented, with detailed requirements on the production of stratigraphic sequences, the recording of all stratigraphic units, especially in single-surface formats, and the isolation of artifacts to the stratigraphic units in which they were found. Such statements would also note that excavation by arbitrary levels is unethical, except within deposits already defined and recorded by the stratigraphic method or when excavating from the ground surface where stratigraphic deposits cannot be seen or recognized.

Such ethical standards are enforceable. Since the introduction of the Harris Matrix, it is now possible to audit any archaeological site records in the manner of an accountant. Such auditing is vitally important, as archaeologists should be able to justify their recording methods. This is due to the fact that the methods of the Harris Matrix and associated stratigraphic principles and recording systems are of universal application. The Harris Matrix and its allied methods are the double-entry bookkeeping system of archaeology. Any professional archaeologist, or even trained technician, should be able to audit the records of any excavation, anywhere, to determine that the data was correctly recorded and thus is sound archival evidence for what happened on a given site.

"Paydirt", in the form of recognition of this aspect of archaeological ethics seemed to be discovered in Brian Fagan's (1995) article, "Archaeology's Dirty Secret," but alas his discussion was about the scandal of unpublished excavations. Attention has been brought to that sorry state of unethical and irresponsible non-production on many occasions, but the best-kept dirty secret in archaeology is actually the destruction of archaeological sites without producing a stratigraphic record of modern, scientific caliber. This may be a major contributory factor in the lack of publications, for many sites cannot be put back together again, or recreated. The reasons for this are: 1) before the 1950s, the stratigraphic method was not well defined; 2) until the invention of the Harris Matrix, archaeologists had no means by which they could create and see the stratigraphic sequences of sites; 3) over half of the stratigraphic units on sites, the surfaces, were ignored or undervalued until the mid-1970s; and, 4) until the advent of GIS technology, it was simply not possible to record efficiently all surfaces and to produce later the hundreds of phase and period plans required for complex sites after the fact of excavation and analyses of artifact data.

In other words, we now have all the ingredients to carry out recording work as excavators in a professional manner and we have the means for recreating the site by such scientific stratigraphic methods combined with computer mapping technology. We have no excuses for not being able to put our archaeological sites back together again as well. Such recreation of a site is the foundation for its publication. The failure to record the stratification of a site by the methods of archaeological stratigraphy will result, inexorably, in the non-publication of the site, or in the publication of research that is inherently fallacious. The profession, through its professional associations, should demand that ethical standards for the scientific destruction of archaeological sites are promulgated, accepted and enforced around the world.

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Chapter 8

FINDING COMMON GROUND IN COMMON PLACES

Interdisciplinary methods for analyzing historic architecture on archaeological sites

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Abstract: As exemplified by James Deetz' use of Henry Glassie's ideas, there has long been a theoretical cross-fertilization between vernacular architecture studies and historical archaeology. This chapter presents a case study in which that cross-fertilization extended beyond theory to practice in the field. The project, a joint historical archaeology and vernacular architecture study, focused on the cultural landscape of southeastern Colorado, a fertile ground for both types of investigation. In this chapter the authors discuss significant theoretical foundations common to both disciplines, and suggest ways practitioners can benefit from one another's innovations and expertise.

Key words: Cultural geography; cultural landscapes; field documentation; field methods; interdisciplinary collaboration; vernacular architecture.

1. INTRODUCTION

One of the most difficult concepts to convey to students is that tangible remains of the past make up the archaeological record but they are not, in fact, data. Data are what we generate, in the field, in the lab, and through analysis. Our field documentation, the first stage of that data production, is the bedrock upon which all other forms of data and analysis rest. It is also one of the elements of our practice that we learn very early in our professional careers. Much has been written about the field school as an archaeological rite of passage (e.g., Goodwin, 1994; Perry, 2004). Like other such rituals, it is designed, in part, to recreate the culture from which it springs. Although many of us have spent agonizing hours in graduate seminars or conference hotel bars arguing the finer points of theoretical orientation, critical conversation is rarely turned to field practice. Precisely because these are the techniques we learned as neophytes and often replicate relatively unthinkingly, it is important that throughout our career we stop to think about what we do in the field.

This chapter is a collaborative project between a historical archaeologist (Bonnie Clark) and an architectural historian (Kathleen Corbett). In it we suggest that one class of remains that historical archaeologists often study, standing or partially-standing structures (especially buildings), are better served by an interdisciplinary approach, not just in analysis, but also in the field. Certainly we are not the first members of our respective disciplines to collaborate. People trained in architectural research, be they historians, preservationists, or folklorists, have long been involved in work on archaeological sites. Generations of students and archaeologists have been introduced by James Deetz to Henry Glassie's ideas about vernacular architecture through *In Small Things Forgotten* (Glassie, 1975; Deetz, 1977). Many public sites, especially those with architectural reconstructions (e.g., Colonial Williamsburg), are part of a legacy of collaboration between architects and archaeologists. Yet, what we are suggesting in this chapter, that architectural historians and historical archaeologists collaborate *in the field*, is in our experience both rare and valuable.

2. CONVERGENT THEORIES

In the twenty-first century, most of us who study the human legacy agree that, to at least a certain extent, method cannot be separated from theory. Before we launch into a discussion of an overlapping methodology, it seems appropriate to discuss the ways in which archaeological and architectural theory converge. As Dell Upton (2002) notes, architectural discourse has, in the last decade or so, begun to shift from a model based in representation and language to one that stresses spatiality and materiality. Discussions of space and material culture have been especially useful as scholars attempt to give deserved attention to the often overlooked architecture of the everyday places where, as Upton (2002:708) puts it, "the material settings of human life and ... the narrower concerns of professional design" intersect.

This emphatic shift has its roots in the works of social theoreticians, such as Henri Lefebvre and Pierre Bourdieu. Lefebvre's theories of the production of space posit an understanding of spaces as social processes in themselves, not just containers of social processes (Lefebvre, 1991; Crysler, 2003). Likewise, Bourdieu's theories of *habitus* and *doxa* explain the structure of social dispositions that form the spaces of everyday life (Bourdieu, 1977). Like archaeologists, these scholars use examples from history, looking to the past to explain the present. Bourdieu's ideas, especially his insistence that daily acts both form and are formed by the spaces around us, has been a fruitful starting point for both archaeological and architectural studies (Jones, 1997; Stevens, 1998; Silliman, 2001). Lefebvre's work has long informed architectural discourse (Hayden, 1995; Crysler, 2003), but is less well known in the archaeological community. His concern with the recursive nature of the material environment at multiple scales, from the body to the globe, has much to offer multiscalar archaeological analyses.

A second body of theory from which we both draw is found in the works of those who study cultural landscapes. Those of us who look at nineteenth- and twentieth-century sites in particular must understand the ever-increasing interconnectedness in the world brought about by the forces of modernity. Archaeologists use cultural landscape theory in an attempt to apprehend sites and site components in their larger contexts, just as those who practice vernacular architecture studies try to place buildings in context, spatially, culturally, and geographically. The works of cultural geographers such as John Brinckerhoff Jackson (1980, 1984) and others (Lewis, 1976, 1979; Groth, 1994, 1997) help us conceptualize built space by understanding its formation at a variety of scales and as a result of a series of cultural and economic processes. As Paul Groth (1997:3) notes, fundamental to this body of work is the tenet that "ordinary, everyday landscapes are important and worthy of study." That this is aligned with the goals of historical archaeology is clear, yet landscape research in the field has historically been concerned with designed landscapes, like William Paca's famous garden

(Leone, 1984). However, the focus is changing to the point that some suggest that the line between historical landscape archaeology and cultural geography is "beginning to blur" (Yamin and Metheny, 1996:xvi).

This theoretical overlap has not gone unnoticed by the larger fields of anthropology and architecture. In the 1960s and 1970s, a handful of architects and architectural historians, as a response to modernist design, began to look at the built environments of traditional cultures (e.g., Scully, 1962, 1975; Oliver, 1969; Norberg-Shulz, 1979). More recently, in 1996, the editors of the British architecture journal *Architectural Design* published a thematic issue entitled "Architecture and Anthropology." In the introductory editorial, "Why Anthropology?," Clare Melhuish proclaims that anthropology has much to offer architectural theoreticians and practitioners, both through its methods, such as fieldwork, and through the results of its research. "There is a real need for architecture to engage imaginatively with the patterns of life as it is lived in different situations" (Melhuish, 1996:8). This disciplinary shift, from an overall focus on architecture as art, or the *tabula rasa* of modernism, to a stronger commitment to culture and its diversity, continues in architectural journals like *Traditional Dwellings and Settlements Review*. Yet, when architects look to anthropologists for concrete discussions of vernacular architecture, they have often been disappointed. Although field notes might be filled with detail, published anthropological analyses of the actual built environment have often focused more on symbolism than structure.

Seizing upon this disciplinary lacuna, Mari-Jose Amerlinck has proposed the creation of a new subdiscipline, "Architectural Anthropology." As the editor of a book by the same name, Amerlinck (2001) takes anthropologists to task for believing that they have all the tools necessary to study any human phenomena. When it comes to buildings, he argues, "much insight is gained from an architectural awareness that permits us to understand and graphically convey and describe to others basic constructive mechanisms" (Amerlinck, 2001:11). If true interdisciplinarity in the study of built space is to occur, Amerlinck argues, it needs to involve both theory and practice. In his words, we have to share "the recipe and not just the cake" (Amerlinck, 2001:12).

3. COLLABORATING AT LA PLACITA

Theoretical background and research goals have not, in our fields, always been shared. However, this recent convergence has laid the groundwork for increased collaboration between historical archaeologists and practitioners of vernacular architecture studies; or at least that was the idea we had when we decided to take archaeologists, architects, and architectural historians into the field together. At the time, both of us were graduate students at the University of California at Berkeley, Corbett in Architectural History (which at UC-Berkeley is part of the College of Environmental Design) and Clark in Anthropology with a focus in historical archaeology. Our destination was the Pinon Canyon Maneuver Site, located in the wide-open spaces of southeastern Colorado (Figure 8-1). Here, arid climate and low economic productivity have been key factors in the preservation of the cultural landscape. Another boon to both of us was the regional preference for building in stone. The result is an area that is dotted with sites, small and large, where standing architecture is more the rule than the exception.

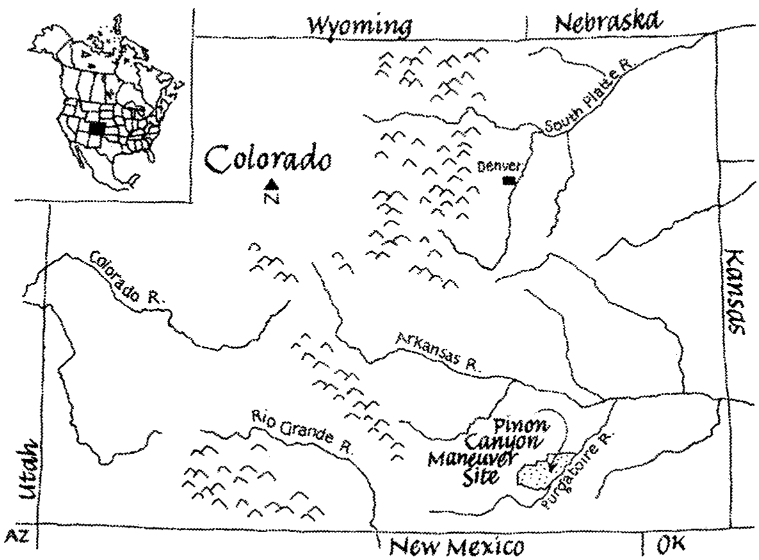

Figure 8-1. Location of research area. Illustration by H. Hinchman and L. Olson from Loendorf (1998:17). Used by permission.

Once a part of Spain and then Mexico, this portion of the American West is still home to descendants of the Hispanic, Anglo-American, and Native American occupants who shaped it from the beginnings of the historic period. Both of us were interested in how ethnicity was lived and built into the cultural landscape of the region. In particular Clark was concerned with how the region's majority Hispanics, who were losing political, economic, and demographic ground to incoming Anglo-Americans, balanced tradition and change during this time of struggle. In a period when their control over the area was slipping, what were the material expressions of Hispanic ethnicity? Corbett was interested in how the local architectural vernacular changed in the course of this cultural shift. As incoming Anglo-Americans imposed their ideas of good building on the Hispanic vernacular, they also drew from Hispanic stylistic and formal elements. How then did two distinct cultures come to establish a single regional vernacular?

Our main collaboration took place in the investigation of a site called La Placita, a small settlement built and occupied by Hispanics on the eve of the twentieth century. Protected by its abandonment and isolation, the site consists of a series of sandstone structures grouped around a small plaza or "placita." While the archaeologists and architects excavated, both inside and outside the structures, the architectural historians focused on documentation, through photos and measured drawings. The synergy of that experience taught us a number of lessons, three of which might be of interest to readers of a volume on method in historical archaeology.

4. LESSON 1: PERFORM FIELDWORK COLLABORATIVELY

Archaeologists who work on sites with architecture should bring along someone trained in architecture. Like most forehead-slappers, this one is easier said than done. It is certainly common in the field of cultural resources management (CRM) to staff projects involving standing structures with someone who specializes in architectural history, either in-house or as a subcontractor (e.g., Groth and Gutman, 1997). But our experience with such projects indicates that, even when both types of practitioners are involved, we tend not to go in the field together. We may speak to each other over the conference table, but projects are rarely proposed or designed in such a way as to allow digging and drawing together. If such collaboration in the field were written into the timelines and budgets of heritage management projects, our tangible history would benefit.

Historical archaeologists working in the academy seem to work even less frequently with those who study architecture than CRM archaeologists do. This is certainly reflective of traditional disciplinary divides. We work with colleagues in our departments, but often do not tap resources beyond them. This divide also owes something to the dominance of the study of high-style architecture in academic architectural history. Historic preservation specialists have to take what comes their way, but until recently many academic architectural historians were uninterested in the vernacular (Upton, 1991). Indeed, the one scholar most historical archaeologists identify with vernacular architecture studies is Henry Glassie (1975), who is by training a folklorist (e.g., Glassie, 1977). It has taken architectural historians a decade or two to discover the architecture of the everyday as a topic worthy of study, but this subdiscipline, as noted earlier, is well on its way. So, we humbly suggest that historical archaeologists go knocking on doors in architecture or art history departments. They are likely to find kindred spirits, whether at the faculty or graduate student level. Our experience suggests that students training to be architects can measure, draw, and add, which means it does not take much work to mold them into crack archaeological field hands.

This first step, going in the field together, made the next two lessons possible.

5. LESSON 2: STEAL FROM EACH OTHER

Stealing or borrowing — when it comes to field methods — one is the same as the other. Perhaps a more apropos term might be *adoption*. Whichever, we discovered that there was much that we could use in one another's kitbags. These kitbags include ways of seeing the site, and the tools and language we used to discover, record, and describe it.

Archaeologists concern themselves with architecture on a site as one part of the material culture found thereon. For an architectural historian though, the vernacular structure is often the "whole enchilada." Architectural historians often extrapolate the events that took place in a structure based on known practices in similar structures, with factors like the age of the building and ethnicity of the occupants taken into account, among many other things. The resulting conclusions, while usually sound, are not necessarily sure. For an architectural historian to investigate the structure while archaeological investigations are ongoing, allows for a much more detailed understanding of how houses or other types of buildings were used.

