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Stanley South, Chairman
The Conference on Historic Site Archaeology
The Institute of Archeology and Anthropology
University of South Carolina
Columbia, South Carolina 29208
1979
The nineteenth annual Conference on Historic Site Archaeology was held at the Museum of Early Southern Decorative Arts in Winston-Salem, North Carolina on September 28-30, 1978. The conference was hosted by Old Salem, Inc., with 120 attending. The papers published here are some of those presented at that conference combined with others contributed by conference members.

The Old Salem conference was the first one held at which the place and time was not selected by the Southeastern Archaeological Conference. The high attendance and successful program and excellent local arrangements made this a most memorable conference. This success demonstrates that the CHSA is strongly supported by those concerned with archeology on historic sites. An advantage now enjoyed is the selection of the conference site which can be at any historic setting chosen by the Board of Directors.

In recognition of his continual support of the conference since its founding in 1960, Charles H. Fairbanks was presented with a lifetime membership.

Also recognized for her many years of service to the conference as executive secretary/treasurer was Mary Jane Rhett, who was presented with a gift of ceramics. Mary Jane has resigned this office and has moved to Utah. Her excellent service to the conference will be missed in the years to come.

Thanks are extended to all those at Old Salem, Inc. and at the Museum of Early Southern Decorative Arts for hosting the conference, especially John C. Larson who acted as coordinator for the local arrangements and the conference.

The treasurer's report indicated that the conference assets now stand at $6,399.43.

The conference officers are: Stanley South, Chairman/Editor, Mary Jane Rhett, Executive Secretary/Treasurer. The Board of Directors are Stanley South, Chairman, Leland Ferguson, Kenneth Lewis, and Robert L. Stephenson.

Thanks are expressed to the following staff members of the Institute of Archeology and Anthropology for their assistance in the preparation of this volume: Cindy Mahoney, Kenn Pinson, Angela Talaber, Darby Erd, and Susan Jackson.

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ETHNOHISTORY, ANALOGY, AND HISTORICAL ARCHAEOLOGY

Charles E. Orser

This paper examines the relationship between ethno­history and archaeology by using a particular model of archaeological argumentation. My specific argument is that the use of ethnohistorical sources in historical archaeology is significantly different from the use of ethnohistorical infor­mation in prehistoric archaeology. In developing this argument I briefly review ethnohistoric inquiry to show how inter­pretations of this approach have differed and to illustrate the manner in which it is related to archaeological inquiry in general. It is not necessary to detail the development of ethnohistory or historical archaeology as such discussions have appeared elsewhere (Carmack 1972; Cline 1972; Axtel 1978; Harrington 1952; Fontana 1965; South 1977).

In examining recent treatments of ethnohistory it becomes immediately clear that a number of methodological views are possible. A review of these positions shows that many ethno­historians view the union of history and anthropology as a major strength of ethnohistory (Eggan 1961; Fontana 1961; Leacock 1961; Lurie 1961; Valentine 1961; Hodgen 1974). While the relationship between history and anthropology underlies this discussion, this relationship will not be considered because more detailed treatments can be found elsewhere (Mead 1951; Kroeber 1957; Hughes 1960; Evans-Pritchard 1962; Sturtevant 1966; D. Walker 1970; Hodgen 1974). It is necessary only to point out that the usual low-level distinction drawn between history (using written library-based information) and anthro­pology (relying upon verbal data gathered in the field) is a technical rather than a theoretical difference.

In American anthropology an interest in historical questions allowed ethnologists readily to acknowledge the harmonious relationship between history and anthropology and the potential of ethnohistory in uniting the two disciplines (Steward 1940; Riley 1967; Hudson 1973). Many scholars emphasize this inte­grative aspect in their definitions of ethnohistory. For example, this position is well illustrated in Erminie Wheeler-Voegelin's (1954:168) definition of ethnohistory as "the study of identities, locations, contacts, movements, numbers, and cultural activities of primitive peoples from the earliest written records concerning them, onward in point of time." The union between anthropology and history was operationalized when already historically-inclined ethnologists "discovered" historical documentation and historiography. For present purposes,
historiography is viewed as "an interpretation of the past by the selection of events which have been filtered through the mind of the original recorder" (McKay 1975:129). For Nancy Oestreich Lurie (1961:80), the discovery of primary research data represented the sudden awareness of historiography on the part of ethnologists. The archive was no longer seen as the domain of the historian alone (Gann 1956), and by using written materials, ethnohistorians began producing historical ethnographies, specific histories of nonliterate cultures, and works of folk history (Sturtevant 1966; Carmack 1972). Although the inclusion of the last as a type of ethnohistoric study has been questioned by Charles Hudson (1966) who distinguished between historical ethnographies as "etic" in nature and folk histories as "emic" (cf. Schuyler 1977), folk histories are usually grouped with general ethnohistorical inquiry.

Implicit in Lurie's (1961:84) assertion that the ethnohistorian must have a firm ethnological background is William Fenton's (1952:328; see also 1966) earlier idea that ethnologists must "carry the perspective of field work to the library." This seems to be a prevalent view, and many other practicing historical ethnologists have upheld the notion that fieldwork experience is a necessity for an ethnohistorian (Kluckhohn 1945; Gunnerson 1958; Ewers 1961; Leacock 1961; Schapera 1962; Sturtevant 1966; Cohn 1968; Fontana 1969). In place of actual ethnological fieldwork, it has been also stressed by a number of ethnohistorians (principally those traditionally labelled "historians") that merely a firm knowledge of ethnological concepts is necessary for ethnohistorical research. James Axtell (1978:112), in tracing the history of the academic prominence of ethnohistory, noted that the questions asked of the historical record by historical ethnologists were drawn from their own fieldwork experience and ethnological training and were, therefore, not the same types of questions traditionally posed by historians. Axtell's (1978:113) definition of ethnohistory as the study of culture change by reference to historical materials defined by ethnological concepts and categories reinforces the integrative aspect of ethnohistory. This view shows that ethnohistory can be practiced equally by anthropologists interested in historical questions and by historians interested in cultural processes (See also Washburn 1961; Pearce 1974).

Such discussions between historians and anthropologists have led to a great deal of controversy over the academic placement of ethnohistory as either a subdiscipline of
anthropology or history or as a separate but multi-faceted discipline. Generally, it seems that ethnohistory is best viewed as an approach rather than as a distinct discipline (Fenton 1962:2) based upon a set of special techniques acquired from historians (Carmack 1972:232; Euler 1972:203). Axtel (1978:114) asserts that ethnohistory is not a discipline or even a subdiscipline but rather "a hybrid method, process, or approach applicable to a variety of historical problems." Harold Hickerson (1966:822), however, in a pessimistic review article, voiced a useful warning about hybridization, cautioning that anthropologists, through their use of historical materials, could become heedless of culture while historians, in their cursory reading of ethnological literature, could become lax about historical matters. While Hickerson's caution is important, I believe that this hybridization has been affected in such a way as to offer the best of both disciplines to the ethnohistorian.

One effect of hybridization has been to show that many different information sources can be employed in an ethnohistoric study. Indeed, it is this "flexibility in bringing seemingly diverse sources of data to bear on particular problems" which is the most significant aspect of ethnohistory (Handler and Lange 1978:217). Which "diverse sources" will be used seems to be determined not only by what types of data are available but also by the particular direction the investigator wishes to take (Dark 1957:254). Most ethnohistorians who have made explicit reference to ethnohistorical materials have upheld the history/anthropology union by delineating two major classes of data consisting of library and museum studies and field studies (Gunnerson 1958; Ewers 1961; Schapera 1962; Cohn 1968). It is interesting to note, however, that John C. Ewers is the only ethnohistorian to make even implicit reference to archaeological materials (which occur within his "site exploration" category). His category "artifacts" is included in the "library and museum studies" group and must be construed as ethnological specimens or artifacts gathered from previous excavations (which he considers historical documents) (Ewers 1961:267). The nature of the relationship between archaeological and ethnohistorical materials, which is the major concern of this paper, deserves detailed examination.

In order to adequately present the relationship between archaeology and ethnohistory and the differential use of ethnohistorical information in prehistoric and historical archaeology, I rely upon a model developed by David P. Braun (1977) concerning anthropological argumentation in archaeology.
In Braun's model all behavior which has been viewed first hand or experienced with the senses (Fritz 1972:136) is called the observed behavioral record. It is not relevant whether the observer is a modern ethnologist or an eighteenth century missionary because both sets of data are derived from face-to-face confrontations (Kluckhohn 1945:79; Schapera 1962:152). Within this framework Fenton's (1952:336) notion that all ethnographic information is secondary source material does not hold. All of this type of writing, no matter how biased or inaccurate, represents direct observation. This is not to contend, however, that first-hand accounts and observed behavior represent the same thing. It is clear that because of observer misunderstanding, error, or deliberate deceit, actual behavior must also be inferred from written accounts. As a result, all reworked, synthesized, or interpreted direct observation (used in the reconstruction of past lifeways) is termed the inferred behavioral record. These materials are extremely important in archaeological argumentation and often give meaning to the observed behavioral record (Schuyler 1977:110). Secondary historical writings, which are often useful in delineating problems, are included within this category. In this model the archaeological record can be viewed simply as consisting of information sets in archaeological context (Schiffer 1976:16).

The central feature in this model is bridging propositions. These are instruments of indirect observation (Fritz 1972) or propositions about the material correlates of cultural phenomena (Binford 1968a). Bridging propositions provide a link between the archaeological record and behavior and offer premises concerning this relationship. The construction of these instruments allows archaeologists and historians to indirectly observe remote phenomena which they cannot experience with their senses, and in effect, permits scholars to observe past sociocultural phenomena (Fritz 1972:136). In this sense, the archaeological record itself is not the instrument (cf. Fritz 1972:137) because it is not developed by the scholar. The archaeological data sets are directly experienced by the archaeologist, but the propositions about the material correlates of past sociocultural processes are consciously created. Bridging propositions must be used to infer actual behavior from written accounts. In addition, other disciplines can offer information which allows archaeologists to link archaeological data and behavior. The fields most often relied upon are those which permit archaeologists to comprehend the noncultural processes which may have affected the site after it was abandoned (Schiffer 1976:15-16).
In Braun's model, arguments of plausibility or arguments of prior probability link the argumentation process with cultural theory. According to Merrilee Salmon (1976:379), "The prior probability of a hypothesis may be taken as a measure of its likelihood, independently of any testing of it through checking its (deductive or inductive) implications." For archaeologists, many types of information, including ethnographic analogies, can be used to determine an hypothesis' prior probability in order to increase our confidence in it. Analogical arguments play an important role in judgments of plausibility in archaeological inference. As Bruce D. Smith (1977:608) points out, the function of plausibility judgments is to present the opportunity to reject the hypothesis with the highest prior probability. As often happens, a number of hypotheses may have a roughly equal prior probability all of which require verification by an inductive-deductive procedure.

Bridging arguments or arguments of relevance which serve to link the archaeological record with behavior, often take the form of analogical arguments (Binford 1968a:22; Smith 1977:611). An argument by analogy is an inductive argument which postulates a general similarity of the basis of a few shared attributes. These arguments allow archaeologists to relate phenomena to one another (Fritz 1972:140). In analogies, arguments of relevance question the strength of the similarity between the objects being compared (W. Salmon 1973:98), and obviously, the greater the similarities, the greater the strength of the analogy. Like the formulation of test implications, the establishment of bridging arguments illustrates the creative ability of the archaeologist.

For heuristic purposes, this argumentation form can be represented graphically (Fig. 1). It will be noted that each component in the argumentation process is linked by a bi-directional arrow. This arrow can be viewed as two distinct arguments, one representing an inductive argument (from the data to the bridging propositions) and the other representing a deductive argument (from the propositions to the data). This continual process is necessary for the construction and alteration of the propositions about the material correlates of cultural phenomena. For purely illustrative purposes, the arrows also indicate the interconnectedness of the argument components.

Using this model, then, the seven kinds of ethnohistorical sources cited by Ewers (1961:267) can be divided between the
Figure 1. Anthropological argumentation in archaeology.
observed behavioral record (primary historical writings, maps and pictures, language, and ethnology), the inferred behavioral record (secondary historical writings and folklore), and the archaeological record (site exploration). Drawings and paintings can be included as part of the observed behavioral record because their evaluation is similar to that of written sources (Ewers 1967).

The placement of Fenton's "ethnological specimens" (the material items rather than the ethnologist's field notes) presents more of a problem. I view such specimens, however, as part of the observed behavioral record. According to Wilcomb E. Washburn (1964:247), the distinction between manuscripts and museum specimens (termed "manufacts") is an unjustifiable theoretical distinction made by university scholars. In addition, it can be easily argued that manuscripts are artifacts (Dymond 1974:16).

Using Braun's model, it is relatively easy to provide auxillary models to represent types of ethnohistorical research. The following figure shows ethnohistory as practiced by those investigators who stress the study of culture change in their definitions of ethnohistory and make use of data gathered archaeologically, but who do not explicitly make reference to the important role of bridging propositions (Fig. 2). In this type of research there is a direct link between direct observation, cultural reconstruction based upon the interpretation of the direct observation, and the archaeological evidence. There is no need for the ethnohistorian to construct an instrument of indirect observation linking the archaeological data and behavior because hopefully the archaeologist has already accomplished this. In addition, ethnohistorians using archaeological data do not necessarily have to make use of methods and concepts from other nonbehavioral disciplines. William Sturtevant's (1966:41) view that culture history is the main concern of archaeology can be represented in the same figure by replacing "cultural theory" with "historical sequence." While temporal sequences are certainly important to many ethnohistorical and archaeological studies, the construction of such sequences is generally not the desired end product of most current ethnohistoric research. Most ethnohistorians agree that the goal of ethnohistory is to provide more than just a chronological sequence of past events, and the recent position of Jerome S. Handler and Frederick W. Lange (1978:2), who characterize their archaeological and historical investigation of plantation slavery in Barbados as a work in cultural anthropology, is adopted here. Using this model, the following
Figure 2. Ethnohistoric research using archaeological data.
diagram (Fig. 3) shows the relationship of the observed behavioral record (primary sources), the inferred behavioral record (secondary sources), and cultural theory and historical sequence in ethnohistorical writings which make no use of archaeological information (either by choice or because it does not exist). The "particularistic ethnohistory," such as that debated between Melburn D. Thurman (1974a, 1974b, 1974c, 1974d) and James H. Howard (1974a, 1974b, 1974c), can be diagrammed in this drawing by excluding cultural theory. In the type of ethnohistory they were debating, synchronic accuracy was the goal rather than any firm statement relative to cultural operation and change.

Having provided the background for viewing ethnohistory, archaeological argumentation, and the placement of ethnohistorical sources within the model, it is now pertinent to discuss the role of ethnohistorical materials in archaeology. An examination of writings on ethnohistory reveals that it can and often does exist independently of archaeology and is often united with many other fields (Carmack 1972:232). It is obvious, however, that ethnohistorical information has frequently been paired with archaeological materials in a subordinate manner in order to either reinforce or add substance to a particular temporal argument made primarily with archaeological material, or to illuminate a particular cultural-historical problem. Essentially, both prehistoric and historic period archaeologists use ethnohistorical data to support arguments of relevance and to evaluate an hypothesis' prior probability. I argue, however, that the use of these materials is distinctly different in historical archaeology.

The traditional use of ethnohistorical materials in archaeology is in reference to the direct-historical approach. As defined by Julian Steward (1942:337), this approach "involves the elementary logic of working from the known (i.e., historic) to the unknown (i.e., prehistoric)." This approach is based on a number of analogies which must be made by the prehistorian who is essentially working back in time. In these instances the archaeologist uses historically known groups as an ethnographically reliable base from which to infer selected components of prehistoric society. The analysis of ethnohistorically documented groups offers empirical support for the confirmation of the statements in the argument (Fritz 1972:152-153).

In cases where the archaeologist does not employ the direct-historical approach, the notion of cultural similarity
Figure 3. Ethnohistoric research without using archaeological data.
through time still occurs in the argument. In prehistoric archaeology ethnohistorically-based analogies embody a temporal element in their argument almost by definition. Even in cases where the archaeologist is arguing an analogous similarity on the basis of settlement location, the analogical argument is still temporal in nature. The analogies which are generated in prehistoric archaeology are based largely upon the concept of uniformitarianism. This principle contends that past cultural phenomena is not radically different from present or historically-observed cultural phenomena merely because they occurred in the past and were not directly observed.

In terms of their archaeological research, prehistorians can use only ethnohistorical information in an analogous manner to construct inferential arguments. This usage, however, is important because it is one way to assess the prior probability of hypotheses and to offer possible explanations (Binford 1967, 1968b; Smith 1977). As archaeologists are dependent upon many different types of ethnographical observations (of varying quality and utility), one of their main problems is to discover the most effective way to use them (Gould 1971:143). Put another way, a major concern is to try to increase the plausibility of the generated hypotheses by increasing the strength of the analogical arguments. For Robert Ascher (1961:318-319), the indiscriminate use of analogies in archaeology can be distinguished from what he termed the "new analogy." In this "new" approach "boundary conditions for the choice of suitable analogs" were established (Ascher 1961:319) in order to solve the "correlation problem" (Nicholson 1955:596).

The most obvious use of analogy in historical archaeology concerns the simple correlation of material objects with historically known drawings of objects of similar form (Schuyler 1968). This approach, which is an extremely particularistic and low-level use of analogy, seeks to interpret archaeologically-derived data by analogies to ethnohistorically known specimens. This approach has been called "historico-archaeological deduction" and has often been used in prehistoric archaeology. It is known to have been used as early as 1880 by Jacob Brower (Bennett 1943:214). When analogies are made between objects noted in the documentary record and objects seen in the archaeological record, such arguments have great strength because the relevant similarities approach unity (Schuyler 1968:391; see also Deetz 1970:123). This low-level usage of analogy is not the only use of ethnohistorical materials in historical archaeology, and ethnohistorical and
archaeological information have often been equally united in the study of past sociocultural phenomena.

The most explicit reference made to the equal union of ethnohistory and archaeology was made by David Baerreis (1961). Baerreis' (1961:70) definition of the ethnohistoric approach in archaeology as "the use of documentary sources in conjunction with the study of data derived from archaeological excavation" showed the value of this type of approach in providing possible explanations for past cultural processes. For Baerreis, the use of ethnohistorical information could increase our knowledge of the material correlates of human behavior in general and in particular fill gaps in the archaeological record by references to perishable material items (Baerreis 1961:59). This view of the ethnohistoric approach in archaeology, which often finds the archaeologist engaged in research as an ethnohistorian (McKay 1975:138), represents a very much used approach in historical archaeology (see, for example, Spector 1977).

In a recent study, Jeffrey P. Brain, Alan Toth, and Antonio Rodriguez-Buckingham (1974) applied Baerreis' approach under the rubric of "ethno-historic archaeology." They defined this multidisciplinary approach as using "the contemporary native contexts and benefits from the addition of ethnographic data, methods and interpretations, a perspective we are not traditionally wont to apply to ourselves" (Brain, et al. 1974:232). Handler and Lange (1978:221) object to the final phrase of this definition because it ignored the notion that ethnohistory "is not a discipline confined by limits of time, geographic space, or the cultural group being studied." For Handler and Lange, the fact that archaeologists have not applied ethnohistoric methods and materials to North American colonial history has been "one of the major obstacles to accepting an anthropological approach to the study of historic period archaeological data" (Handler and Lange 1978:221). While Handler and Lange's general comment concerning North American colonial history appears well founded, certainly they would not disagree with the idea that ethnohistoric archaeology denotes a "purposeful coincidence and selective integration of the special data and methodologies of ethnography, historiography and archaeology" (Brain, et al. 1974:284). This is essentially the same approach used in their study of plantation slavery in Barbados (Handler and Lange 1978; also see, Schuyler 1974; Otto 1977). For Brain, et al. (1974:284), the strength of their approach derives from the diverse methodologies and data bases which ethnohistoric archaeology offers.
Even though the equal union of ethnohistoric information and archaeological data does not outwardly appear to involve analogy, it is clear that the employment of analogical arguments is important in historical archaeology. The two types of analogies used in historical archaeology are spatial and temporal analogies. Spatial analogies are those analogies which rely more heavily upon geographical space rather than upon temporal sequence. Temporal analogies, on the other hand, are just the reverse. These terms are not mutually exclusive for spatial analogy does involve temporal factors. These factors, however, are not of major concern. Spatial analogies are the most frequently employed and are what distinguishes the use of ethnohistorical information in historical archaeology.

Spatial analogies in historical archaeology are very similar to some analogies employed in ethnohistoric research. According to Axtell (1978:119), ethnohistorians frequently examine "relative cultures in the same general culture area, preferably at the same period, which may be expected to share cultural traits." This is a clear use of a spatial analogy. Similar uses of spatial analogy are common in historical archaeology. One of the most explicit uses of this type of analogy occurs in Kenneth Lewis' (1976) archaeological research at Camden, South Carolina, in which a number of hypotheses concerning frontier change were generated based partly upon archaeological information as well as upon direct and comparative documentary evidence.

The strength of analogies constructed in historical archaeology are often due to a one-to-one correlation. The part of the observed behavioral record which can be used consists of primary historical information which often directly relates to the social group in question. In prehistoric archaeology the usable observed behavioral record relates to culturally and temporally distinct groups.

The neat one-to-one correlation has obvious implications for particularistic historical archaeology which deals only with individual people, groups, places, events, and things and is not greatly concerned with culture process (South 1977: 8-12). In this type of research little attention is paid to the establishment of general laws of human behavior. For example, in historical archaeology of very limited scope, an "accurate" map (part of the observed behavioral record) can be an invaluable guide to the location of structures.
(part of the archaeological record) within an eighteenth-century military post. If the map shows a building in a particular location with characteristics i, j, and k, and a structure with similar characteristics x, y, and z is located by excavation, a direct analogy between them has great strength. This type of historical archaeology, which often has physical reconstruction as its only goal, was accurately termed "restoration archaeology" by J. C. Harrington (1952:341). Even in this type of archaeological research, however, it is necessary to successfully link the historical "object" (noted in the observed behavioral record) with the archaeological "object" (the physical feature as seen in the archaeological record). While the bridging argument may take the form of an analogical argument, it is equally important to attempt to measure any transformations which may have acted upon the archaeological record (Schiffer 1976). Whenever a direct link is made, it is done based upon a number of implicit or explicit assumptions which may or may not be tested or testable. This procedure is often merely an extension of the historico-archaeological deductive method. Within this paradigm the only exposition of the inferred behavioral record consists of low-level generalizations about daily activities.

In addition to spatial analogies, ethnohistorians and historical archaeologists can also use temporal analogies. This usage has occurred when ethnohistorians have examined cultures descended from earlier traditions in order to gain information on the earlier social entity, based upon an assumption that the major patterns of culture remain stable through time (Axtell 1978:119). Historical archaeologists can use this approach in situations where historic period artifacts are found but no historical records are extant. In these instances, the historical archaeologist operates like the prehistorian, and his analogies are subject to the same questions of relevance.

Another, although less frequent, use of temporal analogy in historical archaeology concerns the insights gained by the archaeologist by reference to a people's present or historical view of their past. This approach is closely allied with the production of folk histories (see, for example, Dorson 1961; Fontana 1969) and has been used successfully by historical archaeologists (Schuyler 1974; Schuyler and Mills 1976; cf. Dollar 1977). This use of temporal analogy is not presently as prevalent as the use of spatial analogy and is somewhat regulated by local conditions.
In order to establish the strength of any analogy it is necessary to draw upon a considerable amount of background information in addition to the evidence contained in the premises of the argument (W. Salmon 1973:100). In historical archaeology the positions taken by Ivor Noel Hume (1969:12-15) and Iain C. Walker (1974) are particularly important because this background is supplied by a thorough knowledge of the history of the site(s) and of the social group in question. Documentary analysis is best undertaken by the archaeologist who is working directly with the problem at hand. This approach allows him to combine the compiled historical information with his anthropologically-learned insights of cultural dynamics in order to ultimately increase the reliability of the hypotheses presented (Nicholson 1955:595-596). In this approach the archaeologist operates as an ethnohistorian (McKay 1975:138). In this manner equal importance is relegated to understanding the cultural framework and the historical setting of the group under investigation (Albright 1966:5). This approach, however, is not always straightforward because one task of the historian as well as of the archaeologist using ethnohistorical information is to evaluate the material for its utility and credibility (Brian, et al. 1974:234; Schuyler 1977:106). As Carl Becker (1910) and others have pointed out, not all past events constitute "historical facts," but rather, historical facts are selected by the historian. An analysis of both types of analogy reveals that only through an intensive knowledge of the background information will historical archaeologists avoid constructing partial or superficial analogies (see Larrabee 1964:139).

In constructing arguments in historical archaeology it is important to understand the role of analogy. Historical archaeologists must recognize that merely the occurrence and recitation of historical documents does not validate their arguments. The use of ethnohistorical information in archaeology rests upon the strength of analogies and the prior probability which such analogies add to a series of working hypotheses. While many prehistorians may not have understood the role of arguments of relevance and the importance of bridging arguments in their explanations, temporal limitations of ethnohistorical information have been implicitly realized. Archaeologists working on historic period sites, however, have generally not understood the role of analogy in their own work. It is hoped that this paper has illuminated one way to view the role of ethnohistorical information in historical archaeology.
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REFERENCES

Albright, William F.

Ascher, Robert

Axtell, James

Baerreis, David A.
1961 The Ethnohistoric Approach and Archaeology. Ethnohistory 8:49-77.

Becker, Carl

Bennett, John W.

Binford, Lewis R.


Brain, Jeffrey P., and Alan Toth, and Antonio Rodriguez-Buckingham
REFERENCES (Continued)

Braun, David P.

Carmack, Robert M.

Cline, Howard F.

Cohn, Bernard S.

Dark, Philip

Deetz, James F.

Dollar, Clyde D.

Dorson, Richard M.

Dymond, D. P.
1974 Archaeology and History: A Plea for Reconciliation. Thames and Hudson, London.
REFERENCES (Continued)

Eggan, Fred

Euler, Robert C.

Evans-Pritchard, E. E.

Ewers, John C.

Fenton, William

Fontana, Bernard L.

Fritz, John M.
REFERENCES (Continued)

Gann, L. H.

Gould, R. A.

Gunnerson, James H.

Handler, Jerome S. and Frederick W. Lange

Harrington, Jean C.

Hickerson, Harold

Hodgen, Margaret T.

Howard, James H.


Hudson, Charles

REFERENCES (Continued)

Hudson, Charles (Cont.)

Hughes, H. Stuart

Kluckhohn, Clyde

Kroeber, A. L.

Larrabee, Harold A.

Leacock, Eleanor

Lewis, Kenneth E.

Lurie, Nancy Oesterich

McKay, Joyce

Mead, Margaret

Nicholson, H. B.
REFERENCES (Continued)

Noel Hume, Ivor

Otto, John Solomon

Pearce, Roy Harvey

Riley, Carroll L.

Salmon, Merrilee H.

Salmon, Wesley C.

Schapera, I.

Schiffer, Michael B.

Schuyler, Robert L.


REFERENCES (Continued)

Schuyler, Robert L. and Christopher Mills

Smith, Bruce D.

South, Stanley

Spector, Janet D.

Steward, Julian H.

1942 The Direct Historical Approach to Archaeology. *American Antiquity* 7:337-343.

Sturtevant, William C.

Thurman, Melburn D.


REFERENCES (Continued)

Thurman, Melburn D. (Cont.)

Valentine, C. A.

Walker, Deward E.

Walker, Iain C.

Washburn, Wilcomb E.

Wheeler-Voegelin, Erminie
A fort site on the southern tip of Parris Island, South Carolina, has been of interest from the 1850s, when Captain George Parsons Elliott and the historian Jeptha R. Simms dug looking for the gate (Hoffman 1978: 5). Other digging was done in 1916, and 1918 and in 1923, with the latter work by Major George H. Osterhout being the most revealing (Hoffman 1978: 14). As a result of Major Osterhout's work the site was designated as the site of the French "Charlesfort" of 1562 (Hoffman 1978: 14-20; Osterhout 1923).

A controversy developed soon after when historians Mary Ross in 1925, and A. S. Salley, Jr. in 1927, clearly identified the fort site as that of the city of Santa Elena and its forts San Felipe I (1566-1570), San Felipe II (1570-1576), and Fort San Marcos (1577-1587) (Hoffman 1978; Ross 1925: 356-57; Salley 1925; 1927: 113-124). In 1957 the artifacts from the 1923 dig were identified by Albert Manucy of the National Park Service as Spanish in origin (Manucy 1957). With the identification by these historians of the Parris Island site as that of the Spanish colonial city of Santa Elena of 1566 to 1587 and its protective forts, and the research by historian Paul Hoffman of Louisiana State University who concurred with these interpretations (Hoffman 1978), the next step was archeology on the site to test these determinations.