The best illustration of this at La Placita took place in the space between the two buildings that comprised the main house at the site. Until archaeological excavations revealed the postholes that told us the area had been a roofed *zaguán* (Figure 8-2), we had entertained the possibility that the two buildings were closely set, but separate, dwellings. Knowing that they

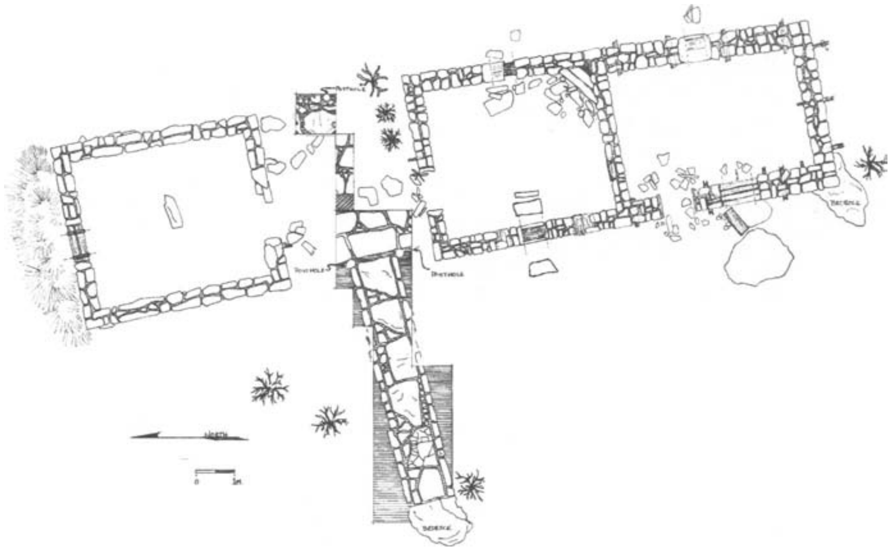

Figure 8-2. Composite plan showing architectural and excavation data. Compiled from illustrations by Kathleen Corbett and Pamela Rasfeld.

were thus linked allowed for a far better understanding of the use of space, not only in the *zaguán* itself, but in the entire house. As very closely spaced houses, these separated structures were anomalous within the Hispanic architectural vernacular of the area, but after excavation we understood them as typical (Figure 8-3). They were different elements of a single linear dwelling that included an "outdoor room," which the same excavations revealed had served primarily as a work space. Likewise, had unit excavations not revealed the buried walkway that extended into the plaza area from the *zaguán* (Figure 8-4), the theme of *display* at La Placita would not have come into play. This evidence was pivotal in Corbett's argument that, despite commonly held local belief, Hispanics in this economic class, and in such isolated circumstances, used built elements to communicate status in much the same way as their Anglo-American neighbors (Corbett, 2003).

This is not to suggest that architectural historians take up trowels and whisk brooms. Rather, we suggest that by understanding sub-surface artifacts and features to be as important to the story of a site as those that stand in place, architectural historians can gain a more complete picture. A more overt and concrete instance of stealing from one another's kitbags was Corbett's use of the speed grid the excavators used to facilitate unit

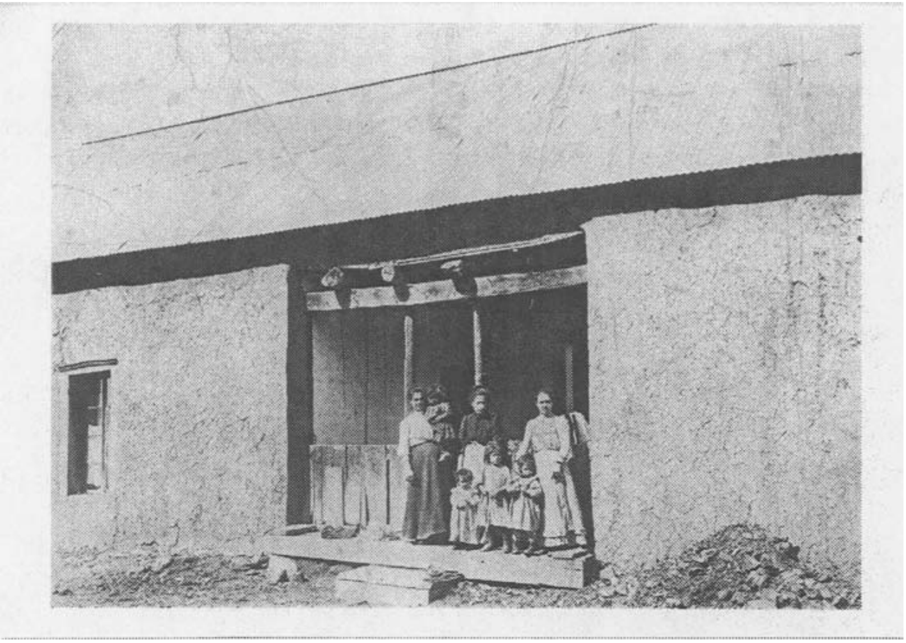

Figure 8-3. Historic photograph of Hispanic family in zaguán of their southeastern Colorado home. Photograph courtesy of the Colorado Historical Society (image #10028668). All Rights Reserved.

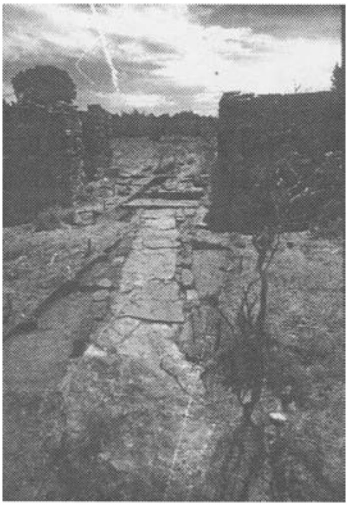

Figure 8-4. Zaguán and walkway at La Placita, post-excavation. Photograph by Kathleen Corbett.

sketching. Turned on its edge and hung on the exterior wall of one of the features, it clearly showed the coursing technique the masons had used to compensate for the sloping bedrock foundation of the building (Figure 8-5). In fact, it proved so useful for drawing masonry detail that the excavators had a hard time getting it back when they needed it to sketch units in plan.

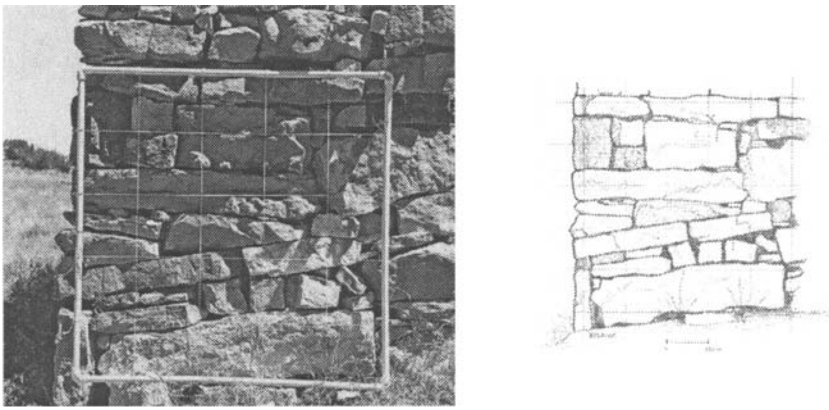

Figure 8-5. Photograph of drawing grid in place and sketch made with grid. Photo and illustration by Kathleen Corbett.

Appropriation works both ways, of course. Borrowing terminology from architectural historians meant that the description of structures written for the archaeological reports were both consistent with and more useful to those who research vernacular architecture. But terminology is not the only point of departure. When architectural historians document a site, they often focus on different elements using different methods. While archaeologists both can and do draw buildings in plan, i.e., a horizontal cross section of a structure (see Figure 8-2), architectural historians look to sections and elevations to help them think about how the ways form and style are expressed in vertical space (Figure 8-6). They tend to look very specifically at these elements, something archaeologists tend to do only generally. At La Placita, elevation drawings became a key piece of data that shored up archaeological discussions about how ethnicity was expressed in style and technology. Figure 8-7 is an elevation drawing of the remains of a door jamb that clearly shows flat stones set parallel and upright. Why this masonry technique was utilized is unclear; it may have been a stone- or mortar-saving move. Regardless, this technique gives the impression that massive stones were used when they were not. Although evidence of this technique is present at other Hispanic sites in the area, it is not commonly seen at Anglo-American-built sites (Corbett, 2003). In addition, noting architectural detail, such as whether windows were casement or double hung, told us something about the economic picture at the site, and to some extent helped us date building episodes more accurately.

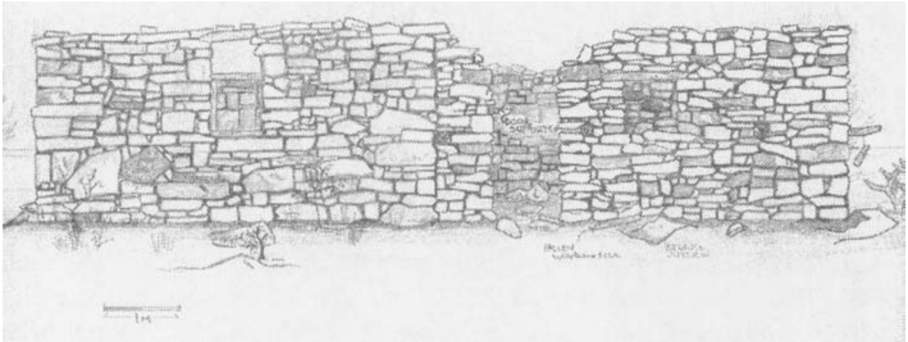

Figure 8-6. Architectural elevation drawing. Illustration by Kathleen Corbett.

Figure 8-7. Wall Section. Illustration by Jody Estes.

6. LESSON 3: WORK IN THE GAPS

If we have learned only one thing from philosophers of science, it is this: paradigms can cause disciplinary blind spots. However, it does not always take a Kuhnian paradigm shift for new elements to come into view. Collaboration means that an outsider gets a quick inside track, and outsiders can often see what is, to insiders, invisible. This was certainly the case for our research.

The Pinon Canyon Maneuver Site, within which La Placita is located, is a nearly quarter-million acre parcel of land controlled by the U.S. Army. As part of their compliance with legal mandates, the Army undertook a survey of all the parcel's architectural resources. The sites included in that architectural history were only those easily located in the historic record (Haynes and Bastian, 1987). As it turned out, over 50 sites with standing structures were categorically ignored through this strategy (Carrillo et al., 1996). One of those sites was La Placita, whose buildings were created with such care and skill that they mostly still stand, despite having been abandoned for over 100 years. In fact, the site has since been nominated for the National Register of Historic Places based both on its architecture and its archaeology. It was archaeologists who reclaimed La Placita and a host of sites like it.

Nonetheless, archaeologists have their gaps too. Although a number of archaeologists have taken issue with the site-centered approach (e.g., Dunnell and Dancey, 1983; Zierden and Herman, 1996), it is still the norm for archaeological research. Because of the time and resource commitment involved in excavation, the archaeological view tends to be strongly site-focused, especially in academic work. But architectural historians are trained in the comparative approach. Because of this method, architectural historians tend to look at a variety of examples rather than focus in on one or two structures or sites.

Clark's work on this project was tightly focused on La Placita and one other Hispanic occupation site. Corbett, who took seriously the idea that Anglo-Americans have ethnicity too, looked at a number of other sites in the region, including one just across the creek from La Placita. Moses Stephens, who moved to the area from Michigan, was a neighbor of the residents of La Placita. Although he built using the same native sandstone as his neighbors, he approached the material in a completely different way. Where the builders of La Placita created irregular coursing that played up the natural shape of the stone, Stephens quarried his stone, creating elaborate random ashlar walls (Figure 8-8). These two very different approaches to the same raw material highlight different cultural expectations of the proper way to build a house (Corbett, 2003). On her own, Clark would probably never have looked at the Moses Stephens Site, but in investigating it with Corbett, she realized that it provided important context for her own work. That these neighbors expressed such different attitudes towards natural elements of their shared landscape was an important insight into the way residents lived their ethnicity (Clark, 2003). Any collaboration means there are more eyes to see overlooked elements, but interdisciplinary collaborations expand our vision even more.

In 2003, Clark was invited to give a paper at the annual National Trust for Historic Preservation meeting, whose members received her work enthusiastically. One comment card even said, "Archaeology rocks!" Although historical archaeologists often think that they exist in some sort of limbo (Wilkie, 2005)—not really archaeologists, not really historians, certainly not architects—in fact, many organizations like the National Trust are very open to and interested in historical archaeology and the ways it informs preservation issues and architectural research. Likewise, Corbett has presented her archaeology-informed research to members of the Society of Architectural Historians (2004) and members of the Vernacular Architecture Forum (2005). Archaeologists may find it worthwhile to attend the meetings of the National Trust and similar organizations like the Vernacular Architecture Forum. While archaeologists well understand architecture as being on the continuum of material culture, preservationists less often understand material culture revealed through archaeology as being on a continuum with the built environment. By acknowledging and publicizing the shared concerns of our disciplines, we can better meet our ethical obligations to the increasingly threatened tangible past.

This chapter has sprung from a very simple idea, that historical archaeologists need architectural historians, and vice versa. Most historical archaeologists would never think of taking on the task of analyzing recovered botanical or faunal materials from their sites without consulting an expert in those remains. Yet they often tackle standing or partially standing structures without batting an eye. Certainly a few archaeologists do have the expertise to do justice to the architecture on their sites. But, as the fields of anthropology and architecture continue to converge, the possibilities for and benefits to be derived from collaboration grow. Starting collaboration in the dirt phase of our research means our discussion phase will be that much more fruitful.

Figure 8-8. Top, detail of architecture at Moses Stephens Site; bottom, detail of architecture at La Placita. Photographs by Kathleen Corbett.

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Chapter 9

RE-EXCAVATION, REFLEXIVITY AND RESPONSIBILITY AT COLONIAL WILLIAMSBURG

The archaeology of archaeology and the refinement of site interpretation

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Abstract: It has been said that archaeological excavation is always about walking in another's footsteps so far as excavation is concerned but few archaeologists have the opportunity to excavate their own excavations, as well as those of their predecessors. In 1984, the authors excavated an excavation done in 1955, and eighteen years later excavated their excavation, only to learn that they were in their own way no closer to understanding the physical evidence than the restoration architects who did the first digging. This contribution examines the importance of repetition in archaeological fieldwork, notably as a source of both interpretive revision and technical refinement. It is argued that the archaeology of archaeology is essential to sound methodology within historical archaeology, especially at a time when field methods in common use have become so routine and formulaic.

Key words: Archival recording standards; Colonial Williamsburg; Peyton Randolph; reflexive excavation; re-excavation; repetition of fieldwork.

1. INTRODUCTION

Inasmuch as excavating an excavation can be called repetitive, all archaeological practice could be ascribed the same character; it is an encounter that has taken place before (Lucas, 2001a: 202).

With this observation, Gavin Lucas challenges us to think about the process of excavation not as Philip Barker did a generation before, as a destructive action, or an "unrepeatable experiment" (Barker, 1982: 11-12). Instead, Lucas wants us to see excavation as a "transformative process" in which our actions, undertaken in the present, become part of the on-going record of physical effects at a site. He offered up this argument as part of a general consideration of what it means to follow in another archaeologist's footsteps. Since implementing a more anthropologically-oriented archaeological research plan at Colonial Williamsburg in 1982, we have had the opportunity to follow in any number of archaeologists' footsteps, at Jamestown, in Yorktown, at George Washington's Birthplace, and, of course, within the Historic Area of Williamsburg. We have come to know what it means to view archaeological excavation as an act of repetition, perhaps setting a record during the summer of 1993, when we oversaw the *seventh* excavation at Structure 17 in Jamestown, a controversial building in the interpretive history of the New World's first permanent English settlement (Horning and Edwards, 2000).

This chapter explores some of the implications of archaeological excavation as repetitive practice, viewed in the context of the discipline's recent discussions of self- reflexivity (Hassan, 1997; Hodder, 1997, 2003; Chadwick, 1998, 2003; Andrews et al., 2000) as part of the process of digging and recording archaeological sites. What, in fact, do archaeologists learn by having the opportunity to look more than once at the same piece of the archaeological record, either through the recurrent examination of the physical evidence itself, the records made of such evidence, or the combination of the two? What lessons do these acts of repetition hold for the practice of field archaeology, and for related issues such as the matter of a conservation ethic in archaeological preservation and stewardship?

2. THE FIRST TIME

There is a first time for every site excavation but second looks, let alone third chances at excavation, as opposed to collections research, are comparatively rare in archaeology. Such opportunities are mostly encountered in the context of heritage sites, which have been developed as museums, or set aside and protected from other kinds of development. One such place, where archaeological excavation has a long history, is the Historic Area of Williamsburg, Virginia, where many acts of repetitive excavation have take place since trained archaeologists arrived on the scene in the mid 1950s. Prior to this period, beginning in the 1930s, "archaeology" of a more rudimentary sort, involving extensive, destructive digging in a haphazard manner (in some cases, removing backdirt from the site and backfilling with material from other sites in Williamsburg [Edwards et al., 2000]) was performed throughout the parcel of land destined to be restored to its eighteenth-century appearance.

The first opportunity we present to consider the influence of the prevailing archaeological precepts, and their influence on the same evidence came in 1955, with the first excavation that can properly be called systematic or ordered at the site of Peyton Randolph's home. Randolph, a prominent revolutionary, made his home in Williamsburg between 1737 and 1775 on property inherited from his father, John Randolph, who succeeded several other previous colonists in owning and building on the property, starting in 1714. The property has been excavated numerous times since the initial restoration project of Williamsburg in the 1930s, with the intent of reconstructing the property to appear as it did during Peyton Randolph's tenure in the 1770s.