A proposal for funding exploratory archeology on the site of Santa Elena and its forts was submitted to the National Geographic Society in May, 1979, after an earlier proposal had been turned down by the Research Committee. More specifics were desired by the Committee as to location of the Santa Elena site and a one week expedition was launched by the Office of Research and the Institute of Archeology and Anthropology at the University of South Carolina on July 1, 1979, to obtain such specific information. The discovery of Fort San Felipe II and the probable location of one structure in the city of Santa Elena resulted from this one week project. These discoveries were followed by the approval by the National Geographic Society's Research Committee of a grant for the purpose of conducting a seven month project of exploratory archeology in order to assess the potential the Parris Island sites have for extensive archeological research. This project was completed in the fall of 1979 with Stanley South as Principal Investigator and Robert L. Stephenson as Project Director.
If the "Charlesfort" site on Parris Island was actually the site of the Spanish Fort San Marcos of 1577-1587, then documents suggested that the site of the city of Santa Elena would be found to the north of Fort San Marcos during the period from 1566 to 1576, and adjacent to the fort during its occupation. Somewhere to the north of Fort San Marcos the earlier fort of San Felipe II was known to have been located, having been lost to the Indians in an attack in 1576 when the town and fort were abandoned (Hoffman 1978). Archeological testing on the high ground of Fort San Marcos seemed advisable and it was here that a sampling strategy was undertaken to discover the remains of the structures once a part of this capitol of Spanish Florida.

The major evidence expected was Spanish pottery of the sixteenth century and fired clay daub which would have been produced when the structures in the town burned in 1576. The structures were known to have been made of wood and clay, and were probably thatched with local materials such as palmetto leaves.

Given this means for identifying the location of burned clay-daubed structures it is possible to conduct a stratified systematic unaligned (Redman and Watson 1970) sampling design which will allow clustering of concentrations of daub fragments (representing houses) to be seen on a map as printed by a computer (Dudnik 1971; South and Widmer 1977: 119; Lewis 1977: 151). Such clustering would then allow pinpointing of specific sites for further more detailed excavation. It was expected that such a sampling method applied to the suspected site of Santa Elena would reveal house locations through fired daub fragments. Artifacts, whether nails, Spanish pottery or other objects would also reveal clustering provided they were present in quantities large enough to be revealed by the sampling units. It was expected, however, that because of the large quantities of fired daub compared with other artifacts left by Spanish occupation that daub would be the major means for identifying house sites through a sampling strategy.

The area to be tested was located between the Marine Corps golf course and the marsh, an oak-covered site about 200 feet wide and several hundred feet long. Such an area cannot be adequately sampled in a one week project so a smaller zone 90 by 420 feet was selected and divided into 42 thirty-foot squares. Inside of each of these large squares a single three-foot square was chosen for excavation and the contents sifted through a ¼ inch screen. This sample represents a 1% sample of the entire area of 37,800 square feet.

As excavation of the 42 sample squares was being carried out toward the goal of locating the houses in Santa
Elena some of the squares were found to reveal the edge of a ditch which was in surprising alignment with the archeological grid. When exploratory trenches were cut from these squares to determine the width of the ditch, it was found that a large ditch 14 feet in width had been found. When other exploratory trenches were cut to determine the extent of this impressive ditch, a two-bastioned moat for a fort was revealed (Fig. 1). From the documentation on the Spanish occupation, it was apparent that we had discovered the moat of Fort San Felipe II, which guarded the town from 1570 to 1576 (Hoffman 1978). The moat itself, however, dated from 1574 to 1576, and was in use only two years.

The discovery of this bonus was exciting but nevertheless resulted in cutting down the area in which potential structures could be delineated as revealed by the clustering of fired clay daub and Spanish pottery. However, when the computer-printed map of the concentration of these artifact classes was in hand, a suspected house site was pinpointed at the southwest edge of the research frame (Fig. 2A and 2B). The one-week project had resulted in the discovery of the fort of San Felipe II and the site of one of the structures in the town of Santa Elena. As a result of these discoveries, a more intensive assessment of the archeological potential of the site was funded by the National Geographic Society.

The concentration of daub and Spanish pottery was thought to be a certain indication of a Spanish structure of Santa Elena, but the demonstration of this was not possible until an area 20 by 30 feet was removed from over the area of the concentration and the posthole pattern for a Spanish hut was revealed. The three-foot sample square had been placed at the entranceway to a "D" shaped structure twelve feet wide having a burned hearth area in the center (Fig. 3). The structure was built of posts set into holes five feet apart. Large nails found beside each post reveal that horizontal timbers were fastened to each post. Cane impressions in the fired clay daub found beside each post revealed that canes were likely woven vertically between the horizontal timbers and the entire fabric plastered with gray clay to be found beneath the marshes of Parris Island. As the vertical posts burned, the clay wall in the immediate area was fired to an orange to red brick color and crumbled to the ground to lie beside the posthole for four hundred years until again seeing the light of day as a result of the archeological removal of the soil blanket covering the site. The quickness with which the town was set on fire after the fort of San Felipe II was abandoned in 1576 (Connor 1925:201) suggests that the structures were roofed with highly flammable roofs, probably locally available palmetto thatch.
FIGURE 1: The sampling area (research frame) showing the location of the 42 sampling squares and the moat of Fort San Felipe II.
Research frame

Concentration of Fired Clay Daub

- Sample point
- Value range 60-250 gms.
- Value range 250-1712 gms.

Concentration of Sixteenth Century Spanish Pottery

- Sample point
- Value range 21-30 sherds
- Value range 31-40 sherds

**Computer Projected Artifact Densities at the Site of Fort San Felipe II in Santa Elena, S.C.**

**FIGURE 2:**
A. Concentration of fired clay daub predicted from sample squares.
B. Concentration of sixteenth century Spanish pottery predicted from sample squares.
The Site of a Spanish Dwelling (Ruin #1) at the First
SANTA ELENA (1566-1576)
(38BU162A)
on Parris Island, South Carolina
Excavated September 10-26, 1979
A Joint Project of
THE INSTITUTE OF ARCHEOLOGY AND ANTHROPOLOGY
University of South Carolina
and
THE NATIONAL GEOGRAPHIC SOCIETY
in Cooperation with
THE U.S. MARINE CORPS

NOTES ON THE DWELLING

12 foot wide "D" shaped structure with door on straight side
Horizontal slots spiked to upright posts were laced with vertical canes.
Fiber-tempered daub was hand-smoothed against the cane wattle.
Dirt floor with central hearth
Smoke hole in peaked, palmetto thatched roof
The alignment with Fort San Felipe is that used from 1566 to 1576.
The dwelling was burned, probably in 1576, by Indians.
Household refuse (Indian and Spanish pottery, animal bone, etc.),
was discarded near the door.
The dwelling is a product of the blending of Spanish and
Indian building materials and methods.
The site was used as a vineyard during the period of the
second Santa Elena (1577-1587) when vineyard ditches
aligned with Fort San Marcus intruded on the dwelling ruin.
A thriving vineyard was at Santa Elena in 1568. **

* Hoffman, Paul E., Sixteenth century fortifications on
Parris Island, S.C. Mahonstran
** Lytle, Eugene, The Enterprise of Florida. The University

FIGURE 3: The site of a Spanish dwelling at the first Santa Elena.
The discovery of the small "D" shaped hut constructed of local materials and probably once housing a single soldier or perhaps a slave was a demonstration that the combination of elements of fired clay daub, Spanish pottery, and a posthole are positive clues to the location of a structure in Santa Elena. With this knowledge in hand three other research frames were established for sampling using the three-foot square approach found to be so successful in the first project. This time it was found that those sample squares placed away from the edge of the shoreline revealed less Spanish pottery and almost no evidence of such structural clues. Those squares placed along the shoreline between the two forts, however, revealed a dozen areas where the proper combination of daub-pottery-posthole was present. These data suggest that each of these holes represents a structure in Santa Elena.

One of these areas was expanded and a large rectangular posthole pattern was seen, revealing that much larger structures than the little Spanish hut are to be found on the site of Santa Elena. In addition to the twelve structures, a large hole nine feet wide was found, possibly a well. The alignment of this well and ten of the twelve structures suggests a row of houses has been found extending along the edge of Parris Island as it is seen today. However, the fact that two of the bastions of Fort San Felipe II have been washed away by erosion suggests also that a block or two of the town of Santa Elena may well have been washed away and what we are seeing is the row of structures remaining on the back side of town.

To obtain a sample of the moat of Fort San Felipe II a ten-foot wide section was excavated across the fourteen foot wide moat near the center of the west curtain wall. As a result it is clear that the moat at this point was backfilled with the exception of a small accumulation of humus at the bottom of the five foot deep ditch which had built up during the period from 1574 to 1577 when the ditch stood open. This is consistent with documentation which reveals that the fort was leveled in 1577 to prevent Indians from using it as a protection from which to launch an attack against nearby Fort San Marcos (Eugene Lyon, personal communication). Large fragments of majolica, olive jars, and a whole bullet mold were found in the fill soil of the moat.

An additional aspect of the assessment phase of the Santa Elena Project was the excavation of exploratory squares over the four walls of Fort San Marcos to locate the palisade posts seen in 1923 by Major Osterhout (1923). Such posts were indeed revealed as well as the neat trenches cut by the Major. Work at this fort site revealed that the fort has great potential for revealing architectural data of great value in interpreting this last Spanish fort on Parris Island.
A search was made for the site of the first Fort San Felipe (I), with negative results. It is apparent that this fort was located in an area now seen to be tidal marsh and locating the site of San Felipe I and recovering data of archeological value is highly unlikely.

Now that the site of the capitol of Spanish Florida has been located with two of its forts (Figure 4), extensive archeological excavation is needed on the three sites to reveal the story lying beneath the soil of Parris Island. The book has been found. It remains now to read and interpret the pages this archeological treasure has to reveal. We hope to do this in the years to come.
Acknowledgements

The one week project at Parris Island was a low budget, largely volunteer effort for which help was received from a number of people. Special acknowledgement is due to Dr. A. Riley Macon, Associate Provost for Research, at the University of South Carolina, through whom the grant from the Committee on Research and Productive Scholarship was obtained. Special acknowledgement is also due to Dr. Robert L. Stephenson, State Archeologist and Director of the Institute of Archeology and Anthropology and Parris Island Project Director, through whose office the expedition was undertaken.

I would like to acknowledge the financial support of the Committee for Research and Exploration of the National Geographic Society which funded the second phase of the project in conjunction with the Institute of Archeology and Anthropology.

I would like to thank Joseph R. Judge, Associate Editor of the National Geographic Magazine, and Dr. Paul E. Hoffman, Consulting Historian at Louisiana State University for introducing me to the site of Fort San Marcos and Santa Elena in September 1978, and sharing with me their research suggestions as to the location of the city of Santa Elena and the three forts which guarded her gates. Hoffman's research synthesis was an invaluable document which guided our research strategy throughout the project.

The fullest cooperation was received from the United States Marine Corps Recruit Depot, Parris Island, South Carolina, through the office of Colonel C. W. Schreiner, Jr., Assistant Chief of Staff G-4, and Captain R. W. Kelemen, assistant to Col. Schreiner, and Master Sergeant Jerry M. Walker, Public Affairs Chief. This cooperation is a most appreciated and vital aspect of the archeological research program on Parris Island. Thanks also to Mr. Dave Todd, Golf Pro/Manager of the Parris Island Golf Course and Mr. Woodrow Garvin, Greens Superintendent.

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Alexander Tallant, Carol Libby, Darla Johnson, Emily Short, and photographers David Brill, Larry Cameron, and sound man Ed Breeland. Special thanks go to the crew members who carried out with me the second phase of the project: Leland Ferguson, Michael Hartley, John Goldsborough, and Bryan Watson. Other assistance was provided by Bill Monteith for the loan of a metal locator and Charles Gay for the loan of a photograph of Parris Island. Others who were helpful and to whom acknowledgement is due are: Paul Brockington, Richard Taylor, Gordon Brown, Jim Sexton, Kenn Pinson, Angela Talaber, Cindy Mahoney, and William Marquardt.

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Appreciation is expressed to Joseph R. Judge and his staff at the National Geographic Society office for the press conference held on July 12th at which the discovery of Santa Elena and Fort San Felipe II was announced. Thanks also to Joseph R. Judge for funding the analysis phase of the project through the National Geographic Magazine.

A special word of thanks is given to Consulting Archeologist, Rex Wilson, of the Interagency Archeological Services Division, Office of Archeology and Historic Preservation, through whose office the Federal Antiquities Act Permit No. 79-SC-077 was issued, under which the Parris Island Project was carried out.

Thanks are also expressed to the media representatives who have taken such an interest in the discoveries resulting from the project.
REFERENCES

CONNOR, JEANNETTE T.

DUDNIK, ELLIOTT E.

HOFFMAN, PAUL E.

LEWIS, KENNETH E.

MANUCY, ALBERT
1957 Report on relics from 1924 excavation of fortification site on Parris Island, South Carolina. Typescript, St. Augustine, Florida.

OSTERHOUT, GEORGE H.
1923 After three hundred and fifty years-being the story of Charles' Fort, built by Jean Ribault in 1562 on what is now known as Parris Island, South Carolina, The Marine Corps Gazette, June 1923: 98-109.

REDMAN, CHARLES L. and PATTY JO WATSON

ROSS, MARY

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SALLEY, ALEXANDER S., JR.


SOUTH, STANLEY A.

SOUTH, STANLEY and RANDOLPH WIDMER
HOMESTEADERS AT WINTERSBURG: 
A STUDY OF LAND TENURE AND RESIDENCE PATTERNS

Pat H. Stein

Introduction

Wintersburg, an unincorporated town in western Maricopa County, is located in the Sonoran Desert of southwestern Arizona (Fig. 1). Geographical factors that made settlement feasible and desirable in other parts of southwestern Arizona were lacking in the case of Wintersburg and could not account for its historical growth. Wintersburg was on no major waterway, it lay along no existing or projected railroad, and it could promise no riches such as copper, silver or gold. The locality was too high above the Gila River to permit stream fed irrigation canals. And federally assisted irrigation projects that helped populate the Salt and Gila Valleys of central Arizona provided no benefits for distant Wintersburg (Parkman 1957; Seargeant 1960).

Despite few incentives for settlement, Wintersburg grew in the course of eight years (1923-1931) from a cattleman's camp with wells but no other facilities (Ross 1923:166, 227), to a small community with a school, a post office, a general store, and a population of 100 or more residents (Barnes 1960: 197; Buckeye Review 1931).