Archaeologist James Knight first worked on the location of "the old dairy," a structural footprint discovered by the Foundation's architectural staff in a 1955 cross-trenching expedition. Although, as easily seen in Figure 9-1, a distinct hierarchical structure operated under Knight's direction, far from the multivocalist ethos described by Conkey and Tringham (1995), Hodder (2000) and others, it is no less, as Lucas (2001b) argues, a "materializing process," generating a record of the site contingent upon the common archaeological "language" of the skilled excavators. The norms of the "materializing process" under Knight and his team, however, would be alien to the modern archaeologist accustomed to an "acceptable" modern toolkit of quarter-inch screens, square holes, and detailed stratigraphic recording. Knight's crews, all over the entire town, dug to subsoil in speedy, parallel diagonal cross-trenches, one shovel blade in width and one shovel handle length apart, covering entire lots and blocks to locate brick foundations. Knight's crews relied on their experience of brick and mortar morphology and an informal grammar of outbuilding footprints in relation to surviving examples, as well as on excellent surveying and drafting skills that certainly surpass the abilities of many excavators who have since left their imprint on Williamsburg. Their archaeological common language, or materializing process, was honed by the goals of the day, namely, the location and rough periodization of brick buildings, years of experience refining the skills to perfecting this excavation technique, and the social reinforcement of their everyday archaeological excavation praxis. The same practices of "creating equivalence" as Yarrow (2003) calls the social generation of the archaeological record— through discussion and negotiation

Figure 9-1. Excavation of the Peyton Randolph site in 1955, archaeologist James Knight shown (far right). Photograph courtesy of the Colonial Williamsburg Foundation.

—were in operation under James Knight, as much as any excavation today, albeit with different standards and norms.

Knight's process of archiving generated a measured plan (and very little else) which identified this building in Randolph's yard as a dairy and associated it with the "early colonial period" (not surprisingly, the choices in periodization for Knight were simply early, middle, and late depending on the type of mortar in evidence).

Following Knight's work, the Peyton Randolph Site, although not this particular structure, was revisited under another archaeological paradigm, by English archaeologist Ivor Noël Hume, whose research approach to Williamsburg's already dug-over back lots guided Colonial Williamsburg's archaeological work between 1955 and 1982. Noël Hume, implementing stratigraphic techniques for the first time, was heavily influenced by Wheeler's *Archaeology from the Earth* (1954) which contains all of the prescriptions for laying out a site and excavating stratigraphically that influenced not only excavation practice, but also Noël Hume's own version of such a text, *Historical Archaeology* (1968). Today, we still fondly refer to the square-and-baulk excavation units placed in Williamsburg' Historic

Area between the late 1950s and 1982 as "Wheeler boxes." Although Noël Hume did not specifically re-excavate the "old dairy," his style of archaeology, with the exception of a small excavation elsewhere on the property in 1978 (Klingelhofer, 1978), left a minimal imprint on the Peyton Randolph Site itself. His overall undeniable influence on excavation methods in the town were important in understanding the shortcomings of method that later excavations in the 1980s sought to address.

3. THE SECOND TIME

Although the construction of a house in the 1920s (just prior to the initial restoration of Williamsburg's Historic Area) came very close to destroying this foundation, we had a chance to examine it again during our investigations of the Peyton Randolph yard between 1982 and 1985. Undertaken to answer questions more definitively than they had been by the excavations of 1938 and 1955, this new work at the Peyton Randolph Site took an explicitly experimental approach to evaluating the archaeological potential of what the architects had left behind. Guided by new concerns driven by new questions of spatial organization and formation process deriving from anthropological archaeology theory at the time, we were especially interested in the matter of spatial analysis using artifact distributions. Based on a rough analogy to plow damage, we spent some time ascertaining the real effects of cross trenching and the backfilling process on the location of artifacts derived from what appeared to be sheet refuse around outbuildings. We concluded that in many areas, artifact concentrations, while displaced vertically by cross trenching, were very close to their original horizontal position. It was clear from this experiment that the then conventional ten-foot square (i.e., Wheeler Box) introduced to Colonial Williamsburg and to other historical sites in Virginia by Noël Hume was woefully inadequate for the identification of artifact distributions, and we introduced our now standard one-meter square for horizontal control after comparing piece-plotted artifact distributions to those simulated at varying intervals.

For the excavation of Structure A, begun in 1978 under the direction of Ivor Noël Hume, we also introduced the use of the Harris Matrix to facilitate stratigraphic recording and interpretation. Although it would be several years before we introduced single-context planning and systematically applied the open-area approach to reconstructing successive backyard landscapes (defined, after Harris [1979], as "period interfaces") within Williamsburg (Brown and Muraca, 1993), our trial application of the Matrix proved very helpful in reinterpreting the function of this building. Initially thought to be Sir John Randolph's law office and Lady Susannah Randolph's dower house, understanding the stratigraphic relationships more clearly through the use of the Harris Matrix showed it to be a tenant house abandoned when Peyton Randolph began to remodel the main house in the 1750s.

Nonetheless, for much of the reexcavation of the Randolph outbuildings we relied on essentially the same kind of evidence that informed the architects: the plan view of the architectural footprint, and specifically, the size, orientation, and overall placement of individual structures. In part, this was the result of the fact that by separating building foundations from surrounding layers and obliterating evidence of builders' trenches in most cases, the cross-trenchers had left us no alternative. We also had "bought into" the same interpretive perspective of comparative approaches to foundations and periodization to some extent, although instead of matching surviving building types with foundations of different shapes and sizes, we paid close attention to the overall site plan. In the case of our 1984 reexcavation of the "old dairy" we challenged Knight's original attribution of the building to the first (pre-Randolph) period of colonial construction and placed it with our "Peyton Randolph phase" plan, a plan that became the basis for the outbuilding reconstruction effort that began in earnest in 2000 with the construction of a replica of Randolph's kitchen. We allowed ourselves to project Randolph's own thinking as he "rationalized" his backyard outbuilding plan according the "Georgian" principles.

Upon reflection, with the distance of the years, it is clear how theoretical and methodological concerns guiding the 1982-1985 excavations imparted a certain 'spin' or interpretive cast on the interpretation of the dairy's period and relationship to the overall layout of the yard; yet, such interpretation is inevitably tethered to the materializing processes – the translation of the archaeology first done by Knight and crew. In seeking to create a new "language" for archaeology at Colonial Williamsburg, replete with improvements in recording (such as the Harris Matrix) and a more holistic interpretation of overall property and landscape design, the reaction *contra* Knight's methods indeed affirms Lucas' (2001b) contention that the materialization process of site excavation and recording is both independent and iterable, in that comparison of interpretation was possible through considering the archaeological languages, of 1955 and 1985 – but at the same time, inextricably bound with those who had gone before.

4. THE THIRD TIME

By committing ourselves to an interpretation of the "old dairy" as being in use during Peyton Randolph's tenure, it became part of the reconstruction plan. Colonial Williamsburg's crew of housewrights was ready to rebuild it in 2003, and would have needed to completely excavate for a new foundation in order to proceed. The fact that they had already completed the massive Randolph kitchen, which was open for business, and the smokehouse immediately beyond it, gave some urgency to our little "salvage" excavation, and it was chosen as the location site for the College of William and Mary's annual summer field school (Kostro, 2005). Archaeologist Mark Kostro, the site director for the field school, helped us establish that Jimmy Knight had been right all along about the "old dairy." Cleaning off the site, carefully exposed and drawn by us not quite twenty years before, revealed that the brick features we had seen as part of wall and paved floor were actually superimposed on one another. He was helped in this observation by the presence of the reconstructed smokehouse, whose orientation and footing provided a useful contrast to the adjacent original eighteenth-century brick structural material.

Actual excavation, made necessary by the imminent reconstruction of the "old dairy" on new brick footings, further confirmed what Kostro's fresh eyes could see in the reexposed plan view of these footings; that there was superposition resulting from two distinct building episodes. We take some small comfort in knowing that we had to rely on a simple exposure of this brickwork, and the visual similarity of the paving bricks from one side of the building to another was convincing at the time. But we are not here to make excuses for our interpretive failing. Rather, we want to emphasize the importance of this third excavation opportunity. Nearly twenty years later, we did benefit from the complete removal of all structural evidence, including associated fill deposits and basal soil features cut directly into subsoil. Ironically, this total excavation was really not necessary after the initial observation and subsequent demonstration of the relationship of superposition between foundation footing and walkway (Figure 9-2).

The Harris Matrix for this structure would easily show that the smokehouse walkway came after the dairy, but the additional excavation did yield artifacts that helped anchor this sequence in time and, in the case of evidence such as a milk pan rim and related vessels, appeared to confirm the "old dairy's" function.

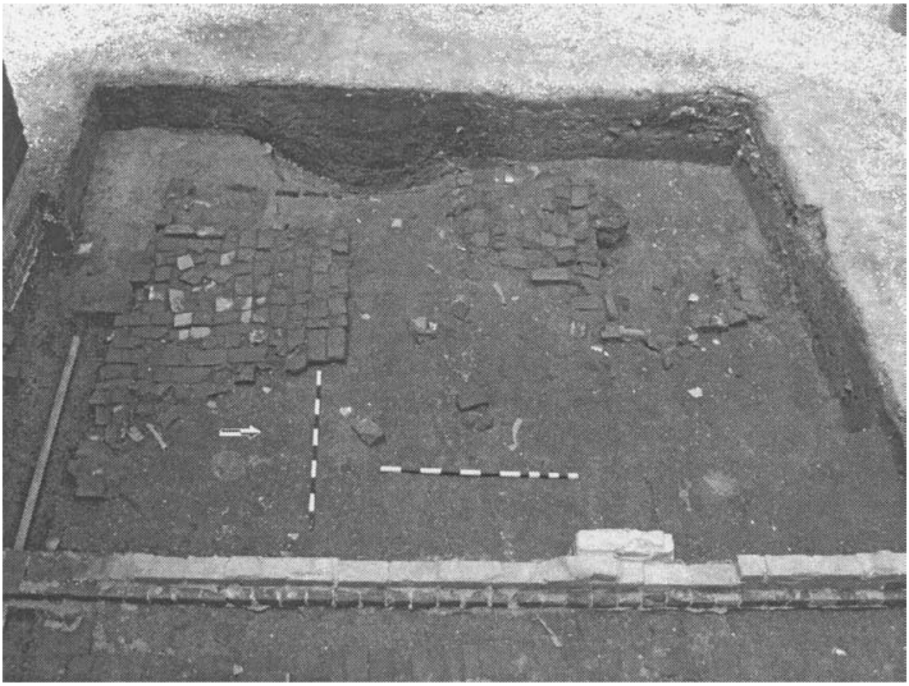

Figure 9-2. Foundation footing of the pre-Randolph dairy structure and later walkway.

It can be argued that, destructive as this last phase of digging was, this additional evidence was necessary to persuade all those involved that the "old dairy" did not deserve to be reconstructed as part of Peyton Randolph's domestic service area. In fact, because of this work, we were actually able to save the Colonial Williamsburg Foundation many thousands of dollars, one of the rare cases where archaeological excavation has served this purpose since 1982. There will be no "old dairy" in the final reconstruction of Peyton Randolph's outbuildings, despite the apparent place this building occupied in the new spatial order imposed behind the main house after Peyton Randolph constructed the middle section in 1754/55 (a construction date known from dendrochronology).

There will, however, be a new fence line, predicted by the organization's architectural historians, and confirmed by a targeted excavation trench where the fence should logically have been located. In this case, the principle was not so much Georgian in nature, but one based on the experience of Foundation staff with other townstead layouts, yet another example of the dual nature of materialization of record through dialogue as both an independent phenomenon (in the sense that it can be operationalized to predict unexcavated features), yet one that is conditioned by disciplinary social structures. In this case, the fence line was erected to separate the near work area from the more distant buildings and activities. Finding this fence line is, in a way, somewhat like the approach of Colonial Williamsburg's first generation of architects, who prided themselves on learning the grammar of the town's eighteenth-century residents such that they could anticipate what outbuildings should be there, and simply confirm their presence with a program of cross-trenching and selective wall following. After all, Jimmy Knight was essentially correct in his 1955 interpretation of the "old dairy."

5. LESSONS LEARNED

Being given a third chance and arriving at a new interpretation of Peyton Randolph's domestic work yard might seem a commonplace occurrence in a context like Colonial Williamsburg's Historic Area; an outdoor living history museum where, as geographer David Lowenthal put it, the quest for "archaeological authenticity" drives an incessant revisionism, whether it be manifest in "the browning of Williamsburg," or in the accurate placement of a fence line (Lowenthal, 1985). The opportunity for revisionism comes, of course, from the fact that our predecessors did not destroy all the physical evidence they had employed in their versions of the town's colonial-era built environment. Thus it was possible to repeat the experiment, in this case with the result that a new and more accurate interpretation resulted. Similar opportunities for repetition and experimentation exist at other so-called heritage sites all over the country, from government-owned historic sites to privately administered properties. Many of us who have done considerable data recovery work in the Section 106 context have also done contract work in these situations. How many times in these circumstances have we simply followed what has become the ingrained standard procedure for cultural resource management projects, as opposed to taking advantage of the opportunity to be innovative, experimental, and most importantly, minimal with respect to volume of dirt moved on projects where the sites are only at risk from us?

The recent spate of self-reflective evaluation of archaeological practice has fixed on the interrelated problems of routinization of fieldwork practices and the deskilling of the practioners (e.g., Shanks and McGuire, 1996). As tiresomely predictable as some of these critiques are becoming, there is no question that the "one size fits all" perspective to fieldwork has undermined the ability of many younger field archaeologists to think creatively about archaeological techniques and methods. It would appear that the ability to tailor technique to context, and to be innovative and experimental when possible is not only a vanishing talent; it is often viewed with suspicion or even outright disdain, especially by some whose training has emphasized the progression of standardized techniques employed in typical contract projects.

Indeed, when faced with the seeming paradoxical quest for both comparable data, and innovative approaches to archaeological methodologies, we are perhaps worried too much about the former, while neglecting the latter, at the risk of what Lucas (2001b: 44) calls the "repetition of sameness," or a "homogenizing process of archiving." Iterability of the archaeological record, as demonstrated in these examples, comes not from rote standardization of method; indeed, retrospectively, the objectives and logic of both James Knight, and our own mindset in the early 1980s were abundantly clear. Interpretive compatibility between the excavations was easily bridged via a critical understanding of the common excavation "language" and materializing processes operating in each period. Yet, the refinement and superiority of site interpretation begun in the 1980s is also clear, although mistaken in appliction to this one specific structure. On one level we can see that Knight's records are in a sense "iterable" or "translatable" to a point where they can be incorporated successfully into a twenty-first century inquiry. Nonetheless they caused unnecessary physical damage to the site and resulted in the loss of a host of significant data categories that no amount of reexcavation will ever recover. In this case, we can learn to appreciate methods since lost (such as a certain level of field drafting skills) and work to refine what has been gained in terms of methodological refinement, all the while mindful of what is yet to be gained and what will fall by the wayside in terms of future methods.

The repeated excavations in the Randolph yard thankfully allowed us, once again, to skirt this trend of rote homogenization of method. Instead, the third exposure of Peyton Randolph's "old dairy" underscored the importance of alternatives to this kind of by-the-numbers archaeological practice. This work also reminded us of the significance of what is left behind when the site itself is no longer accessible. As part of his vision of archaeological practice as transformative rather than destructive, Gavin Lucas advocates a conception of archaeological practice as a materializing one as well, productive in particular of a range of texts and images that become the material record produced by excavation, field archaeology's representations, if you will. He further suggests that "the very validity of archaeological interpretation is not based on the independence of an archaeological reality but on the iterability of the representations we give it" (Lucas, 2001a:213).

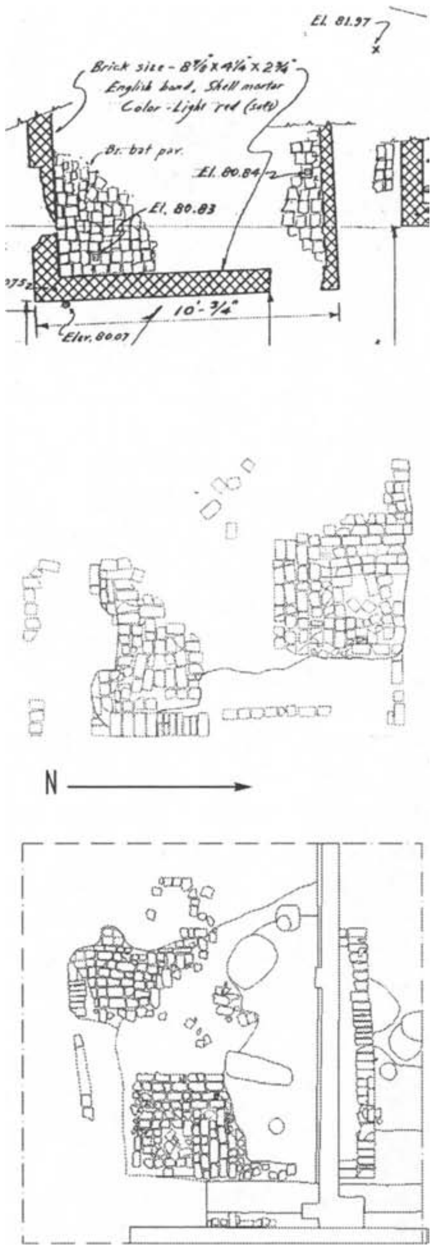

Figure 9-3. Multiple depictions of the Peyton Randolph Dairy: 1955 (top), 1984 (center), 2003 (bottom).

Figure 9-3 illustrates Lucas' point; repetitions from each period of the same physical traces, the brick remains of the "old dairy." Their existence, he would argue, means that

> even in those cases where old sites can be re-excavated, it is the comparison of the plans that assess the validity of the first interpretation – we can never compare their perception directly with our own, only the materializations of that perception. It is these materializations – of texts and images – which guarantee the validity of archaeological interpretation, not the site itself (Lucas 2001a:213).

If indeed the third excavation of the dairy at the Peyton Randolph site can be considered more accurate or definitive, it is because we were able to rethink the actual physical evidence as well as understanding the social and historical precepts guiding previous excavations. There will be no reconsideration in the future without these plans, and the other textual and image records that survive in Colonial Williamsburg's archives, both in digital form, and in hard copy. In this sense, Lucas is right about the fact that it is these material records, existing separately from what might be left of the site itself, which permit "repeatable" comparison in the future. So, even when further excavation remains an option, we are obligated to take great care with the image and the text, and, of course, with the recovered artifacts.

As other chapters in this volume show, by broadening our research questions within the context of experimentation and employing recovery techniques that increasingly incorporate new materials and methods, we compound the problem of how our work is to be represented to future archaeologists. Existing record types will not capture the complexity of much new methodological work in historical archaeology. Many of these chapters also illustrate why it is so important at this juncture in our profession to encourage our students to develop further experiments in methodology, guided by new questions for old materials. We should think carefully about taking our students out to dig sites that are not otherwise at risk unless we have a far better set-up than most academic archaeologists presently enjoy, and unless we can at least partially anticipate the future repeat experiment, and provide some guarantees that our representations of the way we perceive archaeological reality will hold up under close scrutiny even in the near term, let alone fifty years from now.

ACKNOWLEDGEMENTS

We would like to thank our colleague Edward Chappell, Director of Architectural Research at Colonial Williamsburg for his persistence in getting the Peyton Randolph Outbuildings Project brought to a successful conclusion. He and his fellow architectural historians, especially William Graham, have provided important advice regarding the study of the Randolph backlot. We also appreciate the assistance of Mark Kostro, who served as chief instructor of the joint William and Mary/Colonial Williamsburg summer field school session held at Peyton Randolph during the summer of 2003, and whose eyes were sharper than ours had been some twenty years earlier. Finally, we want to thank Steve Archer and Kevin Bartoy for including us in their session and in this subsequent monograph based on it. This essay owes its very existence to their support and encouragement. We especially appreciate Steve Archer's close review of the text and suggestions for appropriate references

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Chapter 10

EXCAVATING SITES UNSEEN

The example of earthfast buildings in the colonial Chesapeake

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Abstract: In this chapter, two case studies from the colonial Chesapeake are presented to demonstrate the potential of low visibility archaeological sites toward the interpretation of historical landscapes. By comparing survey results against data recovery excavations, it is argued that low-density sites offer an important resource that need to be more effectively considered when engaging in inter- and intra-site spatial analyses, regional settlement patterning, and the determination of site significance as part of cultural resource surveys.

Key words: Archaeological survey; colonial Chesapeake; cultural resource management; earthfast buildings; historical landscapes; low visibility artifact scatters; plantations.

1. INTRODUCTION

Archaeologists today regularly rely on archaeological surveys to locate and spatially define archaeological sites not always apparent at the surface. Of particular concern are low visibility sites, those ephemeral sites defined by only thin clusters of artifacts, or accumulations of artifacts with minimal horizontal coverage, thus making them more difficult to find. Although ongoing improvements in site discovery techniques and methods have made the detection of these low visibility sites much more reliable than ever before, comprehensive investigations of low visibility sites beyond identification-level analyses are rarely carried out except under unusual circumstances. More often than not, rather than investigating the reasons for their low visibility, these sites or places on the landscape are categorically ignored simply because of low visibility.

The reasons that account for low visibility are many and complex, and often occur as the result of the interplay of multiple variables. Prominent considerations are the socio-economic and socio-cultural circumstances of the communities responsible for the deposition of the objects on the ground. As a case in point, while persistent settlements often leave clear archaeological evidence of where people lived, labored, and conducted business, these activities represent only part of the wide range of activities and behaviors in which people engage. Many activities, particularly those associated with agriculture, pastorialism, raw-material procurement and waste disposal, to name a few, typically occur away from settlements (Banning, 2002:19). Low visibility sites found at the peripheries of settlements, or at intermediate distances between, may be evidence of these often unseen activities. A population's relative mobility is another important factor affecting site visibility. Due to the limited duration of occupation at any single location on the landscape by nomadic or other highly mobile populations, the opportunity for the accumulation of refuse is significantly reduced. Consequently, the habitation sites associated with these people are often evidenced by only the faintest archaeological traces. Although a phenomenon more often examined by prehistorians (e.g., Klein, 2002), historical archaeologists have likewise measured the impact of mobility in the analysis of the limited archaeological assemblages associated with seasonal military encampments (McBride, 1994) and migratory laborer camps (Smith, 2001).

Site formation processes need also to be evaluated (e.g., Schiffer, 1987). Cultural transformations such as post-abandonment site clearance, landscaping, and agricultural plowing are all common activities that can quickly disperse or obscure archaeological evidence. Similarly, natural taphonomic processes, including sedimentation and erosion, can bury or carry away archaeological evidence without leaving any trace of its former existence. Taphonomic factors are particularly important to consider because of their potential to obscure not only small and intermittent sites, but also large sites marked with extensive concentrations of artifacts and architecture.

The objective of this chapter is to contribute to the mounting evidence on the significance of low visibility archaeological sites, and their potential to significantly enhance site and landscape interpretations. To this end, two case studies are presented of early colonial tobacco plantations from the Chesapeake in the eastern United States that demonstrate the potential of low visibility sites in the interpretation of historical landscapes. But rather than focusing on the overall visibility of the sites, these examples emphasize the relative invisibility of internal aspects of these sites as they relate to understanding site layout and organization.

In both examples, traditional Phase I and II investigations successfully identified the central domestic cores of both sites, which were marked by high-density concentrations of artifacts from plowzone contexts and subsurface features, but failed to adequately forecast the presence of substantial structures with low visibility artifact signatures at their peripheries. The outlying buildings were eventually discovered, but only after the overbearing plow-disturbed soils were mechanically stripped away. In both instances, the surprise discoveries of these buildings significantly affected how the sites were later interpreted, but at the expense of acquiring detailed artifact patterning data often recovered from plowzone contexts.

2. EARTHFAST INVISIBILITY

A common trait of all the buildings at both sites was their method of construction. Each of the buildings was built in an earthfast tradition, a method of construction common in the colonial Chesapeake that left only "the faintest of traces for the archaeologist to ponder" (Deetz, 1993:15). Also known as hole-set, post-in-ground or impermanent buildings, these structures lacked brick or stone foundations, and instead relied on wooden posts set directly into the ground as means to anchor their frames. While the locations of demolished masonry buildings can often still be deduced from concentrations of brick, stone, or mortar rubble, seventeenth- and eighteenth-century earthfast buildings typically leave nothing more than a thin scatter of nails to mark their locations. Even upon excavation, the archaeological evidence of earthfast structures typically exists as little more than a series of postholes that delineate the building's walls (Carson et al., 1981) (Figure 10-1). Accordingly, the earthfast nature of the architecture of these building make them difficult to locate, and they often remain unseen components of the landscape even after extensive survey efforts.

In practice, the identification of earthfast buildings in the Chesapeake is rarely based on any architectural evidence of the structures themselves. More often, their identification is inferred from evidence of their occupation, such as the recovery of household refuse that may have accumulated near the structures, or within interior features, such as basements and sub-floor pits.

Figure 10-1. The excavated posthole remains of Structure B at the Atkinson Site, James City County, Virginia. Photograph by M. Kostro.

Although this method of site discovery has become standard practice, its reliability is highly dependent upon the functional attributes of these structures, the socio-economic status of the occupants, and access to material goods that would survive in the archaeological record. Cultural practices, such as yard sweeping, may also remove artifacts from their proximity to a building. Additionally, off-site disposal of refuse as well as post-depositional processes that move refuse away from primary contexts, may also be important factors. As a result, by relying upon artifact accumulations to mark the locations of earthfast buildings, archaeologists preferentially excavate some sites over others: domestic buildings over non-domestic or agricultural ones; the materially rich over the materially disadvantaged; the remains of those who allowed debris to accumulate around their homes rather than those who kept their house yards clear of any; and those sites with minimal post-depositional displacement of artifacts over those that are more disturbed. The following case studies illustrate the problems associated with accurately identifying earthfast structures.

3. CASE STUDY 1: THE ATKINSON SITE

The Atkinson Site is a small, late seventeenth-century houselot, located southeast of Williamsburg, Virginia, first discovered during an archaeological survey by the Colonial Williamsburg Foundation in 1990. Some 44 round shovel test pits in the area of the Atkinson Site recovered over 300 artifacts. A subsequent Phase II assessment, consisting of 28 75-cm-by-75-cm square test units further defined the core of the site, which included several posthole features in association with a scatter of late seventeenth-century domestic material (Moodey, 1991). Four seasons of data recovery excavations were carried out at the Atkinson Site between 1998 and 2002 in anticipation of the property's development as a light industrial park.

Building on the original survey data, the first three years of fieldwork were focused on the excavation of an earthfast dwelling, and a large artifact-rich pit where most of the domestic refuse generated by the house's occupants was eventually deposited. Missing, however, was evidence of where more ephemeral features such as fence lines, outbuildings, or even additional dwellings may have stood. Very rarely existing in isolation, innumerable excavations of contemporary sites in the region have repeatedly shown how rural houselots were organized into compounds that included not only dwellings, but also agricultural support buildings and yard enclosures (e.g., Neiman, 1980). Studies of the spatial arrangement of these sites have further deduced specialized activity areas within the houselot compounds on the basis of artifact, botanical, and chemical patterning (Keeler, 1978; Pogue, 1988; Fischer, 2001; Sullivan and Kealhofer, 2004). At the Atkinson Site, due to the lack of any significant evidence indicating the presence of additional structures, features, or activity areas, an additional survey of the area surrounding the structure and pit feature was carried out to supplement the original Phase II data.

The supplemental survey consisted of 167 test units, measuring 50 cm by 50 cm, excavated at five meter intervals in a wide area to the west and south of the excavated house and pit. The north end of the site was previously destroyed by modern road construction while its east end was defined by a shallow ravine. The additional testing identified two promising loci for further investigation. Immediately to the south of the excavated house, a concentration of domestic artifacts and architectural debris marked the location of another earthfast dwelling. The second locus was in the bottom of the adjacent ravine, a short distance to the east of the second dwelling. Survey test units within this area identified a broad layer of charcoal-rich soil that contained a small quantity of seventeenth-century artifacts suggestive of a refuse-filled pit feature in the ravine bottom.

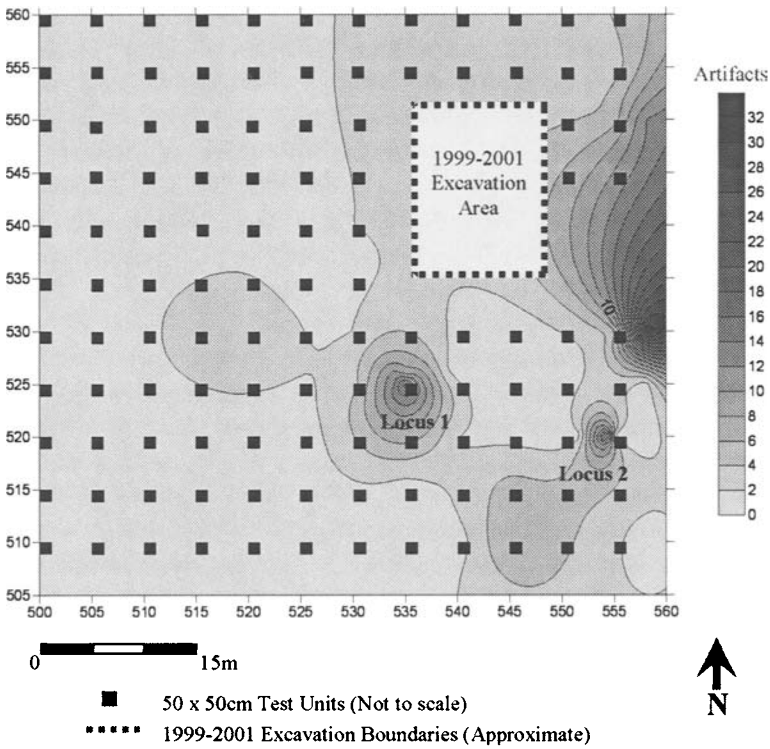

Figure 10-2. Supplemental survey of the Atkinson Site, James City County, Virginia (2001).

In contrast to these discoveries, in the area to the west of the two structures, the supplemental survey recovered no more than a handful of highly fragmented artifacts (n=69) consisting mostly of nails, and a few wine bottle and ceramic fragments. None of the test units contained more than six artifacts and those with the highest density of artifacts tended to cluster close to the already known structures, suggesting they were likely associated with those features, rather than representing the locations of entirely new ones. The extensive shovel testing and test unit excavations provided ample evidence to support a preliminary conclusion that no additional significant features were located at the Atkinson Site. If anything did exist, it was most likely something along the lines of a boundary ditch, garden enclosure, fence line, or other landscape feature. These are important features that help to define activity areas and landscape use, but do not necessarily leave behind any artifact signatures.

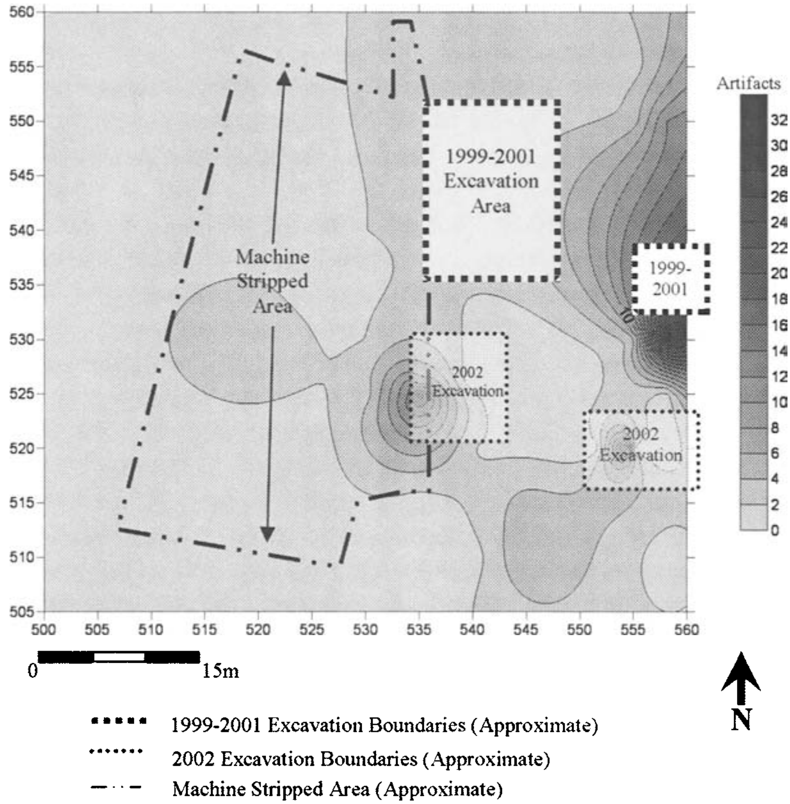

Figure 10-3. Approximate boundaries of the area to be stripped at the Atkinson Site, James City County, Virginia.