The Museum of Northern Arizona was given the opportunity to study the growth and character of this western community when construction threatened to impact its cultural resources. In 1975 the Arizona Nuclear Power Project contracted with the Museum to undertake a program of data recovery at all significant archaeological sites, both prehistoric and historic, that would be adversely impacted. Preliminary investigations (Trott 1975) indicated that Wintersburg had developed as the result of twentieth century homesteading activity. At an early stage in the research, it was realized that archival and archaeological data could be used to (1) produce a detailed picture of the material culture of homesteading, (2) relate Wintersburg's homesteaders to the national homesteading movement, and (3) compare the town's past as seen in archival records with its past as viewed through archaeological remains. In addition to these broad research goals, six more specific hypotheses were defined for testing (Stein, in press). Two of them form the subject of this paper.
Figure 1: The study area, showing historical sites.
On the basis of environmental data, it was hypothesized that stock raising homesteads would be shown to be more successful than non-stock raising homesteads at Wintersburg. This hypothesis was generated from the premise that the 1916 act which created stock raising homesteads was tailored to areas like the project area - non-timbered, non-mineral, and non-irrigable land. The homesteader's chances of success at Wintersburg, it was reasoned, would be maximized if he chose to file a stock raising homestead instead of some other type of entry.

The second hypothesis stated simply that homesteading stimulated the establishment of long-term, stable residence units at Wintersburg. This hypothesis was drawn from interviews with persons who had homesteaded in the general area (Nelson 1975), from first-hand accounts of homesteading along the middle Gila Valley (Sargeant 1960; Mitten 1971), and from studies of the socio-political climate in which homestead laws were formulated (Gates 1963, 1968; Ottoson 1973; Bruchy and Bruchy 1972).

A Review of Public Land Laws

Numerous public land laws stimulated the settlement of the American West. Only four laws and their amendments, however, were instrumental in the settlement of Wintersburg. These statutes were the Homestead Act of 1862, the Desert Land Act of 1877, the Enlarged Homestead Act of 1909, and the Stock Raising Homestead Act of 1912. This section summarizes the legislated, ideal conditions under which homesteading was supposed to occur. The summary is then compared to the actual conditions of homesteading at Wintersburg, as revealed in archaeological and archival sources.

When the Homestead Act was passed in 1862, a prevailing sentiment of the times was that the land reform measure would draw westward not only the Europeans who were then immigrating to American cities, but also those farmers in the northeast whose livelihoods were threatened by the region's harsh climate and rocky soils. Homesteading not only would provide a "safety valve" for crowded and economically depressed segments of the population, but also would facilitate the transfer of land from the public to the private sectors, and would encourage long-term commitments on the part of homesteaders to the improvement of the western ranges.

The Homestead Act of 1862 entitled heads of households or
Figure 2: View of study area, south toward Gila Bend Mountains. Foundation of adobe homestead structure in foreground.
persons over 21 years of age to file for 160 acres of land otherwise held by the government at $1.25 per acre or 80 acres (near railroad grants) held at $2.50 per acre. One homestead was allowed per applicant. Aside from government filing fees, homestead land was free to persons who fulfilled the residency and improvement requirements of the act. The homesteader (entryman) had to live on his homestead continuously for five years. After 1872 veterans could count years of military service toward this requirement, but still had to spend a minimum of one year on the land. Homesteaders who failed to assume residency within six months of the date of their applications risked losing their claims to more recent applicants. The 1862 act also stated that claimants were to cultivate their homesteads, or, in grazing districts, to use the land for stock raising or dairy production (Gates 1968: 394-395; Bruchy and Bruchy 1972:11-36).

Public officials did not customarily visit homesteads to check for compliance with the residency and improvement requirements, but one check was provided on the homesteader's word. A notice of his intention to prove up was published by land officials once a week for five successive weeks in a newspaper of "established character and general circulation" nearest the homesteader's claim. Area residents were invited to respond if the claimant's word was less than the truth (Gates 1968: 394-395).

The Desert Land Act of 1877 reflected a growing national concern that requirements of the Homestead Act would need to be relaxed in order to make settlement feasible in the arid western states and territories. The 1877 statute sought to render western lands more productive through irrigation projects supported by individual labor and private capital. The entryman could file for 320 acres combined with former claims; after 1909 the limit was increased to 480 acres. While the entryman did not have to reside on the land, he did have to reclaim one-fourth the acreage before he could take title. He also had to submit annual proof that he had expended $1.00 per acre in his reclamation project. (Bruchy and Bruchy 1972: 39-44).

The entryman could prove up at the end of three years, but had to prove up by the end of four or risk losing the claim to later applicants; in 1894 the limit was changed to five years. A 1912 amendment made it possible for the settler to obtain a three year extension if he could prove that delays in the reclamation project were beyond his control. Under the 1877 law, notice of the entryman's
intention to prove up was published in a local newspaper for five successive weeks. In addition, the claimant had to appear at the land office with two witnesses testifying to his improvement of the land. The claimant was then required to pay the government $1.00 per acre in addition to a series of service fees. He could mortgage his claim at any time but could not sell it until he had received the title patent (Bruchy and Bruchy 1972: 39-44).

As the result of improved techniques developed by agricultural colleges around the turn of the century, proponents of dry farming obtained in 1909 the Enlarged Homestead Act. The act specified a 320 acre unit as the minimum efficient parcel for this type of land use, which allowed grains and other grass-like crops to be grown in regions that were too arid for standard agricultural crops. The homesteader was required to reside on the land for five years and to cultivate it continuously in non-active grasses. The 1909 statute was similar in most respects to the acts of 1862 and 1877, but did not allow for commutation of the claim to a parcel that could be purchased (Gates 1968: 503-504).

To compete favorably with Canadian legislation offering free homestead land in shorter periods of time, Congress in 1912 reduced the residency requirement on all homestead claims from five to three years. The same amendment gave homesteaders the option of being absent from their claims for five months of each year (Gates 1968: 507).

The Stock Raising Homestead Act of 1916 sought to encourage the settlement of lands that were ill-suited to agriculture but which could be used for pasturage. Many of the areas to be designated for entry under this act had previously been used as grazing commons or as open ranges, and it was argued that the 1916 statute would ultimately add more land to the tax roles. The 1916 law allowed 640 acre homesteads to be granted on non-mineral, non-timbered and non-irrigable land. Persons who had previously homesteaded under the acts of 1862 and 1909 were now allowed to bring their holdings to a total of 640 acres on land within 20 miles of their original entries. To prove up, the entryman had to make permanent improvements on the land in the form of stock facilities, amounting to a minimum investment of $1.25 per acre. Opponents of the act, including many cattle-men, predicted that the break up of grazing commons and ranges into 640 acre homesteads would ruin the carrying capacity of the land. The Stock Raising Homestead Act was replaced by the Taylor Land Grazing Act in 1934 (Gates 1968: 519, 610-611).
These, then, were the laws governing homesteaders who came to Wintersburg in the early twentieth century. The laws were amended through the decades to make homesteading economically more feasible for those participating. The spirit behind the laws, however, remained much the same: that every man had a right to a share of the soil, and that the government should grant the land in small tracts.

Hypothesis Testing

Homesteaders did not settle the Wintersburg area until 1920, when five claims were entered. A flood of applications then followed, cresting in the years 1928 to 1929, when 37 percent of all claims were filed. The rate of applications declined from 1930 to 1931, and from 1932 to 1947 not a single homestead claim was filed. Two final entries were made in 1948. Table 1 summarizes data from the 38 claims filed in the 28 year period of homesteading in the project area.

The table indicates that homesteading was not, initially, a successful venture. Of the 10 claims filed during the first seven years (1920 through 1926), all of them failed, with half relinquished by the entrymen and the others cancelled by the government. It was not until 1927 that a claim was filed that would eventually prove successful. The rate of homestead successes thereafter rose to 64.3 percent for the succeeding years of homesteading. The overall success rate for all claims entered between 1920 and 1948, however, remained low, only 47 percent (Bureau of Land Management Serial Records, 1920 through 1948).

Why did so many of the homesteads fail? Bureau of Land Management Serial Records show that, of the twelve claims cancelled by the government, five were cancelled when claimants let their applications expire, four were suspended when they were contested by third parties, one was cancelled when the claimant failed to satisfy land improvements requirements, one was cancelled because of land designation problems, and the last was terminated for uncited reasons. The records also provide indications of the difficulties experienced by some entrymen who eventually relinquished their claims; two had troubles with land designation, one failed to provide proof of his country of origin or intention to become a United States citizen, one relinquished after his claim was contested, and another experienced difficulties in establishing residency on his land. None of the homesteaders who relinquished claims later purchased them from the government.
TABLE 1
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Rel. = Relinquished  
Can. = Cancelled  
Pat. = Patented
It was predicted that stock raising homesteads would be shown to be more successful than non-stock raising homesteads at the plant site. Contrary to predictions (Fig. 3), all four stock raising entries filed in the project area failed. Of the eight claims filed under the Homestead Act of 1862, six culminated in title patents. Of the 23 entries filed under the Enlarged Homestead Act of 1909, 11 succeeded and 12 failed. Two desert land entries were filed late (1948) in the history of homesteading at Wintersburg; one of them succeeded. One remaining claim failed to list the type of homestead filed. Thus, the hypothesis was not supported by the sample data.

Closer examination of these statistics and of Fig. 3 reveals an interesting temporal phenomenon which could bias the results. The chart shows that all four (unsuccessful) stock raising entries were filed before 1927. But all claims filed prior to 1927 failed. Only those claims filed in the post-1927 era faced any likelihood of success. For example, enlarged homestead entries failed before 1927, but had a success rate of 61 percent following 1927. It appears, then, that the success index for homesteading was more a function of the era in which the application was filed and the land settled, than a function of the type of entry filed, although non post-1927 stock raising data were available to test this notion conclusively.

It can be seen from Fig. 3 that 17 of the 18 successful claims were for non-desert land entries, in other words, for entries requiring residency on the land in order to prove up and take title. It was reasoned that (a) if non-desert land entries required residency in order to prove up, and (b) as indicated on BLM records, 17 non-desert land homesteaders had proven up and taken title to project area land, then (c) the remains of approximately 17 residences of homesteaders should be found in the project area.

To gather the data needed to test this hypothesis, an intensive archaeological survey of the 3880 acre plant site was conducted with archaeologists walking the study area at 75 to 100 ft. intervals (Trott 1975). These intervals permitted the detection of all archaeological features in the study area, which had a low density cover of creosote-bush and saltbush. All historical remains found by the archaeologists were recorded. Such remains included building foundations, trash middens, check dams, wells, rock alignments, and cleared or artificially filled tent platform areas. An 0.5 mi buffer zone around the plant site was also
Figure 3: Homestead entries filed in the study area.
surveyed because it was expected - and later found to be the case - that some homesteads filed on the plant site land would have boundaries extending to one-half mile beyond the plant site proper.

The hypothesis was not confirmed by the data. The intensive archaeological survey of the plant site plus buffer zone located the remains of only six historical sites (Trott 1975). Matching site location information (township, range, section, quarter section) to legal descriptions on BLM records, it was further discovered that one of the six historical sites represented the remains of a 1948 desert land entry, a second marked the remains of an earlier claim that was relinquished, and a third was an historical roasting site and not a residence at all. Thus, only three sites represented the remains of successful homestead claims for which, presumably, residency had been required.

Soil deposition was not rapid enough to have buried sites dating from the 1920s in the study area. It is unlikely that the survey crew missed any features (foundation, tent platforms, trash areas, etcetera) which could be interpreted as historical sites. The Buckeye Review, the weekly newspaper that covered Wintersburg in the 1930s, indicated that wood frame houses were routinely disassembled and moved during that era (Buckeye Review 1929-1935). But even if some homestead structures had been moved, traces of their foundations and associated trash deposits would have been left behind, and recorded later by the survey crew. The implication of the archaeological survey data is that the great majority of the successful homesteaders took title to their claims without ever residing on them.

A study of the artifacts from the three successful homestead sites revealed a pattern of transient rather than permanent settlement on the homesteads. Following the survey described above, the sites were totally collected and excavated in a controlled manner (Stein, in press). Among the hundreds of artifacts yeilded by each site, approximately 3 percent of all artifacts could be dated to within five years of their dates of manufacture. Particularly accurate - and abundant - devices for dating the sites were "KC" brand baking powder cannisters. Embossed with the slogan "Same Price for Over ______ Years," the lids of these containers were closely dated by reckoning from the base date of 1890 (see Ward, Abbink and Stein 1977:240). Because of the relatively short life span of baking powder (less than two years), and a concomitant lack of evidence that the
Figure 4: Number of years homestead patents were retained by homesteaders.
baking powder containers had been modified or reused by consumers, it was concluded that there was no significant time lag between the dates of manufacture for these containers and their dates of use and deposition.

An examination of closely datable artifacts from each of the three sites indicated that one of them could have been occupied for as long as seven years, but none was likely occupied for more than two years following the receipt of the homestead title patent. This discovery provided the first evidence that plant site entrymen did not view their homesteads as life-long residences involving long-term commitments to the property.

This idea was further tested by examining county grantor deeds to ascertain the eventual disposition of patented homestead claims (Maricopa County Grantor Deeds, 1931 through 1975). Grantor deeds for 17 of the 18 claims were located. Of the 17 traceable transactions, four homesteaders sold their claims within two years of the receipt of the title patent, and seven sold from four to six years following receipt of the patent. The remaining six homesteaders kept their lands for substantially longer periods, eventually selling them from 12 to 22 years after receiving full ownership.

Grantor deeds also indicated that several of the homesteads were eventually aggregated into a single farming unit. Between 1936 and 1953, one individual bought up several hundred acres of formerly homesteaded land. With wells and irrigation canals he developed a cotton farm that was still productive in the early 1970s. The generation of one large farm from several smaller homesteads was typical of the process of land aggregation which occurred throughout the western states in the first half of the twentieth century. In Arizona, 20,000 homesteads patented between 1910 and 1930 became only 9,000 farms (Gates 1963:42).

Discussion

Homesteading in Wintersburg apparently provided a vehicle for acquiring land which homesteaders could, and usually did, sell after a short period of time. Homesteaders did not usually settle on the land for periods substantially beyond the minimum required by law. Most of them, in fact, never resided on their claims at all, if we are to believe the evidence which archaeology presents.