Nevertheless, because the site was going to be destroyed by development, the plowzone from a large area to the west of the site's core was stripped using a backhoe. The decision to use the backhoe was not made lightly, as countless studies from the Chesapeake have repeatedly demonstrated the close correspondence between spatial patterning of plowzone data and subsurface remains (Keeler, 1978; King and Miller, 1987; Pogue, 1988; Neiman, 1990; Archer and Bartoy, 2000). However, the near absence of artifacts from the plowzone samples within the western portion of the Atkinson Site and the total absence of features suggested that further sampling of the plowzone by hand was unlikely to yield significant additional data. Anxiety over the machine's use was further heightened by the fear that its use might be erroneously understood as an endorsement of the indiscriminate use of large earthmoving machinery (inauspiciously known to some critics as "Virginia trowels") to remove large blocks of plowzone without adequate prior sampling.

The backhoe's use was a last resort, used solely because the site was going to be destroyed. If it was possible to preserve or protect the site, we would not have brought in the machine, leaving the the site to future investigators.

In contrast to our expectations, the removal of the plowzone from the west end of the site revealed the remains of three additional earthfast structures and two fencelines. The largest of the three newly exposed structures was a dwelling interpreted to have been a quarter for plantation laborers, possibly enslaved Africans. The two smaller buildings, on the other hand, were plantation outbuildings. Particularly intriguing was the fact that these newly exposed buildings were separated from the main dwelling by a fence line that divided the houselot into two distinct areas. The area to the east of the fence consisted of the planter's house, yard and refuse pit, while on the other side of the fence was located the quarter, the two small outbuildings, and what was presumably the plantation's working yard.

Excavations further revealed that the various buildings were likely built and occupied at different times, owing to an ordering of the site into two distinct phases of occupation. The earlier occupation related to the site's settlement and occupation by a middling planter (Thomas Atkinson). Although Atkinson was not among the local elite, the physical separation of his house from that of his workers by a substantial fence suggests that he deliberately sought to distinguish his status as distinct from those who were working for him. Accordingly, he organized the layout of his houselot to reflect that distinction. The second phase of the site's occupation included the removal of the fence between the two dwellings, the construction of yet a third dwelling, and the construction of a new outbuilding (Kostro, 2003).

The changes in the houselot's layout seem to represent the transformation of the plantation from a small independent operation with a resident owner into an outlying quarter or tenant farm owned by an absentee landlord, a pattern that is consistent with late seventeenth- and early eighteenth-century settlement patterns for the region (e.g., Deetz, 1987; Edwards and Brown, 1993).

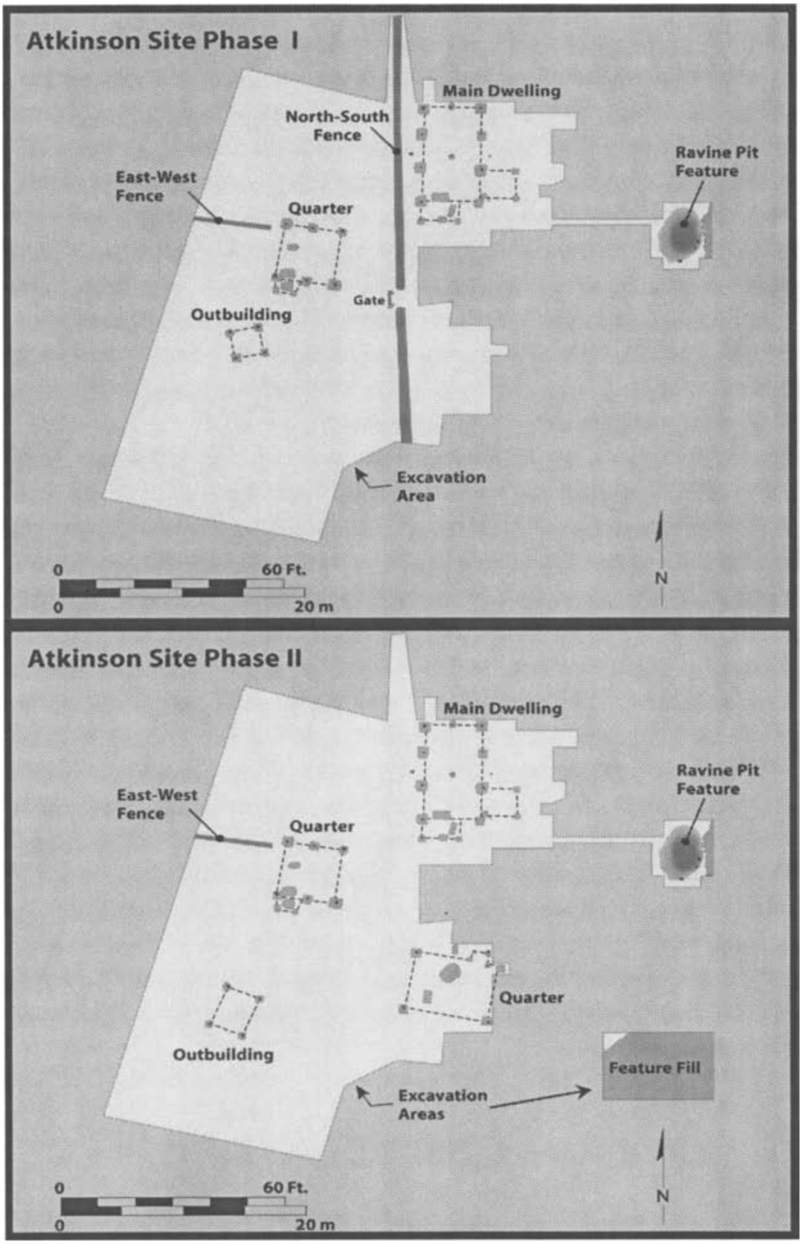

Figure 10-4. Plan map of Atkinson Site features, James City County, Virginia.

For the purposes of this discussion, however, the most significant result stemming from the discovery of these low visibility buildings was their impact on the interpretation of the Atkinson Site as an early example of how plantation landscapes in the early colonial Chesapeake were organized and changed over time. Had the buildings not been found, a very different interpretation of the site would have been likely. Based on the evidence available prior to the discovery of the quarter and outbuildings, a viable interpretation for the site could have been that it represented a single household's occupation of the site with limited change over time. Had this been the final assessment, the discussion of the Atkinson Site would have centered on how its organization contrasted with the excavation results of contemporary sites, a very different interpretive thread than the one decided upon following the removal of the plowzone.

The survey and excavation experiences at the Atkinson Site also demonstrated how each of the external variables related to earthfast buildings acted to mask the locations of the buildings during the original and supplemental surveys. For example, the two small outbuildings were found in association with almost no corresponding material evidence to mark their locations. In addition to their earthfast construction and small size, large quantities of domestic refuse were unlikely to accumulate near these non-domestic buildings. The low visibility of the quarter, on the other hand, a residential dwelling around which household refuse had a high probability of accumulating, is likely attributable to a combination of socio-economic and socio-cultural factors. If the residents of the quarter did not have access to large quantities of durable goods, which enslaved laborers often did not, the amount of refuse they produced would have been minimal, thus leaving little evidence in the archaeological record. Similarly, if they swept their yards, a practice common among the poor and enslaved in the southeastern United States during the colonial period, a consequence for archaeologists would again be that little material evidence would be found near the structure, thus hindering its identification.

4. CASE STUDY 2: THE PENSKE SITE

The second example comes from the Penske Site, an early eighteenth-century tobacco plantation located approximately one mile southeast of Williamsburg. The site was first discovered during a Phase I survey carried out by the Colonial Williamsburg Foundation in 2000 (Kostro, 2000). The subsequent Phase II investigation identified two concentrations of artifacts. The first consisted of a broad and dense scatter of early eighteenth-century artifacts and several subsurface features, all concentrated on a terrace overlooking a ravine to the west. Later data recovery excavations defined this locus as the domestic core of the site, based on the identification of at least one earthfast dwelling with a half-cellar and several sub-floor pits, a series of fencelines, and a boundary ditch (Kostro, n.d.).

The second locus, located 80 meters to the south of the first, was characterized by an extremely low density of artifacts. The total artifact assemblage from this part of the site consisted of two corroded nail fragments and four pieces of wine bottle glass, all recovered from a single isolated shovel test that was at least 60 meters away from the next nearest artifact-bearing shovel test (Kostro, 2001). In light of the high density of artifacts from the first locus, the initial interpretation of the second was as an inconsequential accumulation, possibly resulting from the erosion of the neighboring terrace where the main portion of the site was located. To be sure, several one-meter-square test units were excavated around the positive shovel test. Each test consistently recovered one or two nail fragments, but no subsurface features were identified to indicate the presence of any structures.

Like the Atkinson Site, the low density of artifacts was sufficient enough to suggest that no significant features were in association with the artifacts. This inference was further verified by the excavation of 52 additional one-meter-square test units in the area. Most test units recovered one or two artifacts, but once again no subsurface features were identified. For this reason, the plowzone from a wide area around the artifact-bearing tests was stripped away to perform one final check for intact subsurface features. Similar to the Atkinson Site, the decision to use mechanical stripping was again made as a last resort prior to development of the area. The unexpected result of mechanically stripping the site was once again the exposure of a large earthfast building, in this instance a structure believed to be a tobacco barn (Kostro, n.d.).

The building's function was likely the cause of of its low visibility. Tobacco barns were typically located near agricultural fields and away from domestic sites (Stone, 1982). The building's distance from the dwellings would have prevented household refuse from accumulating near the building. The only artifacts expected to be in association with a tobacco barn would be framing nails or brick fragments left over from a brick hearth or firebox on the floor of the building built to help reduce humidity and promote the drying of the tobacco (Carr et al., 1991:62-63).

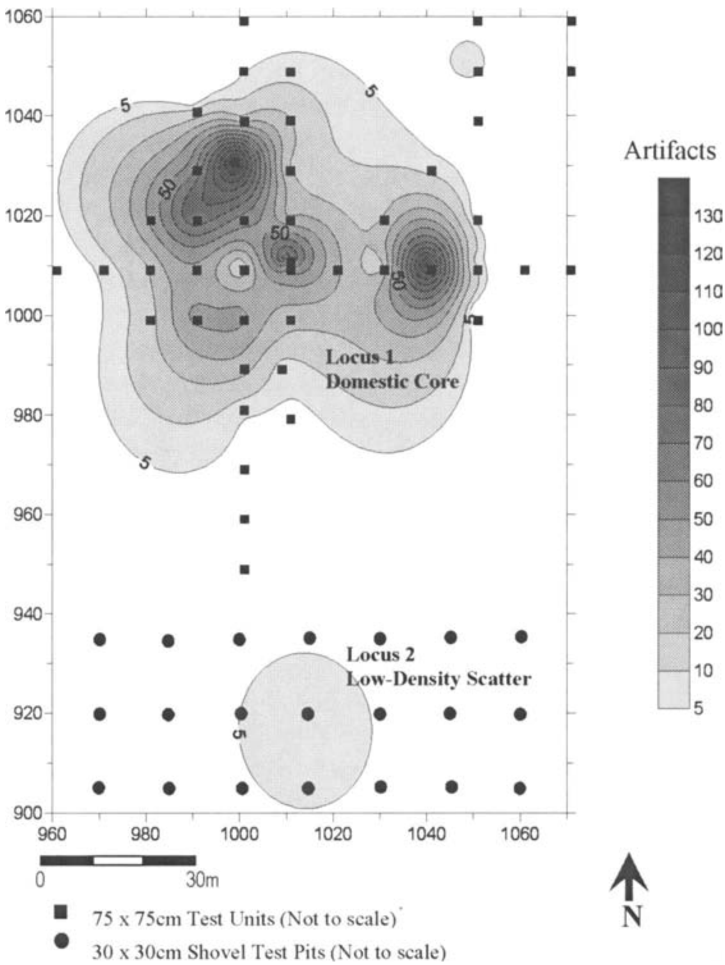

Figure 10-5. Phase II survey map of the Penske Site near Williamsburg, Virginia.

At the Penske Site, the identification of the low visibility tobacco barn did not substantially alter the interpretation of the site. Instead, the identification of the barn permitted a broader interpretation of the site, not just as a locus of settlement, but as an element of a much wider agrarian landscape of tobacco cultivation. A secondary benefit was the identification of a building type not well documented in the region. Despite the fact that tobacco cultivation was the economic staple of the colonial Chesapeake, the number of tobacco barns identified archaeologically is very small in comparison to dwellings known from the period (Kostro, n.d.).

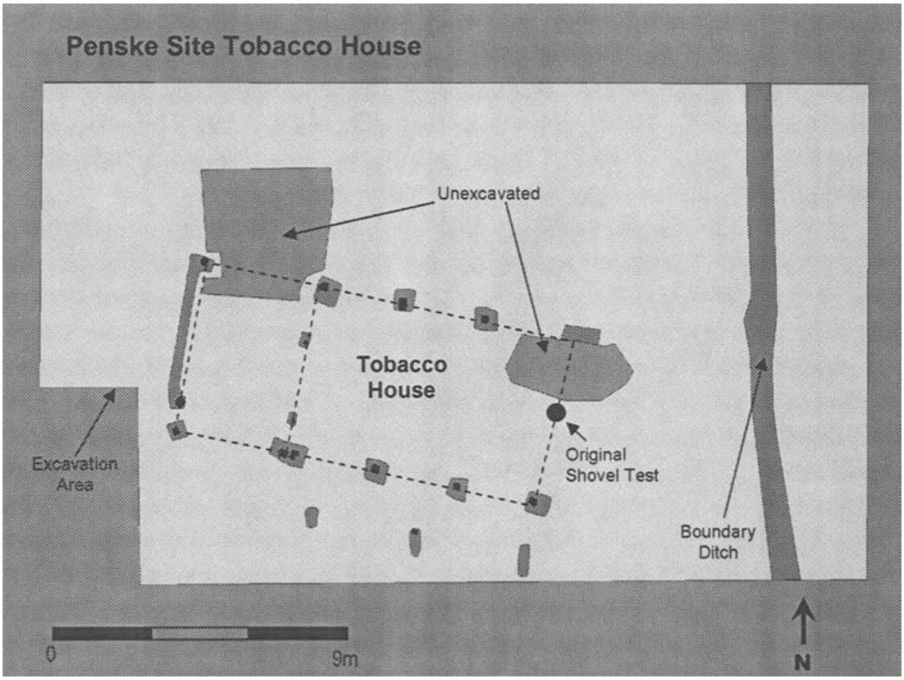

Figure 10-6. Tobacco barn at the Penske Site near Williamsburg, Virginia.

5. CONCLUSION

The unexpected discoveries of the earthfast buildings at the Atkinson and Penske Sites make tangible several important points about how archaeological surveys relate to the identification of sites and the interpretation of landscapes. When fully considered, low visibility data from sites can lead to significant inferences about the internal organization of site as well as broader interpretations of landscapes. Socio-economic factors and socio-cultural activities have the potential to mask significant subsurface evidence. Less clear from these examples, but no less significant, were the impacts of taphonomic variables, which have the potential to mask the location and extent of even the largest sites. However, these limitations can be overcome with careful planning and thoughtful consideration of a landscape's historical context. For the colonial Chesapeake, for example, the knowledge of the faint material record related to earthfast buildings, the substantial enslaved population that was generally limited in their access to durable material goods, and an agricultural staple (tobacco) that generally required the construction of a large number of specialized agricultural buildings erected away from domestic settlements might suggest that low visibility sites would be the *dominant* site type in the Chesapeake in comparison to those sites characterized by dense accumulations of artifacts. Had these considerations been more carefully attended to when evaluating the survey evidence at the Atkinson and Penske Sites, the discoveries of the outlying buildings may have been better predicted.

In addition to the regional and site-specific benefits to settlement pattern and site interpretation, these two case studies also demonstrate the need to carefully consider even the most ephemeral survey evidence when assessing site significance or when planning an excavation research design. As indicators of site locations, low visibility sites should be considered equal to those sites marked by dense concentrations of artifacts or buildings. The quantity of artifacts, or their visibility, does not necessarily correlate to significance. Significance should be measured in terms of a site's contribution to existing knowledge not by the extensiveness of the archaeological remains. Similarly, when considering intra-site organization and layout, loci with low visibility should not be simply disregarded as less interesting than high-density accumulations of artifacts or features. Instead, the low visibility portions of sites need to be considered as the products of specific social, cultural, economic or even taphonomic processes that need to be carefully evaluated when interpreting Phase I and II data to guide data recovery excavations.