With the data available it is difficult to explain why homesteading took the particular form it did in this
western community. Noting how the success rates for claims turned around dramatically in the late 1920s and early 1930s, it would be tempting to state that the onset of the Great Depression strongly influenced the course of homesteading in Wintersburg. Wintersburg's homesteads, archaeological evidence shows (Stein, in press), were integrated with the national and world economies. They were not self-sufficient, as seen by the fact that few of the hundreds of artifacts recovered from the sites were locally produced. If, indeed, Wintersburg's homesteaders were attuned to events in the national economy, perhaps it is not unreasonable to speculate that, as economic opportunities diminished in the nation as a whole, homesteading was increasingly viewed as an avenue to capital gains which could be liquidated in times of greater prosperity.

It may not, however, be necessary to cite an external factor such as the Depression in order to explain the pattern in the Wintersburg data. Speculation, according to some scholars (the most notable being Gates 1963), motivated entrymen long before the Depression came to dominate the national economy. Speculation on the part of homesteaders took several forms. In a well documented practice known as grubstaking, speculators who wanted to amass land tracts exceeding their legal limit compensated dummy entrymen to file in their behalves (Seargeant 1960:123; Gates 1963:35). Other homesteaders borrowed on their claims and then skipped, leaving creditors with unimproved, relatively worthless land (Gates 1963:35). Data from Wintersburg thus seem compatible with patterns of speculation that were widespread before, as well as during, the Depression. The understaffing of government land offices was one factor which allowed speculation to take place. Economic necessity, also, dictated it to some extent; a significant portion of the abuses of public land laws resulted from the credit needs of homesteaders who were, by and large, people of limited means (Gates 1963:36).

The Wintersburg data above all point to the distinction between the history of homesteading and the archaeology of homesteading. If one were to look at only the written records - at serial records, grantor deeds, newspaper accounts - one would conclude that homesteading was a bustling enterprise, with the houses of entrymen dotting the landscape in every quarter or half section. If, on the other hand, one were to consider only the archaeological data, one would conclude that homesteading was probably a negligible
factor in the town's settlement, with fewer than 15 entrymen present in the community at the peak of its prosperity. A more accurate picture of homesteading in this western town, this archaeological and archival study suggests, lies between these two positions.

Arizona's homesteaders were not flamboyant politicians, lawless desperados or feral mountain men - the stock characters so favored by western writers and historians. Consequently, little has been written about them (the notable exception being Fontana and Greenleaf 1962). Their lives were remarkable nonetheless, for they succeeded in populating and cultivating one of the most forbidding and desolate regions of the American Southwest. The homesteaders did not, by and large, write their own versions of life in the Sonoran Desert. The archaeological record, however, combined with historical documents and oral interviews, allows us now to learn about them. Available records, moreover, are sufficiently detailed as to allow sophisticated questions to be asked of the resource base before data recovery begins. The Wintersburg study thus begins to close a gap in the state's - and West's - culture history.

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REFERENCES

Barnes, Will C.

Bruchy, Stuart and Eleanor Bruchy (editors)

Buckeye Review

Bureau of Land Management Serial Records

Fontana, Bernard L. and J. Cameron Greenleaf

Gates, Paul Wallace

Maricopa County Grantor Deeds
1931- On file at Maricopa County Recorder's Office, Phoenix. 1975

Mitten, Charles A.

Nelson, Ann
REFERENCES (Continued)

Ottoson, Howard W. (editor)

Parkman, I. H.

Ross, Clyde P.

Seargeant, Helen

Stein, Pat H.

Trott, J. James

Ward, Albert E., Emily K. Abbink and John R. Stein
A CONSIDERATION OF MONITORING IN URBAN ARCHAEOLOGICAL SURVEY

William R. Bowen

Introduction

Monitoring is defined as watching, observing, or checking for a special purpose or keeping track of, regulating, or controlling (Grove 1969:547). From an archaeological perspective, monitoring refers to applying these actions to an archaeological or potential archaeological resource. In archaeology, monitoring can be used as an excavation tool or a survey tool. For purposes of this paper, monitoring as an excavation tool shall refer to a controlled or regulated process of mechanical soil stripping or backhoe trenching in a known archaeological resource. These techniques have been used extensively throughout the Southeast (e.g. the Normandy and Tellico reservoirs in Tennessee and Wallace Dam and Carter's Dam in Georgia).

This paper is concerned with monitoring as it applies to archaeological survey. In this light monitoring can be utilized in several ways, including 1) attempting to locate sites by observing construction operations, 2) evaluating a site once it has been located, and 3) checking the results of the more traditional surface and subsurface techniques of survey. However, before discussing examples of these applications, monitoring will be evaluated as to its place in the legal process.

Monitoring and Federal Legislation

Federal laws providing for preservation and protection of archaeological and other cultural resources have been in effect for many years, but it has only been in the last decade that legislation has been introduced developing these preservation programs and implementing means by which these programs can be carried out. Several acts of congress (e.g. National Historic Preservation Act, Executive Order 11593, Archaeological and Historical Preservation Act, and National Environmental Policy Act) point out that agencies must take into account the effect of federally funded projects on any site that is included in or eligible to the National Register of Historic Places, and they define the legal steps that should be taken in doing this. In addition, Public Law 91-190, or the National Environmental Policy Act of 1969, calls for the identification
Figure 1: Map showing locations of projects referred to in this study.
and development of methods and procedures "...which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical consideration" (Public Law 91-190: Sec. 102b). However, it was not until the publication of "Proposed Guidelines for the Location and Identification of Historic Properties Containing Scientific, Prehistoric, Historical, or Archaeological Data" (36 CFR 66, Appendix B) in 1977, that specific steps were set forth for conducting archaeological surveys. In a discussion of report preparation for intensive surveys, the description of "special techniques" is called for to cope with "special difficulties". As examples of special difficulties pavement, heavy brush, and overburden are mentioned (36 CFR 66, Appendix B: 5382). It is precisely when such special difficulties, or difficult situations, are encountered that monitoring may be most useful. Although no specific techniques are mentioned other than surface inspection and subsurface testing, the general impression is that any rational method would be suitable for conducting a survey as long as it fulfills the requirement of identifying, evaluating, and documenting the significance of all properties which are potentially eligible for listing in the National Register. Documentation would include "...those assumptions that guided the application of the methods, the results of this application, and deficiencies resulting from missapplication of the technique or the inadequacy of the method" (36 CFR 66, Appendix B: 5381). Therefore, even though monitoring is not specifically listed as a viable technique for site location and evaluation during intensive archaeological survey, if it can be documented and shown to be useful, then there seems no reason not to assume that it is legally and professionally acceptable.

Case Studies

With this in mind several case studies will be presented to evaluate the applicability of monitoring as a locating, evaluating, and checking tool in intensive urban archaeological survey (Fig. 1). Although monitoring as a survey tool has been used in both urban and rural settings to investigate both historic and prehistoric resources, it is perhaps in the urban setting that the value of monitoring can best be realized. This is due primarily to the number and variety of special difficulty situations present in the urban environment and the large number of construction projects taking place there. Also, historic sites would most likely be encountered while monitoring in the urban setting, since the delicate, superficial nature of many prehistoric sites would make them most apt to be destroyed by urban development.
Figure 2: Monitoring the excavation of an old road surface. Houses once stood in the background where the new road is located. Note street car tracks and cross ties.
Figure 3: Excavated profile of late 19th century well. Note wood casing, brick lining, and bucket hoop.
The urban setting poses many special difficulty situations including structures, paved surfaces, and deep fill areas which cannot be tested using conventional methods, i.e. auger, posthole, and shovel tests, and which are often unavailable for survey until just prior to construction (Fig. 2). Also, the extensive use of power equipment such as backhoes and augers would be beyond the budgets of most survey projects and would cause permanent damage to areas which are often utilized up until the time of construction. Close surveillance of construction excavations in these special difficulty areas by trained individuals is one way of locating sites.

In the MARTA Project (Bowen and Carnes 1977, Bowen 1977, and Dickens and Bowen 1978) monitoring has lead directly to the discovery of 13 sites. This constitutes approximately 46% of the sites identified thus far during the course of the survey. These sites were either in areas which had been previously surveyed or in areas which were impossible to survey by conventional methods.

Three examples from the MARTA Project help point out the uses and necessity of monitoring in the urban setting. One example is the bottom portion of a late 19th century well, the shaft of which had been destroyed by previous construction (Fig. 3). This feature was located during monitoring of subway station excavations in downtown Decatur, Georgia, and lay beneath 30 feet of old and recent fill (Fig. 4). Another example is an 1880's garbage dump which was located beneath some six feet of recent fill and an asphalt parking surface. The feature was identified while monitoring excavations for the subway box in downtown Atlanta.

While these are examples of site location, monitoring has also been utilized to evaluate a particular archaeological resource. The third example is a turn-of-the-century garbage dump encompassing 3 acres and having a depth of about 40 feet (Figs. 5, 6, and 7). The site was located beneath several feet of recent railroad fill and garbage. The immense size of this dump and the loose and friable nature of the fill, made conventional excavation techniques useless. Even if a viable means of excavation could have been implemented, the time and cost would have been astronomical. However, by systematically collecting the dump during bulldozing at five foot arbitrary levels, it was possible to both assess the nature of the dump and obtain a contextually meaningful sample of artifact remains.
Figure 4: Shored north profile of subway excavation. 19th century well at bottom.

Figure 5: Location of turn-of-the-century municipal garbage dump prior to MARTA excavations.
Figure 6: MARTA subway excavation through the middle of the turn-of-the-century municipal garbage dump.

Figure 7: North profile of the turn-of-the-century municipal garbage dump. The base of the recent overburden and top of the clay cap is indicated. Note garbage eroding from profile.
A unique example where monitoring was utilized as a site location and evaluation technique in the urban setting is an archaeological survey of the Darien Waterworks Improvement Project which was recently conducted by Soil Systems, Inc. of Marietta, Georgia (Seabury 1978). This project called for laying over 18.5 miles of 8 to 10 foot sewer pipe, preceded by a much smaller water line, beneath the streets of Darien, Georgia. In order to locate the archaeological resources prior to the construction of the sewer line, the excavation of an approximate 31.5 inch wide by 4.3 foot deep backhoe trench for the smaller and less destructive water line was carefully monitored. When sites were located, they were further examined by profiling the backhoe trench and photographing. Pinpointing and evaluating these sites aided in determining if they were eligible for the National Register and helped in the development of a mitigation plan prior to construction of the larger sewer system. Using this method, Soil Systems, Inc. located 18 sites and 17 isolated artifact finds. Other contractual agreements of the Darien Project called for built-in minor construction delays so that a site, when discovered, could be properly evaluated. Monitoring, in this case, seems reasonable since a purely archaeological survey using backhoes, augers, or other power equipment would be both destructive and extremely costly.

Another example of monitoring in the urban setting concerns the archaeological salvage investigations at the site of the French Fort Conde in Mobile, Alabama, conducted by the Department of Anthropology, University of Alabama. In addition to salvage excavations carried out on the fort, an agreement was made between the archaeologists and contractor by which the actual excavation of the tunnel portal of Interstate 10 in the immediate vicinity of Fort Conde could be observed. This monitoring effort "...consisted of maintaining a close check on construction activities and recording, when time allowed, the location and description of artifacts or archaeological features uncovered by such construction work" (Harris and Nielsen 1972:85). Using this method, it was possible to observe objects in situ and recognize their general relationship to the surrounding strata (Harris and Nielsen 1972:86). This careful observation and subsequent recovery and/or recording of numerous artifacts and features, supplied important data on the history of Fort Conde and the Mobile Bay area in general. This data would otherwise have been lost.

A final example of monitoring in urban archaeological survey concerns sewer construction in Rensselaer, New York. During the regular review of construction projects in New York
State by the Historical Archaeology Bureau of the Division for Historical Preservation, New York State Office of Parks and Recreation, it was noted that a proposed sewer project would pass through an area where historic Fort Crailo and several other Colonial archaeological sites were known to exist. "Because of the likelihood that other related archaeological remains existed in deep fill and under road pavement" (Huey, et. al. 1977:19), a decision was made to monitor all sewer excavations in the area. The monitoring program included provisions for a full-time monitoring crew, construction time delays for further investigations in situations where archaeological resources were encountered, and the subsequent excavation of these resources. All work was restricted to the construction trench.

These investigations resulted in the discovery of both historic and prehistoric features, which dated from the Middle Archaic to Colonial times. Several of these features offered significant complimentary data to the known sites existing in the area, and as the authors point out, "Whenever prior testing to identify archaeological remains is impossible or whenever it becomes impossible for construction to avoid destroying an archaeological site of significant interpretive potential, the data must either be salvaged or lost forever" (Huey, et. al. 1977:19). In addition to illustrating the use of monitoring as a site location tool, the Rensselaer survey demonstrates how historical documentation can enhance monitoring.

Conclusions

The above cases of application of monitoring as a locating, evaluating, and checking tool in urban archaeological survey are just a few examples of the use of this technique in archaeological surveys. As previously stated, while monitoring has not been specifically identified in the federal laws as a viable technique for site location and evaluation during intensive archaeological survey, there is also no reason given for it not being used. In fact, federal laws have been interpreted as calling for the identification of all historic properties which may be eligible for inclusion in the National Register (36 CFR 66, Appendix B: 5381 and King 1975:4), and as has been shown above, many sites would never have been identified had it not been for monitoring.

Also, there is some question as to the legality of requiring the construction agency to allow monitoring of the
construction operations, and up until now most monitoring has taken place under contractual or verbal agreements worked out between the archaeologist and the construction firm. However, in support of monitoring in this situation, it should be pointed out that federal laws provide for compensation for construction delays resulting from archaeological investigations (Public Law 93-291: Sec. 3b). Furthermore, sites may be nominated to the National Register subsequent to the initial survey (Executive Order 11593: Sec. 2a).

In the past, and even now, many locations within a survey area were "written-off" because difficult situations made them unavailable for inspection at the time of initial survey. Monitoring is one method of coping with, and overcoming, these difficult situations. This is not to say that monitoring should be used in place of other survey techniques or for the sole purpose of "covering one's tracks". The use of any technique should be justified before its application. Every effort should be made to locate resources or areas of high site potential prior to excavation through historical documentation, examination of site files, and archaeological reconnaissance. If, however, the area under study appears to be archaeologically sensitive, and if other methods of survey, when evaluated, appear inadequate or too costly to justify their application, monitoring should be considered. But whatever the case, monitoring has already proved to be too valuable a tool not to be seriously considered in applicable situations of urban archaeological survey.

Notes: This is a revised version of a paper read at the 19th Annual Conference on Historic Site Archaeology, Winston-Salem, North Carolina, September 1978.

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REFERENCES

Literature

Bowen, William R.

Bowen, William R. and Linda F. Carnes
1977 Archaeological Impact Studies MARTA East and West Lines. Manuscript on file, Laboratory of Archaeology, Department of Anthropology, Georgia State University, Atlanta.