The goal of this discussion was to highlight the potential of low visibility sites and artifact accumulations in the interpretation of historical landscapes. The examples of the Atkinson and Penske Sites can be viewed as near-miss examples of how even the most ephemeral of archaeological evidence can nonetheless lead to significant interpretations. It is hoped that this discussion will motivate other archaeologists to more closely examine survey level data when assessing site significance or when planning an excavation research design.

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Chapter 11

"PONYING UP TO BILLY HURST'S SALOON"

The testing and evaluation of nineteenth- and twentieth-century archaeological deposits through less invasive techniques in Yosemite National Park, California

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Abstract: In the summer of 2004, Pacific Legacy undertook the archaeological evaluation of site CA-MRP-1512H located at Crane Flat within Yosemite National Park, California. CA-MRP-1512H was divided into three distinct loci based upon geographic and temporal criteria: the Way Station Locus, consisting of the remains of the Gobin Hotel and the Hurst Saloon (AD 1860s to 1900s); the Ranger Station Locus (AD 1915 to 1940); and the CCC Locus (AD 1933 to 1942). The following discussion presents a case study in which the twin concerns of conservation and cost effectiveness guided our archaeological investigation of CA-MRP-1512H. A newly identified deposit associated with the Hurst Saloon, which operated at this location from the 1870s to at least 1890, allowed for the investigation of the early settlement and continued use of Yosemite's high country. This research provided an opportunity to explore issues related to historic seasonal settlements in an environment that was challenging prior to the invention and introduction of modern technologies.

Key words: California; Civilian Conservation Corps (CCC); cultural resource management (CRM); conservation archaeology; high country; hotels; Mariposa County, California; National Park Service (NPS); nineteenth century; park rangers; preservation; saloons; Sierra Nevada; testing methods; twentieth century; Tuolumne County, California; way station; Yosemite National Park.

1. INTRODUCTION

Archaeologists who work in the realm of Cultural Resource Management (CRM) are frequently confronted with legal, economic, and ethical issues that seldom are the primary concerns of most academic archaeologists. While we are not trying to further exacerbate the CRM versus academic divide, the practicalities of contracted compliance archaeology present a unique set of issues for practitioners of CRM. This is particularly true with respect to the identification, recordation, and evaluation of archaeological resources.

In the context of CRM, archaeological research methods are often judged in terms of their potential to produce data as well as their cost-effectiveness. Controlled excavation of deposits is a necessary part of the evaluation of any given site. However, the costs of excavation, in terms of both monetary expenditure and destructive impact to the evaluated resource, can be prohibitively high. The primary goal of testing and evaluation should be to recover a statistically significant amount of data with a minimal impact to the resource in the most efficient manner possible.

Recent investigations at a large, multi-component nineteenth- and twentieth-century site at Crane Flat in Yosemite National Park posed a great challenge in terms of developing a program of testing and evaluation that was both cost effective and less invasive than traditional archaeological methods. Through a combination of GIS data, documentary research, remote sensing, intensive surface survey, auger testing and limited excavation, we were able to define, characterize and evaluate the archaeological site with a minimal impact to the resource. Although each method employed is a standard part of the archaeologist's toolkit, the nested, or progressively invasive, combination of these methods created a strong program that allowed for less invasive testing of the resource.

The following discussion presents a case study in which the twin concerns of conservation and cost effectiveness guided our archaeological investigation of CA-MRP-1512H/CA-TUO-4240H (hereafter CA-MRP-1512H). The most significant lesson from this investigation concerns the need for research methods and designs to be developed with maximum flexibility and site specific solutions in mind.

2. INTEGRATED METHODS, IDENTIFICATION, AND EVALUATION

The sole difference between historical archaeology and prehistoric archaeology lies in the fact that historical archaeologists have access to an additional data source, historical documents. This is not to say that historical archaeologists solely deal with literate societies or the written word. Oftentimes, historical archaeologists research individuals who could neither read nor write. It should also be kept in mind that the written word is frequently not as valuable a data source as other types of historical documents, such as maps and photographs. However, the use of non-archaeological data sources requires that historical archaeologists use an approach that is both integrative and interdisciplinary. While prehistoric archaeologists frequently conduct interdisciplinary research with scientific disciplines, historical archaeologists more frequently align with humanities, such as history, architectural history, and cultural geography.

Unlike the archaeological record, the historical record is not destroyed during the course of study. For this reason, it is advisable to exhaust the historical record prior to the initiation of archaeological research. This allows for an initial portrait of the potential location and components of the resource to be developed. Historical research also provides the initial avenues for the development of questions that will drive subsequent research. However, the information derived from the historical record may not be substantiated by or may differ greatly from the information gathered through archaeological research. A research design must be developed that builds upon the results of the initial historical research, but also allows for a critical evaluation of that research as new questions are formed from the archaeological investigation. Data derived from historical and archaeological sources must be used in concert rather than allowing for the precedence of one source over another.

Unfortunately, archaeological projects do not frequently begin as a "blank slate" that allows a researcher to exhaust the historical record prior to conducting archaeological testing. As discussed in the introduction to this volume, the idealized archaeological process of research design, excavation, analysis, and publication is somewhat fictitious. Most archaeologists start somewhere within this process rather than at the beginning. Our case study at Crane Flat is an example of just this type of "beginning in the middle."

In the summer of 2004, Pacific Legacy undertook the archaeological evaluation of site CA-MRP-1512H as a result of the proposed expansion of the Yosemite Institute's Environmental Education Campus located at Crane Flat within Yosemite National Park. As initially recorded by Ryan (1999a), CA-MRP-1512H consisted of a portion of a historic road, a foundation for a ranger patrol cabin, structures and tent pads associated with the Civilian Conservation Corps (CCC), three giant sequoia trees (planted between 1929 and 1934), one oak tree, and a diffuse scatter of historic trash. Subsequent monitoring for a septic tank replacement (Ryan, 1999b), utility line replacement (Jackson, 2001), and trenching for the potential development (Russell, 2001) did not reveal significant subsurface historic deposits.

Because a formal archaeological survey had not been conducted in the vicinity of the planned education campus, Pacific Legacy was contracted by Yosemite National Park (YNP) and the Yosemite Institute (YI) to conduct a pedestrian reconnaissance of the project area. Pacific Legacy (2003) relocated the previously recorded building foundations, a trash scatter, and remnants of the historic road. During the survey of an area just east of the previously recorded site, a sparse but widespread scatter of historic trash debris was identified. Though few in number, diagnostic materials (ceramics and bottle glass) dated to a time period spanning the late 1800s and early 1900s. Several of the bottle fragments showed evidence of burning. Although the items appeared to pre-date the previously recorded components of the site, Pacific Legacy (2003) determined that the trash scatter formed part of CA-MRP-1512H, and the boundaries of the site were extended to include the newly identified debris scatter.

To address the potential impacts of the proposed expansion of the Environmental Education Campus of Yosemite Institute (YI) at Crane Flat, testing was conducted at CA-MRP-1512H to determine the boundaries of the site, and the nature and the integrity of the deposit. Previous cultural resource investigations focused on recording the surface expression and built environment of the site, monitoring small construction projects in the Environmental Education Campus area, and evaluating the existing buildings (Ryan, 1999a, 1999b; Jackson, 2001; Russell, 2001; ARG, 2003; Pacific Legacy, 2003). The data potential of CA-MRP-1512H had not previously been evaluated through subsurface investigations, a necessity for determining the nature and integrity of the deposits and the site's eligibility for listing on the National Register of Historic Places (NRHP).

From existing archaeological survey data as well as historical information previously published for Crane Flat (Greene, 1987), CA-MRP-1512H was divided into three distinct loci based upon geographic and temporal criteria: the Way Station Locus, consisting of the remains of the Gobin Hotel and the Hurst Saloon (AD 1860s to 1900s); the Ranger Station Locus (AD 1915 to 1940); and the CCC Locus (AD 1933 to 1942). Each locus presented unique challenges that necessitated the use of specific field methods.

3. THE WAY STATION LOCUS

As previously mentioned, this locus was identified by a sparse but widespread scatter of historic debris on the ground surface (Pacific Legacy, 2003). The surface materials, including a German stoneware ale bottle, solarized amethyst glass, and cut nails dated the deposit to the late nineteenth and early twentieth centuries. Documentary research determined that settlement at Crane Flat during this period was scant and seasonal. Crane Flat was located roughly at the intersection between two main roads to the Yosemite Valley and along the Mono Trail, a prehistoric and historic route across the Sierra Nevada. This crossroads location enabled Crane Flat to serve as both a tourist stop and a summer meeting place for many cattlemen and shepherds (Gookin, 1983).

The meadows in the area of Crane Flat were especially attractive to shepherds and cattle owners. Sheep were brought to the Sierra as early as 1856 and were driven to the mountain meadows in great numbers especially after the severe drought of 1864. The grazing of sheep in the mountains was a California version of the "long drive" that varied with markets, wintering grounds, and railroads (USDI, 1991). In some cases, shepherds' camps served as hostels and lunch rooms for travelers on the trail. A guidebook published in 1868 stated that campsites could be easily found from the number of empty tin cans lying about (USDI, 1991).

One of the first buildings reported at Crane Flat was the cabin of Hugh Mundy, a shepherd who tended his flocks during the summer in the mid 1860s at Crane Flat and Gin Flat to the east (Whitney, 1868:51). Crane Flat continued to have strong ties to livestock raising throughout the nineteenth and early twentieth centuries. Later residents, including Lewis and Ann Gobin and William Hurst, were known to keep both sheep and cattle in addition to providing accommodations to travelers and shepherds who visited Crane Flat. The Gobins were an important part of the early infrastructural development of Crane Flat. Their small hotel provided sustenance to the locals and facilitated tourist visits to Yosemite Valley.

According to Gookin (1983:124), the Gobin's camp at Crane Flat looked more like a hostel than a hotel, though it grew with time. The lodging and meal services appear to have been a secondary business, that often was conducted by Ann while Lewis and their son Ed tended to the sheep. Their lodging and meal business was an outgrowth of summer grazing in the mountains at a location that was both a stage station en route to Yosemite and an area used by other stockowners. Animals and tourists who needed food and shelter received it at Gobin's place.

In the early 1870s, Major William Morrison Bell (1872:213) recalled the modest accommodations offered by the Gobins:

> [A]round us a swampy bit of ground, where the forest had left a trickling stream, and a patch of coarse grass. Here was Crane's Flat; and here Mr. and Mrs. Goulburn [Gobin] and suite … entertain royally. Their palace two sheds. Their furniture deal tables, forms, and beds – four divided by some boards from the centre room on one side, two by like boards on the other – and a kitchen.

E.D.G. Prime wrote glowingly of Mrs. Gobin's hospitality and cooking skills. Not since leaving San Francisco had Prime and his party enjoyed such "fine fare, such delicious bread and butter, coffee and rich cream, canned fruits of all kinds, mutton, ham, etc." (Prime, 1872:50). The Gobins had a dairy house in which they churned their own butter and most likely kept fresh milk and cream (Greene, 1987).

Other travelers through the area provided colorful accounts of time spent at the Gobin's humble abode. James Vick described one such visit to their way station in June 1874:

> The accommodations were not equal to a first class hotel, but the good landlady apologized for the scantiness of her larder, stating that she had only just opened for the season, and her cows had not yet been driven up the mountain, and the chickens were coming with the cows, and the house had tumbled down on account of the weight of snow the past winter, and in the fall of the house the furniture had been destroyed or badly injured; and the accommodations were truly meager (Schlichtmann and Paden, 1986:220).

Although Lewis Gobin died in 1882 (Gobin Biographical File n.d.), the hotel remained open and was likely run by Ann Gobin. The hotel burned in 1886 and was rebuilt in 1888. Following the rebuilding, the hotel became a comfortable stage station and a welcome resting place for horseback and stage passengers en route to Yosemite via the Big Oak Flat Toll Road.

Prior to 1880, across the Big Oak Flat Toll Road from the Gobin's hotel, William Hurst established a saloon. Hurst was an English immigrant who was born in 1828 (U.S. Federal Census, 1870). At his cabin, Hurst stored supplies that were hauled to Crane Flat by pack mules or wagon, depending on how far the road from Groveland had progressed. He distributed these supplies piecemeal as needed to the shepherds. His cabin was a popular spot in the sparsely populated area that Schlichtmann and Paden (1986:221) described as:

> [a] riotous spot much of the time; the men from the mountains didn't come down to play cribbage; they could do that at camp. Indians, although legally forbidden liquor, managed to get it at Billy's and went whooping up and down the trail in bands of twenty or thirty, giving the isolated ranchers cause for reflection, but never, to our knowledge, necessitating any more violent action.

Hurst's saloon served as a "warehouse, amusement center, address and home away from home to the solitary sheep herders from the camps far-flung on the steep mountain sides and in the aspen-clumped meadows" (Schlichtmann and Paden, 1986:221; Burley and Eissler, 1997:159). In the 1880 Census, Billy Hurst was listed as a saloon keeper (U.S. Federal Census, 1880). This census listed nine men, ranging in age from 19 to 58, who were staying with Hurst, most likely at Crane Flat.

Hurst's saloon operated from the 1880s through his untimely death in 1890 during one of the worst winters that had been recorded up to that time (Schlichtmann and Paden, 1986). Though Hurst's saloon closed with his death, the Gobin Hotel remained open on a limited basis until 1895 (Greene, 1987) and possibly as late as the early 1900s. The Gobins owned the property at Crane Flat until at least 1905, when it was listed in Ann Gobin's probate (Gobin Biographical File, n.d.).

Photographs from 1900 and 1901 (Schlichtmann and Paden, 1986) pictured Gobin's hotel on the north side of Big Oak Flat Road. In addition to the hotel building with an attached porch, the Gobins had three outbuildings located to the north and west of the hotel. One of these buildings was likely the dairy house mentioned earlier. To the south of the road, Hurst's property was pictured with three buildings. The saloon was likely the log cabin in the center that is flanked to the east and west by other outbuildings (Schlichtmann and Paden, 1986). Although not present in the historical photograph of the Gobin and Hurst Way Station, a tollgate for Big Oak Flat Road stood just down the road from Hurst's saloon (Gookin, 1983).

Given the early date determined from a pedestrian survey, as well as its location on either side of the present Tioga Road, we concluded that this area was the former location of the Gobin Hotel and Hurst Saloon. Prior to subsurface testing, data from historic photographs, drawings and maps were used to map the predicted locations of historic features at the site. In addition to historic photographs, a "memory map" of the location provided the most useful data concerning the location of structures and possible features in relation to each other and in relation to the existing road. The "memory map" was created in the 1950s when local historians visited Crane Flat with former residents and visitors from earlier in the century. The "memory map" is a schematic depiction of how the individuals remembered the location of structures at Crane Flat.

While the existing road was based on the historic road alignment depicted in the photograph and memory map, it was unclear as to how much the existing road deviated from its historic antecedent. Without this information, the historic data could only provide relative rather than absolute information concerning the location of the Gobin Hotel and the Hurst

Saloon. We decided to attempt to locate the historic road bed through limited mechanical trenching.

In the first phase of subsurface testing, four mechanical trenches (3.0 m by 0.75 m by 1.0 m) were excavated along Tioga Road. Because the use of mechanical trenches can be overly invasive and destructive to archaeological deposits, the trenches were placed in areas with no cultural materials visible on the ground surface. The excavation of each trench was also closely monitored by an archaeologist. Three of the trenches were excavated to the south of the road and one was excavated north of the road. The original roadbed existed below the current surface of Tioga Road and deviated only slightly south from the current alignment. The original roadbed remained intact to the west of the beginning of a modern banked curve, which appears to have destroyed the remnants of the original roadbed further to the east.

With the location of the historic road alignment known, we were better able to interpret the historical data from photographs and maps as well as from narrative descriptions of the location. Steve Jenevein of Resource Graphics created a standard grid in metric units prior to the initiation of fieldwork. Cultural remains visible on the surface were noted. An intensive survey of the locus was conducted with a metal detector to map the distribution of subsurface metal. The metal detector survey was carried out in transects spaced at five meter intervals across the locus and positive hits were recorded with a point provenience. This survey fully covered the locus. The results of the surface survey and metal detector survey were mapped in the field to determine, along with the historical data, locations for more intensive subsurface testing.

Areas identified for subsurface testing through the previous less invasive methods were explored with a half-inch-diameter metal probe to determine changes in soil density associated with filled pit features. Probes were placed at five meter intervals along transects spaced at five meter intervals. Due to the compact nature of the soil, the systematic use of the probe across the entire locus was not an optimal strategy. However, the probe was used effectively at other loci to pinpoint subsurface deposits identified from other data sources, such as historic maps.

Manual excavation commenced with hand augering. Auger bores of no greater than six inches in diameter were manually drilled at five meter intervals across the locus. In areas of repeated negative bores, the interval between auger bores was increased to ten meters. Probing and hand augering of the locus allowed for expedient determination of the presence of cultural materials. Based on the results of surface survey, metal detector survey, probes, and auger bores, shovel test units (50 cm by 50 cm) were excavated to test buried deposits. One shovel test unit was expanded to a formal excavation unit (1 m by 1 m) to more thoroughly characterize and collect data from a dense subsurface deposit.

81 metal probes, 69 auger bores, 15 shovel test units, one formal excavation unit, and four mechanically-excavated trenches were dug. The total amount of soil excavated in test units and the excavation unit amounted to 2.55 cubic meters. A total of 2,944 artifacts were recovered from this locus during this investigation. A total of 37 metal detector hits were recorded and plotted.

While cultural materials were widespread on the ground surface, testing revealed that the subsurface materials were concentrated in an area to the southwest of Tioga Road. The construction of a banked curve along Tioga Road destroyed the integrity of the deposit to the north. According to a historic photograph and a memory map of this location, the affected area was the former location of the Gobin Hotel and its associated outbuildings. The photograph and map also revealed that the remaining intact deposit was in the approximate location of the Hurst Saloon.

Only one area within the locus produced significant subsurface cultural remains. This concentration of artifacts indicated a cultural stratum otherwise not visibly distinct from the surrounding soil matrix. The deposit covered an area of approximately 400 square meters based on the auger bore and shovel test data.

The deposit was consistent with sheet refuse and was located in the approximate area labeled as "scraps" on a memory map of this location. Because there was no distinction visible in the soil profiles within this concentration of cultural materials, it can be inferred that the deposit accumulated in a rapid and homogenous manner, consistent with the short, circa 20 year span of operation of the Hurst Saloon.

While the integrity of the former Gobin Hotel and outbuildings was lost due to modern road construction, the deposit associated with the Hurst Saloon maintained excellent integrity. Even though there were no visible soil changes within the deposit, the concentration of cultural materials suggested the existence of vertical stratigraphy. The deposit also maintained intact horizontal stratigraphy as evidenced through the discrete spatial distribution of materials in this area. An increased number of architectural artifacts and a decreased number of domestic artifacts to the north and east of the site suggested the presence of a structure in this vicinity. The increased amount of domestic artifacts to the south and west of the site suggested a layer of sheet refuse south of the former structure. This interpretation was strengthened by a memory map that showed this same approximate layout.

Artifacts recovered at the locus provided a date range for occupation of 1867 to 1934. The majority of datable artifacts were from the period between 1880 and 1910. The most precise date was from a shell casing produced from 1885 to 1894. The archaeological and historical data coincided concerning the dates of occupation. Historical documentation dated the Gobin Hotel from the 1860s to the 1900s and the Hurst Saloon from prior to 1880 until 1890. Artifacts that date after 1890 suggested that the structures and trash dump associated with the Hurst Saloon were likely used after the 1890 death of William Hurst.

The artifact assemblage was consistent with the known historical use of this area as a saloon. Of all the artifacts recovered, 71% were classified as food storage, beverage storage, food preparation and food remains (n=2091). An additional 12.2% of the assemblage was composed of fragmentary artifacts that were not classified within a functional category but most likely were used for food and beverage storage (n=359). William Hurst was the "custodian of the supplies which were hauled thus far by pack mule or wagon" (Schlichtmann and Paden, 1986:221). From archaeological evidence, it is clear that Hurst not only supplied goods to the shepherds and other visitors to Crane Flat, but also provided meals and drinks. This fact was also poetically evident in the historical record:

> There's Cloudman full of music and Buchanan full of tune.
>
> We drank and ate and stayed up late, at Billy Hurst's saloon
>
> (Schlichtmann and Paden, 1986:222).

As evidenced by the 13% of the assemblage classified as architectural artifacts (n=382), the demise of Billy Hurst's saloon seemed to come about through decay. Of these, 87.2% were nails (n=333). The great quantity of nails suggests that the structures at this location deteriorated and collapsed in place. The structures were not moved or salvaged for building materials. The nails also showed no signs of having been subjected to high temperatures that would indicate a fire. The probable abandonment and eventual deterioration of these structures was consistent with Hurst's death and no record of a new proprietor for the saloon.

4. THE RANGER STATION LOCUS

As originally identified by Ryan (1999a), this locus consisted of the remnants of a dry-laid, granite boulder and cobble foundation, and three giant sequoia trees planted between 1929 and 1934. Through documentary research and oral history, the foundation remains were identified as the former location of one of the first ranger patrol cabins built in Yosemite. By the early 1900s, Crane Flat was still privately held, but the lodging and saloon operation was largely defunct in part due to the deaths of Lewis Gobin and Billy Hurst. Though Crane Flat was not yet a part of the Park, the activities of stockowners in the area had been heavily curtailed.

In 1915, one of three ranger patrol cabins in Yosemite was erected at Crane Flat (Ryan, 1999a). The construction of this cabin coincided with the opening of the Park to automobiles. The cabin served as an entrance kiosk/visitor center by informing tourists arriving by automobile of the Park regulations and collecting the entrance fee (Ryan, 1999a). The cabin was moved from this location to the Pioneer Yosemite History Center in 1960, where it stands at present.

The investigation of this locus followed the methods successfully used at the Way Station Locus. The remnant foundation allowed for convenient identification of the locus on historic maps and photographs. The foundation consisted of a single course of local stone and was oriented to true north. Prior to any archaeological testing, the foundation was documented through a stone-by-stone drawing of the exposed stone. The foundation appeared to be intact with little disturbance since the cabin superstructure was moved in 1960.

Following the recording of the stone foundation, a standard metric grid was established across the locus. A pedestrian survey failed to reveal any cultural material visible on the surface. Metal detector transects spaced at five meter intervals recorded hits with a point provenience. The historical data, the location of the foundation, and the results of the metal detector survey determined locations for more intensive subsurface testing.

Because the use of the metal probe was ineffective at the Way Station Locus, testing commenced with the manual excavation of hand augers. Again, similar auger bores were drilled at five meter intervals. Based on the results of the metal detector survey and auger bores, shovel test units were excavated to test buried deposits. An additional shovel test unit was excavated to expose the stone foundation and test its depth.

Ultimately, 2 metal probes, 15 auger bores, and 4 shovel test units were placed at the Ranger Station Locus, totaling 0.375 cubic meters of soil and producing 341 artifacts. Ten metal detector hits were also plotted.

Sheet refuse of early twentieth-century artifacts was uncovered to the southwest of the foundation in an area dominated by a granite bedrock outcrop. This deposit was associated with the cabin foundation by dates of the material and its spatial proximity. Further research with maps and photographs of the cabin showed that the sheet refuse was within toss distance of the kitchen porch of the cabin. A half-inch-diameter metal probe was used to determine the boundaries of this deposit. Probes were placed at intervals of 50 cm to determine the presence of the layer. In contrast to the failed use of the probe at the Way Station Locus, the probe was able to penetrate the ground surface and provide evidence for this artifact concentration.

Again, the artifacts appeared to be indistinct from the surrounding soil matrix, and we inferred a rapid depositional event. This assumption is consistent with the date range of the recovered materials as well as the known length of occupation of the ranger cabin, approximately 45 years. While the cabin foundation has maintained its original integrity, the surrounding area has been greatly disturbed by the construction of multiple modern utilities. The archaeological deposit within the granite outcrop is the only archaeological element associated with the ranger cabin.

Artifacts dated the assemblage between 1895 and the 1950s. Although few datable artifacts were recovered, the archaeological data coincided well with the historical occupation date of 1915 to 1960.

The artifact assemblage reflected the use of the cabin as a living quarters with 80.6% of the assemblage composed of domestic artifacts (n=275). Of these domestic artifacts, 71.5% were classified as food and beverage storage (n=196). An additional 27% of the domestic artifacts were classified as indefinite (n=74), but were mostly fragments of glass bottles. Although the lack of activity-related and personal artifacts may be related to the small sample size, the lack of architectural artifacts was directly attributable to the moving of the cabin superstructure in 1960.

5. THE CCC LOCUS

This locus was initially identified by Ryan (1999a) as remnants of structures and tent pads as well as a widespread surface scatter of historic debris. The locus is located on a hillside that has been terraced to create level areas for the placement of tents and other structures.

In 1933, Crane Flat was established as a Civilian Conservation Corps (CCC) campsite, known at different times as Camp 3, YNP-3, and NP-17. Occupied from approximately May through October, it served as a permanent summer camp. The CCC camp at Crane Flat was seasonally occupied by approximately 100 to 200 men nearly every year from 1933 to 1942 (Anonymous, n.d.; Tweed et al., 1977; Greene, 1987; ARG, 2003). The workers' activities included installation of telephone lines, replacement of the rangers' quarters at Crane Flat, construction of a wood shed, opening fire roads and trails, landscape work, fire hazard reduction, and, the eradication of *Ribes* sp. plants as a way of controlling white pine blister rust (USDI, 1939, 1941; Paige, 1985).

The CCC ceased operation at Crane Flat in 1942. However, blister rust continued to be a concern. After the withdrawal of the CCC, the National Park Service (NPS) took up the operation of Crane Flat from the Army and continued to use it as a base for *Ribes* eradication. For labor, NPS called on local high school students to replace the CCC enrollees. By 1946, the temporary buildings at Crane Flat were dismantled and a new camp was established 150 yards to the west of the old camp. *Ribes* eradication efforts continued to be based at Crane Flat through 1967. The camp was then used as a summer camp for firefighters until the early 1970s when YI was granted a special use permit for the camp. During this time period, the CCC Locus was most likely abandoned.

In contrast to the Way Station Locus and the Ranger Station Locus, the CCC Locus posed a unique challenge for archaeological testing primarily based on its large size, but also on the structure of the deposits. The area that encompassed the terraces, other structural remains, and a large surrounding surface scatter of historic debris amounted to approximately 35,200 square meters.

Following similar methods that had produced good results at the other loci of the site, historic photograph and map data were used to generate a field map which identified the known historic features at the site. A standard grid in metric units was established. Cultural remains visible on the surface were noted to identify boundaries for the locus. An intensive survey of the site was conducted with a metal detector in transects spaced at five meter intervals across the locus and positive hits were mapped with a point provenience.

Manual excavation commenced with the same hand augering method. At the CCC Locus, an almost complete lack of subsurface materials encountered during augering in contrast to the large amount of surface finds necessitated a change in strategy. While a small number of shovel test units were excavated, an intensive surface survey with transects spaced at five meter intervals was conducted across the entire locus. All surface artifacts were recorded with a point provenience. Each surface find was identified and classified in the field.

Ultimately, the CCC Locus testing consisted of 18 metal probes, 140 auger bores, and 6 shovel test units. Subsurface testing totaled 0.65 cubic meters of soil producing 233 artifacts. In addition, the surface survey identified, recorded, and piece plotted 910 artifacts. The metal detector survey of the locus recorded 12 positive hits.

Of the 140 auger bores, only 20 encountered cultural materials. All subsurface historic materials were encountered on or near tent pads and foundations. These materials were predominately architectural in nature (nails, screws, and window glass). Auger bores within known privy locations failed to produce any artifacts other than building construction and/or destruction debris. Metal probes were used to test feature locations derived from historical data. No subsurface refuse deposits were encountered.

The lack of subsurface artifacts was unusual given the artifact density on the surface. However, the spatial distribution of surface artifacts suggested that the camp was repeatedly reused after the CCC occupation. The identified surface artifacts were also primarily architectural debris associated with the destruction of foundations and domestic debris associated with the later reuse of the area by NPS. Several dated artifacts, including a 1944 penny and a fragment of concrete inscribed "1947," clearly demonstrated that the area was used after the CCC. Additionally, the surface finds closely paralleled artifacts discovered at trash dumps that have been associated with blister rust camps throughout Yosemite National Park (Burton et al., 2003).

Of subsurface finds, only 31.7% were datable (n=74). These finds consisted of wire nails and nail fragments that indicated a date of occupation after 1895. Of the datable surface finds, 12.9% provided a date range of 1850 to 1964. The majority of datable artifacts placed the surface deposit as after 1930. Although the subsurface finds may date to the CCC occupation of this area, the majority of surface finds were associated with the later NPS camp for blister rust control and possibly the use of the area by firefighters and YI.

The lack of domestic, activity-related, and personal artifacts associated with the CCC occupation was most likely due to the use of a centralized Waste Accumulation Area (WAA) located some distance from the camp. This type of waste disposal has been documented for other CCC camps within Yosemite National Park (Burton et al., 2003). However, no historical or archaeological evidence was found to indicate the location of the WAA associated with the CCC camp at Crane Flat.

An analysis of the functional categorization of surface versus subsurface finds revealed a clear distinction. A much higher percentage of the surface finds were classified in categories other than architectural. This distinction was most likely attributable to the transition in the control of the camp from the CCC to NPS.

During the CCC occupation of the camp, the Army was responsible for all aspects of life. Military discipline surely extended to the proper disposal of waste, which entailed the careful accumulation and disposal at designated WAAs. When NPS took control of the camp, local high school students replaced the CCC enrollees. NPS most likely did not enforce military discipline on these students. Although the small amount of waste that accumulated on the surface over approximately 30 years indicated that NPS still disposed of trash at a WAA, the presence of the "improperly" disposed of items demonstrated a different attitude towards discipline in camp life.

6. FLEXIBILITY IN RESEARCH DESIGN AND METHODS

The archaeological investigation of CA-MRP-1512H was guided by themes and associated questions from a research framework developed for Yosemite National Park (Hull and Moratto, 1999). These themes and questions were dependent upon specific data requirements outlined in an initial research design (Pacific Legacy, 2004). Because CA-MRP-1512H had not previously been subject to subsurface investigations, it was uncertain how well the sites could adequately address the research issues.

Given our initial historical research, the most productive areas for testing appeared to be the Gobin Hotel portion of the Way Station Locus as well as the CCC Locus. A large amount of historical data inspired research questions based on archaeological data categories likely to be encountered (given the existing information) at the loci. However, subsurface investigation failed to produce the specific data categories necessary to address any of the initial themes and questions. The deposits associated with the Gobin Hotel at the Way Station Locus had been destroyed, and no significant deposits directly associated with the CCC were encountered at the CCC Locus.

Subsequently, the research emphasis was modified to better suit the deposits that were found. The need for this degree of "flexibility" was addressed by Hull and Moratto (1999:505), who emphasized that "project directors are encouraged to revise micro-scale research plans continuously in response to changing opportunities, constraints, and data yields as work progresses."

Of the three loci, only the Way Station Locus produced a significant amount of quality archaeological data. Although sheet refuse was present at the Ranger Station Locus, the quantity of cultural remains was small due to disturbance caused by the modern utilities. At the CCC Locus, few cultural remains could be associated with the CCC occupation of the camp. These were primarily architectural debris and presented little potential to address our research questions. The remaining evidence post-dated the CCC occupation and could not definitely be associated with a single group of people or a specific period of use.

The sheet refuse at the Way Station Locus provided the best archaeological data in terms of quantity and quality at CA-MRP-1512H. This deposit was associated with the Hurst Saloon, which operated at this location from the 1870s to at least 1890. We revised our interpretive themes in response to the opportunity afforded by the identification of the deposit associated with the Hurst Saloon. The sheet refuse allowed for the investigation of the early settlement and continued use of Yosemite's high country. This research provided an opportunity to explore issues related to historic seasonal settlements in an environment that was challenging prior to the invention and introduction of modern technologies.

7. SAYING A LOT WITH A LITTLE

Archaeological data from the Hurst Saloon provided evidence for the existence of networks connecting William Hurst to his neighbors, local merchants, regional producers, and national and international manufacturers. Although only less than 1% (n=23) of the total assemblage could be identified as to manufacturing origins, the manufacturers that could be identified revealed connections to communities in California, the eastern United States, and Great Britain.

The local network was represented by 15 fragments of eggshells. Although it is uncertain where the eggs originated, Ann Gobin was known to keep chickens at her hotel across the Big Oak Flat Road from the Hurst Saloon (Schlichtmann and Paden, 1986). These remains may represent the tangible expression of a system of barter known as "neighboring." As elaborated by Miner (1949) in his study of a farming community in Iowa and later by Adams (1976, 1977) in his study of Silcott, "neighboring" was an outgrowth of a primarily "cashless" or "cash poor" local economy that relied on bartering relationships for goods and labor. These relationships created social and economic ties that resulted in a system of alliances and the formation of community bonds. Given that solitary shepherds, placer miners, farm laborers, and Native Americans were Hurst's primary clientele, this cashless system of barter was most likely extensive and may have served as the basis for the local economy at Crane Flat.