Dickens, Roy S. Jr. and William R. Bowen

Harris, Donald A. and Jerry J. Nielsen
1972 Archaeological Salvage Investigations at the Site of the French Fort Conde, Mobile, Alabama. Department of Anthropology, University of Alabama, Tuscaloosa.

Huey, Paul R., Lois M. Feister, and Joseph E. McEvoy

King, Thomas F.

Seabury, Patricia M.
RESOURCES (Continued)

Federal Legislation

36 CFR Part 66

36 CFR Part 800

Executive Order 11593

Public Law 93-291

Public Law 91-190

Public Law 89-665

Other

Grove, Philip B., Editor in Chief
SEA LEVEL CHANGE AS A VARIABLE IN COLONIAL AMERICAN ARCHAEOLOGY

Reynold J. Ruppe'

The genesis of this paper was a series of observations I made at a few Colonial archaeological sites I visited along the eastern coast of the United States. In several cases there was evidence that sea level had risen since the sites were founded. Those sites dated from the early 17th century to the time of the American Revolution and in every case are 30 cm. or more below high tide at present. I believe that we will find other early Colonial sites as well as sites of the preceding Exploration period underwater in locally favorable situations. Those favorable locations are estuaries, lagoons and the tidal portions of rivers. Other sites are reported to occur on the ocean front but they probably will be difficult to deal with due to alteration of the beaches by storms, sedimentation and erosion by long shore currents.

Before we can discuss the archaeology we must review some marine geology that has a bearing on the problems of sea level change. From a geological viewpoint we are dealing with a very recent time period and we can confine our considerations to the problem of sea level rise in the past several hundred years. The problem is difficult due to a complex set of variables and relatively little knowledge of the processes involved. Sea level does not remain stationary. It changes as a result of climatic change on a worldwide scale and has been most dramatically changed as a result of the growth and shrinkage of ice sheets in the geologically recent past.

Present thinking by marine geologists on the problem of recent sea level change is made more difficult by the inability of the geologists to date accurately recent minor sea level oscillations. The prevailing opinion can be termed a paradigm in Kuhns' sense (1962) and holds that there has been relatively little rise in sea level since 6000 B.C. and the rise is graphed as a smooth curve (Shepard and Curray, 1967; Guilcher, 1969). The use of the smooth curve as a model inhibits our thinking about sea level change in the recent past. A number of estimates of recent sea level rise have been made in terms of rate per century. One such estimate is one mm. a year or one inch every 25 years (Mörner, 1971). That estimate calculates to a rise of sea level of 40 cm. in the 400 years since the beginning of the Colonial period in North America.
A major difficulty in dealing with sea level rise is the fact that two distinctly different causal factors are involved in the change of sea level relative to land level. The factor of most concern to us is eustacy, the rise of sea level due to melting ice sheets. Eustatic change is worldwide but its affects will be altered locally by isostatic land movements. Isostacy is the change in land elevations brought about by several causes, of which the most important to us is crustal warping due to the weight of ice sheets on the land. Tectonic movements are another cause of isostatic change of land elevations. The importance of isostatic change to our problem is that it is a difficult process in terms of regularity of earth movement. Consequently, in areas of considerable tectonic activity such as the Mediterranean Sea we are unable to identify sea-land changes that are apparent in many classical cities. Flemming illustrates the problem nicely when he describes the differences in the relationship of land levels and sea levels that are dependent upon local tectonic movements as opposed to sea level changes (Flemming, 1971).

The foregoing discussion suggests that sea level changes occur and that they are made more complex by tectonic movements in specific locations. In an effort to avoid the confusion of variable causal factors it seems sensible to test our ideas in areas that are geologically stable in order to assess the affects of sea level alone. One such area of geological stability is southern Florida (Brooks, 1973). But not all of the coastline of the Gulf of Mexico is stable, however, because land subsidence has occurred due to the weight of local downwarping of the coast for several hundred kilometers on each side of the delta. The coastline of the southeast in general is thought to be relatively stable as well. The important point is that in areas where crustal stability is suspect, we must be careful in our formulations of relationships between natural and cultural phenomena.

This paper is planned to accomplish two things. First, I hope that the audience will be alerted to the possibility of sites of the Colonial and earlier periods along the coasts; and secondly, I hope that some of you will be able to give me some clues about the location of sites under water. It is obvious that if sites are drowned and not evident, they cannot be known. But some of you may have documentary hints to sites that are either lost or do not fit the written descriptions of them. A case in point is Jamestown where the original location is thought to be underwater in the James River.
I am guessing a little, but I have a hunch that the rangers suggest erosion of the river bank as the reason for the supposed inundation. If the latter cause is correct it would be useless to attempt to locate the original remains, but if sea level rise is the causal factor, then one would expect to find archaeological evidence for the original site.

An early claim for inundation of an historical site in the United States was made by Elso Barghoorn in 1953 (Science, V. 117, May 29, 1953) when he reported on the drowned condition of the early Colonial Iron Works at Saugus, Mass. He states, "...well preserved colonial wooden structures have been uncovered at levels now daily inundated by high tides. The arrangement of these structures, which include remains of water wheels, a timbered waterway in its original position, and remnants of a dock and wharf, is such that their intended function would be very inefficient if not impossible under present tidal conditions." He goes on to say "... the entire area of early Iron Works development has been affected since 1650 by an increase in the height of tide in the Saugus estuary of approximately 2 and a half to 3 feet."

The questions posed by the Saugus Iron Works are of two kinds; whether the indicated sea level change was caused by eustatic or isostatic change and whether or not errors were made in the assessment of the archaeological and geological contexts. The article indicates clearly that the archaeological and geological contexts were properly interpreted and we are left with a need to determine the amount of sea level or land level change. Because New England was very close to the Wisconsin ice sheets we must consider the possibility that some of the change of sea level relative to land level was caused by downwarping of the continental margin due to reduction of the load of ice on land.

The warping of the earth's crust due to tremendous pressures placed on the surface by the weight of the ice is a phenomenon well known to Pleistocene geologists. When one considers that the ice sheets were between one and two kilometers thick, it is easy to see how the center of the continent would be depressed under the load. The continental margins were under less of a load, and either were not depressed or were depressed to a lessor extent than the interior. When the ice sheet melted, the release of the ice load caused the center of the continent to rebound upward and, at the same time, the margins of the continent were warped downward. The result of those actions,
for our purposes, is a downward movement of the coastline which would cause water level to appear to be rising. Because sea level was also rising at the same time, the effect was to increase the amount of change. That is one of the reasons why it is difficult to understand the problems in areas where isostatic changes have occurred. The reason why we must be concerned with the problem is that in the case of the Saugus Iron Works, there is indicated a greater than expectable sea level rise. As we shall see, the other examples of Colonial site inundation are further south and do not show as great a sea level change as the $2\frac{1}{2}-3$ foot change at Saugus.

Another Colonial site that appears to have been inundated is Flowerdew Plantation, about twenty miles upstream on the James River in Virginia. The founding of Flowerdew dates to 1620, and the early structures were built on the bank of the river. According to Norman Barka, the project director at Flowerdew, there is documentary evidence of a dock, stockade, warehouse and other structures close to the river. In excavations close to the river, the high tides inundated the archaeologists' trenches, indicating that there has been a change of water level in the area. The James River is tidal at that location, consequently, changed water level is the result of sea level change. It is not yet known what the exact relationship of high tides to the lowest archaeological remains is, but there has had to have been at least a 30cm-50cm sea level rise. In this regard, the situation at Flowerdew probably is identical with that at Jamestown, 18 miles downriver.

A third example is Fort Moultrie, at Charleston, South Carolina, which has been studied by Stanley South, and reported in "Palmetto Parapets" (1974). South reports a one-foot rise of water table between the time of the building of Fort Moultrie in 1776 and the present. The fort is located on the shore of the outer portion of the Charleston harbor and the water table should be almost the same, if not the same, as sea level. South found a large number of archaeological features beneath the water table and states, "As the water table was reached, from three to four feet in depth below present surface, pumps were required to lower the water table enough to allow for reading of archaeological layers and features." Many features, such as a large foundation timber, could not have been placed deliberately below the water table and we are left with the conclusion that the original construction was accomplished before water level had risen. Our conclusion, therefore, is that sea level has risen approximately one foot since 1776 on the South Carolina coast.
A fourth example is the site of Londontown, a colonial harbor town on South River in Maryland. In a brief reconnaissance, Shomette discovered two examples of brick foundations under water off the present shore line (1978). He does not report the foundation depths, but they are close to the shore and must be in shallow water. The site was founded in 1650, and by the 1740's was second only to Annapolis as a maritime and commercial center; but by the end of the Revolution, was all but abandoned. The major building activity had apparently been completed by 1690, and it is possible that the underwater brick foundations date from that time. We need more information on the site before we can determine whether or not the underwater features are the product of recent erosion or of sea level rise. The time span would suggest that sea level rise is responsible for the inundation, but conclusions must await further study.

Another possible example of historic site inundation is Fort St. Marks on the St. Marks River in northern Florida (Fairbanks, 1964). Salvage work in preparation for dredging uncovered 'Two series of wooden posts below waterline' which were identified and mapped. Fairbanks thinks that, "One line of posts, just upstream from the point where the Walkulla enters, is possibly part of the southern bastion of the first Ft. St. Marks. The posts are very small and irregularly set and could well form part of a rather hastily erected wooden fort. The second series of posts is somewhat further upstream on the St. Marks side and represents posts of several sizes, some round, some squared. This is the approximate location of a dock extending out in the stream." The fact that Fairbanks draws a distinction between the two sets of posts suggests that his interpretation could be correct.

Except for Barghoorn's observations of the stratigraphic sections at Fort Moultrie, we are dealing with sets of observations that are not supported by stratigraphic evidence. While inundation has protected the sites, it also has effectively masked the context of the archaeological and geological material. The problem is how best to investigate the phenomena under water. Sub-bottom profilers will not work in such shallow water and while magnetometers and metal detectors could indicate metals, they tell us nothing about stratigraphy. It is possible to excavate under water and to determine both cultural and natural levels with the same precision as on land (Ruppe', 1979). It would also make sense to construct coffer dams around inundated sites and pump out the water. While expensive, coffer dams are a practical solution particularly
twenty feet; but this past year, Martin Klein, a designer and manufacturer of the instrument, has succeeded in reducing that depth of operation to ten feet.

An instrument that sees through the ground must be high on the wish-list of every archaeologist. Magnetometers and sub-bottom profilers, to say nothing of plain, old metal detectors, offer the possibility of site and feature locations both on dry land and under water. Those instruments, documents and good archaeological field skills should be able to pay dividends in the study of drowned colonial sites.
REFERENCES

Brooks, H. K.

Flemming, Nicholas C.

Fairbanks, Charles H.

Guilcher, Andre'

Kuhn, Thomas S.

Mörner, Nils-Axel

Ruppe', Reynold J.

Shomette, Donald G.

South, Stanley
THE SINGLE BROTHERS' INDUSTRIAL COMPLEX: Research Plan
OLD SALEM, NORTH CAROLINA
Kathleen Gilmore

Introduction

Study of the Old Salem Industrial Complex, consisting of a slaughter house, a brewery-distillery, and a tanyard, was undertaken in July and August, 1978, at the instigation of Old Salem, Inc. After a meeting of Old Salem, Inc. personnel, state officials and archaeologists, it was realized that before any large scale activity was done on the Single Brothers' Industrial Complex certain problems needed to be solved and a long range research program and design needed to be developed. It is because of these concerns that this study was undertaken. Although the tanyard was studied historically, time did not allow archaeological testing and therefore will not be considered in detail. Consequently, the primary purpose of this study is the development of a research design or plan for the Industrial Complex.

Old Salem, Inc. Concerns

Basically, Old Salem, Inc., is concerned with the Industrial Complex because it was an integral part of the life of Salem and its influence extended beyond the local area since the products were a part of a widespread trading network. Specifically Old Salem, Inc. is concerned that the geographic area not be lost since it has great value for the interpretation of the past and the history of Salem. The need for a research plan was, therefore, recognized.

Archaeological Concerns

Historical archaeology is a necessary part of the program because there is no evidence of these industries above the ground. Archaeology of the area, however, can provide more information than solely the location of the former buildings if a long term research plan is carried out. Not only can the written record be supplemented, as Deetz has pointed out in his article "Late Man in North America: Archaeology of European Americans" (1978), but anthropological models of culture change relevant to prehistory and history and current situations can be devised. Stanley South based his book Method and Theory
in Historical Archaeology (1977) "on the premise that the archaeologist is concerned with understanding past lifeways, culture history and culture process by examining the material remains of culture reflecting these processes." Lewis (1977:151) comments that "Anthropological archaeology...alone of the various fields of anthropology possesses a methodology able to investigate long periods of human history and retrieve data capable of answering questions regarding the evolutionary nature of sociocultural change."

Moreover, little has been done in industrial archaeology from anthropological perspective where the technological has been integrated with the social, that is where industrial archaeology has been integrated with archival and social history. Appropriately Teague and Shenk (1977:6) noted that, "...archaeologists have been nibbling at the fringes of such reconstruction by correlating industrial archaeology, archival documentation, photography, and oral history...With further studies ...we may in time come to a better understanding of man's place in a man-made world."

Archaeological concerns, therefore, transcend even the concern for technical excellence in excavation, but also are that the kinds of questions asked or the kinds of hypotheses posed provide insight, understanding, or explanation of the human experience in an ever-changing world.

Contents

The first section contains a synopsis of information known at the beginning of the test excavations, including the condition of the sites, the historical background and previous archaeological work.

The historical background is aimed at presenting information pertinent to the Single Brothers' Industrial Complex with enough information to show the relationship to the Salem organization and to provide a time frame for an interaction sphere of which the industrial complex was a part. The background information was used in developing the archaeological testing and the research design.

The second section is the Synopsis of New Information and contains the results of the archaeological testing at the Single Brothers' Industrial Complex and the answers to the questions with which Old Salem, Inc. is specifically concerned. The last section contains the proposed Research Design and Program.
SYNOPSIS OF PREVIOUS INFORMATION - Present Condition

Description

The Industrial Complex composed of
- a slaughter house, stable and shed
- a brewery and distillery and
- a red tannery composed of 9 buildings, including the tanner's house,

were located on the town of Salem lots 94, 93, and 92 respectively of the 1819 lot system (Map 1). The tannery was started in about 1764-70, the slaughterhouse was finished in 1784, and the brewery was approved for construction in 1773. By 1802 the slaughterhouse was used as a Market House, and was sold to Peterson, a cabinet-maker in 1816. The tannery was not sold until 1838. Records of the construction, the progress, the financial status and changes within the system are found in the Archives and Records of the Moravians in North Carolina (Fries et al., 11 vols, 1920-1969). The slaughterhouse and the brewery-distillery were the mainstay in helping financially support the Single Brothers' activities. Along with the tannery, the industries also helped support the village of Salem, which the Moravians had established by 1772.

Environment

At present most of the Industrial Complex is in grass cover or creek bank growth. Some dumping has taken place on the southernmost part of lot 94. Four privately-owned houses are standing on the eastern side of lot 92 and two houses are presently on the western side of lot 93. Old Salem, Inc. owns part of the Complex (Map 1), but the remaining part of the Single Brothers' property of lots 92 and 93 are threatened by the possibility of modern real estate development—the building of apartments and multi-family dwellings. This would destroy the integrity and connection with the town of Old Salem.

Previous Work

Much historical material has been gathered by Old Salem, Inc. and the Museum of Early Southern Decorative Arts; the Records of the Moravian Church in North Carolina have been translated (Fries et al., 11 vols. 1920-1969). No previous archaeological work has been done on the Single Brothers' Industrial Complex; much historical material, however, was collated by Charles Phillips, architectural conservator, and the Old Salem, Inc. staff for an unpublished brochure on the complex.
Archaeological work at Old Salem was initially conducted by Frank Albright, and his notes are on file at Old Salem, Inc. Stanley South (1972) conducted archaeological work at Bethabara, an important work for the understanding of Old Salem. In Old Salem itself excavations have been conducted by Gary Wheeler Stone, John Clauser (1975), Judy Newkirk (1977), and Melanie Coats (1978).

Historical Overview

The first part of the Historical Overview presents the general historical and chronological framework for Salem. The other parts deal specifically with each one of the industries followed by a general survey of the trading network in which they participated.

The Establishment of Salem

The Moravians of Salem had come from Europe to Bethlehem, Pennsylvania, also established by the Moravians. They obtained a grant in present North Carolina which they named Wachovia. A temporary settlement was established at Bethabara on the Wachovia grant in 1753 until a permanent place was found. The site for the permanent settlement was the present Salem where most of the population had moved to by 1772.

Planning for the building of Salem was begun in 1764, and early in 1766 the first house was built. Before the next year ended two additional houses had been built, and the following year two houses, the potter's shop and the blacksmith's house and shop had been built. Until 1771 the church controlled the acreage of Wachovia and all the assets under the Economy which held everything in common for the good of the whole. After 1771 some farms were sold to individuals, but the Church maintained control of the town lots which were leased to church members. Excellent records were kept which are available today in the Records of the Moravians in North Carolina (Fries et al., 1920-1969).

The society was organized into 9 "choirs" based on age, sex, and marital status: Single Brothers, Single Sisters, Married People, Widowers, Widows, Older Boys, Older Girls, Little Boys, and Little Girls. At about 14 years of age the boys would become apprenticed to a Master workmen or a Single Brother. Girls at that age would enter the Single Sisters house where they learned the crafts preparing them for marriage or domestic work in private homes. When a boy was about 21 he could become a journeyman in his trade preparing to become a master. James (1977:5)
notes that it was the adherence to the guild system and the value of achievement of excellence in one's trade that greatly contributed to the Moravians' success in adjustment to their wilderness environment.

The Single Brothers House, which was occupied near the end of December 1769 was organized as a business establishment, and each of its members paid the Salem Diaconie (financial organization) for board and lodging. The Single Brothers carried on several trades of industries besides operating their own farm. The brewery-distillery, and the slaughterhouse were among these. The Red tannery was a Congregation Diaconie enterprise, which was begun in 1769-70.

By the end of 1772 when most of the inhabitants of Bethabara had moved to Salem, the population was 120 persons.

During the Revolutionary War the Moravian policy of strict neutrality contributed to their problems but alleviated others. Because the men were exempt from fighting by paying a tax, they were able to continue their trading pattern, although it was restricted. They were successful enough that they were accused of being Loyalists (Kapp 1976). Because goods were obtainable at Salem and because of its geographic position, travelers other than trappers were passing through, soldiers-British as well as rebels- and after the war, persons moving westward. Salem (and Wachovia) was no longer an isolated internalized community and acculturation was accelerated.

The county seat of Winston was established in 1849 on land bought from the Moravians, and in 1913 the two towns merged, becoming Winston-Salem. By 1860 there was a new Moravian, "... a thorough going Southerner" who participated in the Civil War as a southerner. They were "still Moravians, and in many ways they were still German. But in a broader sense they were irrevocably bound to their new environment and the attitudes and habits of its people" (Fries et al., 1976:81). The beginning of the Moravian experience in a new world is aptly summarized in Forsyth: a county on the march (Fries et al., 1976): "The record of the development of society in the wilderness that was Wachovia is a complex subject, taking into account the impact of that wilderness in its physical and social aspects on a group of people, essentially first-generation German colonials-as well as the impact of that group on the wilderness itself."
SALEM, N.C.
After Sanborn Map Co. - 1890

J.W. Fries Tannery
(closed)

Salem Paper Co.
(closed)

cabinet maker
undertaker

Map 3
The Slaughterhouse

The slaughterhouse on Lot 94 was finished by 30 April 1784, having been started probably in the fall of 1783; a Record entry on 12 September 1783 noted, "since the old slaughterhouse is falling apart by now the Single Brothers think of erecting a new one out of stones at the entrance gate to their farm." Figure A is a drawing by C. A. Phillips made from a plan found among the Single Brothers papers. Figure B is a plan of the Single Brothers stable presumably connected with the slaughterhouse. Map 2 (1785) shows four buildings in the complex.

It was suggested on July 7, 1789 that the Single Brothers should not keep the cattle for slaughtering, but should buy them "from time to time," and that calves and sheep should also be accepted for meat. By July 29, however, it was found that, "Buying of cattle for the slaughterhouse of the Single Brothers so that the town can be supplied with meat has too many difficulties in connection with it to be practicable. We feel it desirable, however, that a meat inspection should be set up so that no unfit meat is brought into town for sales."

In July 1795, the price of beef was increased half a penny per pound. In August 1802, 18 years after the stone slaughterhouse was built, the Single Brothers offered Br. Landman, "who understands the cutting and sawing of the meat and bones," their slaughterhouse and scales for use as a market house.

At a meeting April 28, 1807 it was announced that "Christian Blum has now established himself as a wheelwright in the former slaughtery..." It was in 1816 that Karsten Peterson bought the buildings valued at $600. Before he actually acquired the buildings he was required to be married, although he was allowed to gather materials "since he must make repairs on the buildings."

The next notation in the Records is December 9, 1828 when the fire inspectors "pointed out to Br. Peterson how uncomfortable and dangerous at the same time is the little smoke chamber in his kitchen attic." Karsten Peterson's son, Ed, had bought his father's house and possessions on the lot, and the lot in fee by January 25, 1858.

The slaughterhouse/cabinet shop and a storage shed are shown on a Sanborn Map Co. 1885 map. The same company's 1890 map shows the storage shed gone and a 2-story house with a basement on the west of the slaughterhouse (Map 3). A photograph
SINGLE BROTHERS' SLAUGHTER HOUSE
PRIOR TO BECOMING A SHOP & DWELLING

DRAWING FOUND IN BROTHERS' HOUSE PAPERS
CAPT. PHILLIPS
SCALE 3" = 1'-0"
NORTH

Fig. A
SINGLE BROTHERS STABLE

STABLE

PASSEGE

PIG PEN

STABLE

PASSEGE

HORSE STALL

1

North

Plan found in Brothers House Papers

SCALE 7/8" = 1'-0"

Fig. B
Fig.C Slaughter house - Cabinet Shop, pre-1897
(Fig. C) probably taken not long after 1890 shows the entrance, formerly on Academy/Shallowford Street had been made into a window and a wooden addition on the south end. The photographer, presumably, had scratched the negative with the notation, "hole where blood run out."

Another photograph (Fig. D) shows part of the eastern wall nearest Academy Street had fallen. This disaster took place in 1897, according to a newspaper clipping. An additional photo indicates the debris was cleared. A wall was built across the opening, thus shortening the building but making it possible to continue to be used (C. A. Phillips, oral communication).

The Sanborn map of 1917-1921 shows the 2-story house with some additions, as the only building remaining of those on the 1890 map, and a railroad spur and auxiliary buildings have been built on the property (Map 4). The 1955 map (Map 5) is essentially the same. The 2-story house does not appear on a 1964 aerial photo which indicates use of the lot as a supply yard of some sort. The area was finally cleared and was bought by Old Salem, Inc.

Summary of what is known about the slaughterhouse:

1 Built of stones in 1784 on Lot 94 with probable or approximate dimensions as shown on Fig. A.
2 Map 2 (1785) shows 4 buildings.
3 Adult cattle as well as calves and sheep were probably slaughtered; bones were probably sawed.
4 No longer used as a slaughterhouse by 1807
5 Remodeled by Karsten Peterson about 1816
6 A two-story house with a partial basement was built west of the building between 1885-1890
7 Part of building collapsed in 1897
8 By 1917-1920 there is no evidence of the slaughterhouse/cabinet shop above ground.

Brewery and Distillery

This building, on Lot 93, was built during 1773. A plan for a brewery was submitted by the Single Brothers on April 14, 1773. It was to be built "near their cattle shed," and the nearest spring was "to serve both the tanyard and the brewery." The "new building could be set up only from rest stones," but community representatives were to give their opinion on it "before they start to dig the foundation..." A plan, apparently of this building, is in Old Salem Inc. files (Fig. E).
The year before, 1772, it was realized that a brewery was needed and it was felt the "distillation of strong drink should not be extended too much, because beer is not only much more wholesome for the Brethern, but also neighbors would buy quantities of it." This was indeed the case. As Brown (1978:460) points out, "The early American farmer must have been thirsty most of the time." Not only was his work hard, but his food was preserved by thirst-provoking methods—drying, smoking, and salting. "Milk sickness (tuberculosis)" and polluted water were known, and the colonials recognized that brewed beverages, especially beer, were aids to health and well-being. Besides being disease-free, beers supplied many vitamins and minerals needed for good health since they were not clarified and were dark and cloudy with yeast.

All was not tranquil at the distillery, however. On January 20, 1779, it was reported that "strangers were sold brandy by the quart at the distillery." This could be done in case of emergency, but it was ruled that "brandy shall be sold in the Tavern." Notation in the Records indicated many fights erupted near the brewery and most of them were blamed on the consumption of brandy.

Nearly two years later the above was reiterated. An entry of 19 December 1780 noted "...no brandy shall be sold by the quart, except to people who bring some grains, or those who are real travelers, and who did not stop by in the tavern." The tavern keeper could furnish the strangers with what they wanted, and could give them a lower price if they would take it with them.

A disastrous storm and "cloudburst" took place on the night of August 1, 1784, when the water rose so high that "on the road to Shallowford the supports of the dam gave way, taking the causeway with them, the new wall by the farm and stillhouse of the Single Brethern lost more than twenty feet at one place and about ten feet at another..."

By 1791 the Single Brothers brewery and distillery was the Brothers' main support, but there had been difficulty in keeping a brewer and distiller. Nevertheless, the products remained appreciated. William Smith, a visitor to Salem in May 1791, wrote that "the Brewery and distillery are considerable; the beer is very good, and a cordial made out of whiskey excellent" (Fries et al., 1976:60).
The fear was expressed in August, 1796 that there might be difficulty with beer brewing because wheat had gone up in price and barley was also rare. The price of brandy had fallen by September 1800 because "nearly every farmer is making it," and rum could be imported more cheaply than making it. In October of the same year the Single Brothers wanted to roof the stillhouse with "roof tiles," but since none was available they had to use shingles. Then in December 1802 it was discovered that the "malt kiln" was a fire hazard and it was proposed "to move it to an additional building at the westward gable of the stillhouse. It was also contemplated at that time to make the ceiling of the malt kiln "...from cast iron plates" to improve the safety. But it was held in abeyance and probably never done because in May 1805 it was noted that the stillhouse made a "great deficit" the year before. Nevertheless "great quantities" were being served "to those who are addicted to drinking."

The brewery and stillhouse were suspended by a unanimous vote on 27 June 1805, and the inventory pieces and the cattle and tools of the farm as well, were to be sold at a public sale. Whether surplus fruit in a good year could be distilled was taken under consideration.

Carl Clauder leased the farm and stillhouse in August 1805, with the intention of brewing beer, although "pieces that belonged to the former stillhouse" were being sold. The sheep stall, horse mill and a shed were sold. The buyer of the sheep stall requested permission to move it, but the other two structures were left "for the present."

Br. Clauder's operation at the stillhouse apparently was successful, or at least his products were in demand, since it was noted in January 1806 that he was not able to supply the demand. Consequently the store was allowed to carry brandy, whereas heretofore only the Tavern and stillhouse were authorized vendors.

A successor for Br. Clauder was being sought in September 1810, even in Bethlehem, Pennsylvania. It was not until February 1812, however, that David Blum took over the "administration of the stillhouse." This was not a long lived enterprise, since Johann Ludwig Eberhardt was living there in 1813, Gottlieb Byhan in 1814, and October 1818 Dr. Burkhardt and family moved into the former stillhouse to use as a laundry for the Girls' Boarding School.
The former stillhouse was extant in 1890, as shown on the 1890 Sanborn Co. map (Map 3), and probably later as shown by photographs (Fig. F) taken at different but unknown dates. The building is not on the 1917-1921 Sanborn Map, two 1-story dwellings with basements being shown where it was (Map 4). Both houses were extant in 1964 (Wray Studio 5429-16) and 1966 (Topographic Map, Forsyth County, N.C.). The area was cleared and was bought by Old Salem, Inc.

The Trade Network

Fries et al., (1976:89) commented that, "The Brethren, when it came to business and politics, were expedient, and in their wilderness environment they were obliged to take advantage of the opportunities afforded them. Trading with their neighbors was one of the greatest of these."

The wagon was necessity in carrying on trade. In their "extensive trade" the Moravians sent their wagons, most of which were made in Wachovia, to Bethlehem, Brunswick, Charles Town. From Wachovia to Charles Town the round trip took about 3½ weeks to 1 month, average of 18 miles per day. To Cross Creek (Fayetteville) it took 13 or 14 days (Crittendon 1936).