The regional network was evidenced by a single bottle of soda water that was produced at the Thomas Leonard Soda Works in Sonora, California. Although this bottle provided the only precise evidence for a regional network, the high percentage of consumer goods in the assemblage indicated Hurst's connection to area merchants who provided such goods. No merchants were identified from the archaeological remains but further historical research on the account books and inventories of nearby merchants, may inform us as to Hurst's interactions within the regional commercial economy.

Hurst's connection to a regional network was further made through an analysis of the ferrous cans and can fragments from the site. Over 65% of the assemblage consisted of cans and can fragments, which represented a minimum of 132 individual cans. This proliferation of canned goods at the Hurst Saloon coincided with the development of the first automated can making machinery in the 1880s which greatly increased production. The cans most likely contained canned fruits and vegetables. The origins of these canned goods could not be traced; nonetheless, the decade of the 1880s witnessed the rise in the commercial production of fruits and vegetables in California and the beginnings of the canning industry (Jelinek, 1982). These cans may represent further evidence for Hurst's connection to a regional economy that encompassed California.

National and international networks were most represented by the artifacts that could be identified as to location of manufacture. Of the 22 artifacts that originated outside of California, 72.7% (n=16) were produced in the eastern United States and 27.3% (n=6) were produced in Great Britain. Of the artifacts that originated in the eastern United States, 93.8% (n=15) were produced in the "American Manufacturing Belt" (Riordan and Adams, 1985:16). The American Manufacturing Belt was an area that stretched from the southern Great Lakes to New England and contained upwards of 65% of the manufacturing capacity of the United States in the late nineteenth and early twentieth centuries (Pred, 1970:274). The high percentage of artifacts that originate from the American Manufacturing Belt connected Crane Flat to the developing national market of the United States.

The density of artifacts identifiable as to origin in this sample was small, approximately nine artifacts per cubic meter. Yet, the recovered artifacts place the Hurst Saloon within local, regional, national, and international exchange networks. For archaeological sites that date after the advent of the Industrial Revolution, commodity markets play an increasingly important role in their study. This is particularly true for a location such as Crane Flat, where complete self-sufficiency was never attained by the seasonal inhabitants. In these locations, it is as important to understand the reliance of individuals upon the commodity market as it is to evaluate the degree to which a localized exchange economy allowed individuals to operate outside of it.

Of the total assemblage from the Hurst Saloon, 71% of the artifacts were related to foodways (n=2091). These artifacts were classified as food storage (n=1923), beverage storage (n=95), food preparation (n=37), and food remains (n=36). The majority of the assemblage related to foodways consisted of ferrous food storage cans and can fragments (n=1919). Only 86 of these cans were identifiable as to their contents and consisted of coffee-type cans (n=31), meat-type cans (n=28), and evaporated milk cans (n=27).

The high percentage of food storage cans demonstrated a clear reliance on the commodity market. This was in sharp contrast to evidence of foods, such as fresh meat and eggs, which may have come from animals raised at the location. Only 17 fragments of medium mammal bone and 15 fragments of eggshell were recovered. The remaining food remains consisted of 4 fragments of peach pits (*Prunus* sp.).

Beverage storage containers were the next most represented artifact and accounted for 4.5% of the total of foodways-related artifacts (n=95). Given the association of this assemblage with a saloon, the low percentage of beverage storage containers seemed remarkable. Curation and reuse of containers may help to explain the low occurrence, but no physical evidence of these behaviors was identified. The use of larger containers, such as casks and kegs, may also explain the lack of smaller ceramic and glass containers. The explanation for the low occurrence of these containers remains an important question for future research at the site.

From the recovered assemblage, it was apparent that foodways at the Hurst Saloon may be productively studied through items other than food remains. Almost 70% of the total assemblage at the saloon was comprised of artifacts related to food storage, beverage storage, and food preparation (n=2055). The predominance of commercially-produced foods at the Hurst Saloon may be indicative of a pattern in foodways associated with the seasonal occupation of the high country. Although historical records show that cows and chickens were kept at Crane Flat to provide dairy products and eggs, it is clear that neither William Hurst nor Lewis and Ann Gobin achieved self-sufficiency and they needed outside food sources. The few fresh foods available at Crane Flat, which presumably included fresh mutton as well as dairy products and eggs, supplemented commercially-produced goods for the sustenance of the shepherds and travelers who visited Hurst and the Gobins. The relationship between the commercial market and self-reliance at Crane Flat remains an important issue for future research.

8. CONCLUSION

The primary goal of our investigation of CA-MRP-1512H was to determine the eligibility of the site for listing on the NRHP. The data potential of site had not previously been evaluated through subsurface investigations, a necessity for determining the nature and integrity of the deposits. Because the overall size of the site was in excess of 67,000 square meters, we were faced with a difficult situation in terms of developing a research program that was both cost effective and of limited invasiveness.

The use of a nested, or progressively invasive, method of archaeological testing allowed for the identification and characterization of subsurface deposits with a limited amount of excavation. Based on historical data and existing site information, CA-MRP-1512H was divided into three distinct loci based upon geographic and temporal separation of the deposits. Additional surface survey and intensive metal detector survey allowed for the identification of areas within each of these loci for increasingly invasive testing.

Table 11-1. Summary of testing methods and results for each locus.

	Way Station Locus	Ranger Station Locus	CCC Locus
Probes	81	2	18
Auger Bores	69	15	140
Shovel Test Units (50 cm by 50 cm)	15	4	6
Controlled Excavation Units (1.0 m by 1.0 m)	1	0	0
Mechanical Trenches (3.0 m by 0.75 m by 1.0 m)	4	0	0
Metal Detector Hits	37	10	12
Piece-Plotted Surface Finds	0	0	910
Total Soil Excavated	2.55 cubic meters	0.375 cubic meters	0.65 cubic meters
Artifacts Recovered	2,944	341	233 subsurface; 910 surface (not collected)

Subsurface investigation commenced with the use of metal probes and auger testing. These methods furthered refined our understanding of the subsurface deposits at each locus. More invasive shovel test units were only used when specific locations with subsurface deposits were likely to be encountered. The shovel test units were not only used to help characterize the nature of the deposit, but also as a device for the collection of data that would allow for an evaluation based on the NRHP criteria. Only one formal excavation unit was excavated during the course of our investigation.

While the site area was in excess of 67,000 square meters, the total amount of soil excavated in test units and the excavation unit amounted to 3.575 cubic meters. For the archaeological investigation of the three loci, a total of 101 soil probes, 224 auger bores, 25 shovel test units, one formal excavation unit, and four mechanically-excavated trenches were excavated.

A total of 3,517 artifacts were collected during subsurface testing. Additionally, surface survey of the CCC Locus identified 910 artifacts that were recorded and plotted on the site map.

The use of nested testing methods allowed pinpoint identification of subsurface deposits with data potential. While we used a common set of archaeological testing methods, we worked on a scale of increasing invasiveness as deposits were identified. We attempted to limit the overall invasiveness of our investigation, so that we could evaluate data potential while, at the same time, ensuring that the data would be conserved for future archaeological investigations. Through these means, we determined that only the Way Station Locus, specifically the deposit associated with the Hurst Saloon, maintained the requisite integrity and data potential to be considered eligible for listing on the NRHP.

During this investigation, flexibility in the use of methods and the formation of a research design was essential. Although our testing strategy used a finite set of methods, each locus presented unique challenges that required a degree of adaptation to site specific factors. For example, the significant surface scatter and lack of subsurface deposit at the CCC Locus led to the intensive surface survey and identification of all surface remains of the site. Although we did not collect any surface artifacts, each find was recorded with the necessary data to create a catalog similar to that generated for collected subsurface finds.

Although our methods were not novel, our guiding principles of flexibility and conservation have made a positive contribution to the methodology of historical archaeology. Two key lessons should be taken away from this study. First, it is crucial that we do not allow ourselves to fall prey to a tyranny of rote methods. Since every site or even every locus from every site may be unique, we must not believe that a single research design or set of methods may best fit every situation. All archaeology, but particularly CRM archaeology, has a tendency to stick by the "tried and true" even long after it has become "tired and tyrannical." However, we are the keepers of unique and non-renewable resources that deserve better than to be treated as the next task at hand.

Secondly, we must also remember that as unique and non-renewable resources, archaeological sites are quickly being destroyed not only by development but also every time an archaeologist's trowel touches the dirt. For this reason, we need to encourage the development of new methods and new uses for old methods that increase the amount of data that we can extract while, at the same time, decreasing the impacts of that extraction. This is perhaps the most important lesson that we learned at Crane Flat. Although we had to develop a new research design in the process, we were able to extract a maximum amount of information from the Hurst Saloon deposit with a minimal amount of disturbance to the resource. From only 1.3 cubic meters of soil and less than 2,000 artifacts, most of which were rusty bits of cans, we were able to bring about a greater understanding of life around the bar at Billy Hurst's Saloon.

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Chapter 12

METHODOLOGY, MATERIALITY, AND THE ENDLESS SEA OF ARCHAEOLOGY

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> "If you want to build a ship, don't drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea."
>
> - attributed to Antoine de Saint-Exupery

Taken as a whole, the contributions to this volume should not be read as a checklist for an archaeological investigation. Phytoliths? Check! DNA? Check! Harris Matrix? Check! Rather, we have attempted to offer a small slice of "methodology" to the historical archaeology community. This volume, with its overlapping regional and material case studies, is not meant to be comprehensive. In fact, it is most likely impossible to create a comprehensive volume on "methods." Or, more appropriately, it is perhaps impossible to create a comprehensive volume on "methods" that would not read like an owner's manual. Perhaps there is a place for such a volume.

However, *Between Dirt and Discussion* is our attempt to present a series of case studies that show how critical attention to methods, even when approaching the same material types (contrast, for example, Vince and

Peacey, Chapter 2, with Agbe-Davies, Chapter 7) or sites (Archer, Bartoy and Pearson, Chapter 5, and Kostro, Chapter 10) can create profoundly different, yet equally successful interpretations. In so doing, we are not advocating the use of specific methods, but rather, we are bringing "methodology" back to the foreground of the archaeological process. Although we hope attention has been brought to the utility and potentials of specific methods, at the end of the day, this is not a book about "methods." This is book about "methodology."

In the introduction to this volume, we set out the often overlooked distinction between methods and methodology. As methods are, at their core, "the way we do the things we do," methodology is the study and critical evaluation of these methods. Although each contribution to this volume, in some way, presents a certain method, the significance of the volume lies in the way the authors approached their use of a given method through a process of critical evaluation. The contributors engaged with methodology to create novel and unique interpretations, which, at their core, were driven by the material evidence of the past, that which makes archaeology *archaeology*.

This volume provides a strong argument for the need for archaeologists to thoughtfully engage with the materiality of archaeology. A disturbing trend within archaeology has been the "triumph of theory over data." With the development of the "post processual" critique of archaeology throughout the last two decades of the twentieth century (e.g., Hodder, 1985, 1986, 1997; Shanks and Tilley, 1987; Tilley and Shanks, 1987), innovation in theory has been given precedence over innovation in methods or methodology. The most significant of these theoretical innovations derived from critiques of the status quo, or "tried and true," approaches to archaeology (e.g., Hastorf, 1991; Spector, 1993). Certain theoretical innovations, as seen through gender-based archaeologies (e.g., Conkey and Spector, 1984; Engelstad, 1991; Gero and Conkey, 1991) and the influence of critical theory (Gero et al., 1983; Gero, 1985; Leone et al., 1987; Layton, 1989; LaRoche and Blakey, 1997), have had profoundly positive influences on the discipline. However, these innovations have in themselves become the status quo that they fought so hard to overcome. As archaeologists have sought to "theorize" archaeology, the rampant "borrowing" of social theory from other disciplines has provided many questionable case studies in which the material record of the past, at best, has little influence on interpretation, or, at worst, has been molded to fit a particular theoretical orientation. We have no intention of naming names, but the most honest of us who have been in the discipline for awhile will admit to having heard more than a few talks that begin with lofty theory and degenerate into a cartoonish picture of the archaeologist desperately trying to fill hefty philosophical footprints with potsherds and graphs that seem to bear little pragmatic relation to their initial stated themes.

Allowing us some poetic license, the move towards a more theoretical archaeology has been an exercise in shipbuilding. It has been the construction of intellectual vessels for the sake of themselves not for the sake of their utility. We envision "archaeology," that is, the study of the material record of the past, as the "vast and endless sea" to which Saint-Exupery refers. Theory-driven archaeology has built boats and some of them have been quite "sea worthy." However, we believe that we have reached a point at which theory-driven archaeologists have lost their yearning for the sea. In building better vessels, many have forgotten what had first brought them to the waters.

As archaeologists, our primary responsibility is to the material record of the past. We believe that theories must be formulated and assessed by their ability to expand the potentialities of that material record. In so doing, we recognize, first and foremost, that the material record is an endangered resource. We must not merely acknowledge that our endeavors, specifically excavation, but other recording and analytical processes as well, irreversibly alter this resource. We must embrace our obligation to engage with methodology in such a way as to create less destructive methods that allow for the formulation of richer, materially-derived theories and interpretations. As Lucas (2001) points out, there are also paradoxes to consider that as more and more sites are revealed through development and CRM archaeology, their recording by archaeologists — the *real* archaeological record — has become routinized and conventional. In our opinion, this has had the effect of homogenizing and obscuring the material potentials of sites. We often talk about the damage done to resources by developers or pothunters, but at what point does approaching sites with boilerplate methods or *a priori* theoretical frameworks become an ethical problem as well? This belief in the necessity for ethics in our endeavor is one of the strongest arguments for a more material-driven archaeology. It is also one of the primary themes to be derived from this volume.

Despite the geographical and topical range of the contributions to this volume, the primary unifying theme of materiality provided an inspiration to each author. Every chapter is an example of the potentiality of a material-driven archaeology. In some ways, each author derived their data from "outside" of the traditional or mainstream archaeological process. Be it through historical archives, existing collections, reevaluations of previous excavations, or the testing and salvage of threatened sites, the authors recognized their primary responsibility to the endangered and non-renewable resource that is the material record of the lived past. Through their struggles with this material record, each author created innovative approaches that resulted in enhanced understandings and opportunities to pose previously unasked questions of that past. In so doing, multiple perspectives and interpretations were explored through the pursuit of the strongest and best supported lines of material evidence. We believe this approach is clearly generative *of* theoretical innovation. We do a disservice to archaeology by artificially separating theory from the methods with which we engage our materials.

In addition to the theme of materiality, we believe that two additional themes are evident throughout the volume. The two themes are: the appropriate use of new technologies and the revisiting of old methods. In integrating new technologies, such as DNA (Dixon, Chapter 4), GIS (Madry, Chapter 3) or the internet (Vince and Peacey, Chapter 2), it is important to note that each author engages with new technologies, but does so with the material record in mind. It is not the appropriation of technology for the sake of technology, but, instead, for the sake of archaeology. This is also true of those authors who engage with older, seldom discussed, issues, such as typology (Agbe-Davies, Chapter 6), stratigraphy (Harris, Chapter 7) or survey and testing methods (Kostro, Chapter 10; Bartoy et al., Chapter 11). These authors use the material record to formulate new questions to pose to older, routinized, low-tech, perhaps even "unglamorous" methods.

What is particularly interesting is that these two themes are really opposite sides of the same coin, a coin that is unified by a desire for creativity, innovation, and experimentation. It is really the willingness to engage with new technologies or old problems that unites all of the contributions in this volume. Discipline-wide, we *do* see the advent of exciting new technologies in material science and characterization, yet the gulf between specialist analysis and general archaeological reportage seems to be ever-widening, with a few notable exceptions (e.g., Addyman et al., 1976; Crumley and Marquardt, 1987; Hodder, 1996). These innovative methods seem to find outlets only in highly esoteric, restricted contexts, or as supplements and appendices to a previously established research agenda; they rarely are allowed to flourish and guide research by opening new lines of inquiry, as they have so much potential to do.

Perhaps innovation and constant vigilance in reappraising our established toolkit does not yield better answers, but instead, we may learn to formulate better questions. In this case, creativity, innovation, and experimentation should be judged not by their ability to answer a question, but by their ability to generate more questions. We hope that this volume is not used as an "owner's manual." Indeed, there are no perfect answers to be found within these pages. We can only hope that there are new questions. When innovations become "tried and true," they become the status quo. It is then that we must pause, reflect, and question.

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