Imports from Great Britain to North Carolina were mainly manufactured goods whereas exports were mainly raw material. Many different kinds of textiles were imported; wearing apparel, shoes, hats, silk stockings along with Earthenware, iron pots, cutlery, glass bottles, leather goods, tools, spades, cast iron, wrought brass, copper stills, medicines, among many others (Crittendon 1936:81). Coming from the West Indies were iron, earthenware and other manufactured goods, probably produced in Great Britain, along with rum, molasses, spices, and tropical fruit. Some of these entered North Carolina by re-export from the northern colonies. Some manufactured articles also came from the northern colonies—for example, iron, tools, earthenware, sieves, pots and pans, furniture and building materials. Exports from North Carolina were largely raw products such as corn, beef and pork.

Crittendon (1936:85) discusses trade away from the coastal settlements—the "back country," in reference to the Moravian trade who records, he states, constitute the principal source of information for this area, and suggests that because of this the Moravians "figure more largely than is justified by their importance" (Ibid:84fn1).
It was during the third quarter of the 18th century that the back country frontier was becoming more and more settled. Soon surplus products needed to be disposed of and needs and desires for manufactured goods needed to be filled. A market had come into being for merchants of the eastern region. At this time there were only five small towns in the back country—Hillsborough, Salisbury, Charlotte, Harrisburg, and Salem.

Initially the main product of the back country was skins brought in by trappers, many of whom brought them to the Moravian settlements. In time hides, tallow, snake-root, flax, hemp, butter, corn, wheat, and flour were products of the Moravian settlements. By 1774 hides were one of the chief products of the Moravian settlements, along with butter and pottery (Crittendon 1936:90; Bivins 1972).

The Moravians realized early that trading contacts needed to be made. They first tried the Cape Fear area at Wilmington and Cape Fear, but this was not as profitable as was hoped. Attempts to find good markets were made at Pinetree (Camden), South Carolina, and at Petersburg. A little trade was carried on at Salisbury, Edenton and New Bern, and products were sometimes sent to Pennsylvania. A regular trade, however, began to be developed with Charles Town, S.C. in 1763. Two, four or six wagons made the roundtrip each fall and each spring. They found more articles they needed at Charles Town and were able to get a better price for their deerskins.

An attempt at trading with Brunswick was made, the wagons carrying candles, rye, butter, beehives, a windmill, flour, flaxseed, and tallow, but the Brothers could not find what they needed there.

With the increase of imports at the port of Wilmington and the influx of settlers along the Cape Fear River, the settlement of Cross Creek (Fayetteville) at the head of navigation created a new market place connecting the coast with the back country. The Moravians took advantage of the closer location of Cross Creek, although the market was not as good, and reduced the number of wagons sent to Charles Town.

Trade was difficult during the Revolution, but the Moravians were able to maintain supplies in their stores of most articles. Salt became a scarce item mainly purchased in Cross Creek and crowds of people came to Salem to purchase it. By 1775 the store at Salem got most of their goods from Cross Creek, although trade was carried on with Salisbury, Charles Town, Petersburg,
and Pennsylvania. Crittendon (1936:138) notes that, "So astute were the brethren in conducting their business that they were able to furnish to the merchants of the east various types of commodities which formerly these same men had supplied to the people of the interior."

Overland trading became greater with the blocking of American vessels from the coastal trade, and many teamsters became traders, buying at the Salem store for sale in the northern colonies. During 1779 both Charles Town and the mouth of the Cape Fear were blockaded, so imported goods were difficult to obtain. The Moravians traded with Cross Creek, New Bern, Pinetree store, Charles Town and Pennsylvania.

Recovery from the war was rapid, and by 1783 trade and commerce had become much the same as before 1775 with imports and exports and trading routes remaining virtually unchanged.

SYNOPSIS OF NEW INFORMATION Test Excavations

Test excavations were made in the area of the Single Brothers Slaughter house and Brewery/distillery from August 1 to August 23, 1978. Testing was also planned for the tannery complex of buildings, but the lack of both time and money prevented this. All tests were made on Lots 93 and 94 of the 1819 lot system. Archaeological sites at Old Salem are designated by lot number and years of excavation. Thus, the Slaughterhouse site number is OS93-78; the Brewery-distillery, OS94-78.

The tests were the initial phase of an archaeological planning project and research design for the industrial complex. Drawings, maps and photographs of the complex exist which provide information concerning the description and location of the buildings, but it was uncertain what the precise location is and the condition of any remains, because land use and clearing after the destruction of the buildings have been extensive. Thus, test excavations were made first to gather information for a comprehensive research design, second, to locate remains of the brewery/distillery and slaughterhouse, third to determine the condition of the remains and the problems which might be encountered in future excavations, and fourth, to evaluate the industrial complex for eligibility to the National Register of Historic Places.
Method

Before excavation was initiated as much historical information was gathered together as was possible in a limited time. This study was to provide information to form a conceptual model of what might be encountered in the excavation and the most likely areas to obtain the knowledge desired. Included in the study were not only historical mention in the Records of the Moravians in North Carolina (Fries et al.) but also study of existing photographs and maps in the files of Old Salem, Inc., and information of land use post-destruction.

There was the definite possibility of a good deal of disturbance. Recently Old Salem By-pass had been built and the creek piped underground. Lot 94 where the Salughterhouse was, had been used as a coal yard. Interviews with local people who had lived in the area when there were buildings standing had a difficult time precisely locating structures within their memory because orientation markers were gone with the clearing of the area.

Excavations were planned to answer the questions posed by Old Salem, Inc. Specifically, since this was a testing program, the tests were located to gain information on overburden, stratigraphic sequence and the condition of remains, without adding to the problems of which was a potentially disturbed area.

Initially it was planned to use a probing rod and 1-meter square test pits to gain information on the geological stratigraphy before the backhoe was used. Because of the composition of the fill material, however, this kind of exploration was not cost and time effective and the backhoe was used to cut the exploratory trenches.

Excavation Unit 1 (Map 6)

This unit was placed near the present dirt roadway crossing the site area, to obtain a geological sequence since the roadway appeared to have been in existence from the initial building period, and had the possibility of having an undisturbed sequence. The trench, however, encountered debris from the former 20th century house, and it was abandoned. The roadway was probably farther toward the east about where pine trees are presently growing.

Excavation Unit 2 (Map 6)

This trench was placed between where the maps indicated
A: Stone paving on north side of wall exposed in this portion of trench.
B: X Brick portion of wall, possibly blocked windows.
C: Large stones ca. 4 meters below surface, possible distillery wall.
D: Crape Myrtle tree.
EU: Backhoe trench & excavation.
were the western wall of the slaughterhouse and the eastern wall of a house built between 1885 and 1890. This house had been built before the slaughterhouse had been torn down and had stood until at least 1955, overlapping in time with an extant house on the northeast corner of Academy and Trade Streets.

The trench encountered the eastern wall of the house and was cut along the southern interior wall of the basement through fill composed of clay and large asphalt and concrete blocks and bricks. Apparently when the house had been torn down the gaping hole of the basement had been filled with old paving material. A corner of the house was identified which can be used with the standing house to help locate the other structures from an early Sanborn map. This was useful in placing a trench (EU 5) exploring for the slaughterhouse remains.

Excavation Unit 3 (Map 6)

This trench exploring for the brewery remains was placed next to the sidewalk with the assumption that remains would be encountered because this was the highest part of the site and pictures indicated both brewery and slaughterhouse had been very near the street. One to one and one-half feet of red unconsolidated clay covered the surface. Below this was an organic strained stratum containing artifacts such as window glass, and 19th century ceramics. Two, and a possible third, apparently bricked-in windows, brick being mortared to stone were found; a stone paving next to the stone foundation was uncovered; loosely piled stones were encountered in the western end of the trench; and the northeast corner of the building was excavated. Near this corner and associated with it were sherds of lead-glazed red paste earthenware and fragments of clay roofing tiles typical of Salem manufacture, confirming the ruins of the Single Brothers Brewery/distillery. The artifact bearing stratum seems to have been associated with the brewery, and in all probability with further excavation a sequence of artifacts will be found which will give information on culture change and interaction.

Excavation Unit 4 (Map 6)

Because the stones in the western end of Excavation Unit 3 were a puzzle, trench 4 (EU 4) was dug at right angles to EU 3 to clarify the function of the stones and to test for the presence of the brewery cellar and the southern wall.

The upper 3-5 feet contained debris of 20th century living,
and at a depth of 6 feet a brick wall was encountered. This appears to have been the western basement wall of the 20th century house. Below this, 6-7 feet from the surface was a change in the vertical stratigraphy; at 15.5 feet from the north end of the trench, the deposits changed from a loose brown-red clayey sand with abundant rootlets to culturally sterile red clay. Near this change, 10 feet below the surface were several large stones. Because the depth and narrowness of the trench made it dangerous to explore further without supporting the walls or widening the trench, it was decided further excavation would not be cost, time, or information effective at this stage.

Excavation Unit 5 (Map 6)

This trench was placed to test for the condition of the remains of the slaughterhouse and to gain information on the landfill. In all probability foundations of the slaughterhouse exist near the sidewalk, but a trench placed there would not yield information on the condition of the landfill which was now known to exist. Using map measurements from the corner of the excavated basement corner (EU 2) coordinated with those of the extant house, it was hoped the trench would miss a well and encounter the eastern wall of the slaughterhouse as well as the western wall near a doorway. The eastern wall was encountered within a few feet of where it was expected about 3.67 feet below the surface. Fill was composed of black oily rock rubble with coal chunks, some brick and fine plaster fragments, remains of a former coal yard. Overlying this or interfinger with it is a red clay probably pushed onto the fill from the east. Spread over the top is a red clay about 1 foot in thickness.

A rock wall on the west was not encountered. But 18\( \frac{1}{4} \) feet from the inside of the eastern wall, about where the western wall should have been, was a pit which cut through several more or less horizontal strata, two of which were humic stained, but contained no artifacts. The humic stained strata may represent cultural fill or creek overbank deposits. The pit may represent robbing of the stones from the wall, or there is the possibility the trench encountered a doorway built without a stone foundation, which seems unlikely. Further excavation should clarify this.

Proposed Research Design and Program

Salem was an important center of production and distribution on North Carolina Piedmont. It was involved in a trade network or exchange system which reached to Pennsylvania, South Carolina, Tennessee, and Europe, Africa and the West Indies (see Trade
section). Thus the Old Salem Industrial Complex cannot be fruitfully studied as a lone entity, because as Lewis (1976:17) states concerning Camden, South Carolina, and the same holds true for Salem, North Carolina, "it was part of a larger, ever-changing socio-economic system. Changes in the organization of such a system are reflected in its parts and thus it is impractical to examine one without consideration of the other." Thus the exchange system can be studied as a subsystem of the larger socio-economic system providing a framework for the historical and archaeological study of the Industrial Complex and its role in Salem history as well as an interpretation or explanation of the processes of change and interaction taking place at Salem.

In order for the research to be productive several studies additional to the Industrial Complex should be undertaken within this framework.

1. All previously excavated material at Old Salem should also be studied in its archaeological and historical context. For example, is there a preponderance of English ceramics or foreign tools in one particular situation? Do the documents indicate the importation site of these? By what route did they get to Salem? What was the historical milieu at that time? Why was this preponderance present at that particular time? By using excavated material in addition to the Industrial Complex material enough data can be obtained to use the Mean Ceramic Date Formula (South 1977) to aid in answering these questions. In addition, these data are needed to determine if Old Salem fits into the Carolina Pattern (South 1977), or the Frontier Pattern (Lewis 1976), or was there a Moravian pattern? With both the Carolina Pattern and the Frontier Pattern it was assumed these were patterns of British Colonial sites settled by Britons. Although Salem was a British Colonial site it was settled by non-British persons and it would be expected there would be differences.

2. Since communications systems are an integral part of the exchange system the road and transportation network must be studied.

3. Further studies should also be made of the tannery, located on Lot 93. Although the Paper Co. was established at a later date it was a part of the industrial development of Salem.
4. Other town of Wachovia, Bethabara, Bethania, and Frieberg, should be studied historically and archaeologically in the same manner for their role in the exchange system. For example, did Salem act as a redistribution center for all of Wachovia? What materials did those towns contribute to the exchange system? What did they get in return? Why were these goods desired? If a Moravian pattern is delineated it can be tested.

Archaeological data from the Industrial Complex will add to the existing data base since it may be possible to delineate refuse patterns for the slaughterhouse, the cabinet shop and the stillhouse, wash house and late 19th century domicile, as well as the tannery and the tanner's house. It would be expected that each of these patterns, as patterns of light industry, would differ from those of the town itself, where present available data mainly concern domiciles.

For example, many "strangers" visited the stillhouse-tannery area without entering or staying in the town. Since they probably brought their own containers for beer and brandy, it would be expected that those lost would not be represented in the artifact patterns of the town itself. Does the artifact pattern of the Peterson house indicate differences in exchange from those in town, or from the tanner's house? Do the artifact patterns from the stillhouse and tannery suggest where the equipment was obtained.

Since many goods in an exchange system are perishable they do not show up in the archaeological record, but a sudden increase in containers from a supply center, may indicate an increase in trade of the contents of the container as well as a shift in trade to the center itself.

Many other questions of hypotheses can be generated by addressing the Exchange System; historically, the Revolutionary War contributed to accelerated acculturation and assimilation at Salem. Can this be demonstrated archaeologically? Was there a sudden increase of artifacts not made at Old Salem and coming from places other than the usual supply centers?

Another line of research and inquiry concerns the local Indian population. There is very little mention in the Records about the indigenous population after the move from Bethabara to Salem. Archaeological information coupled with further archival
search should clarify whether this was a real or artificial recording. It would be expected that Indians had been and perhaps continued to live near water sources such as Tanner's Run. If this was so, then excavations in the Industrial Complex would be expected to contain some Indian artifacts.

Potential Significance of the Single Brothers' Industrial Complex

The significance of this area is multifold. On the one hand, the site is important because of its direct relationship with the historic district of Old Salem. Although artificially severed from the historic district by a modern four lane bypass, this site represents a vital aspect of Salem's early economy. The area was part of an over all growth westward which by 1840 had developed several dwellings, a cotton mill, the Brewery, the Slaughterhouse and Tannery sites.

Since the Industrial Complex was an integral part of the economic system of the settlement, and the settlement was an important segment of the trading and exchange system of pre-industrial America, extending to Europe, a unique opportunity is provided for a synchronic study of the mechanisms and flow of this system. Further, in view of the communal economic and social structure which contributed to the success of the system, the study of social and economic change is a challenging question. In fact, it has been noted (Fries, et al., 1976:196), "The sound economic base of the Moravian settlement, already more than one hundred years old (at the beginning of the 19th century), was probably responsible for the fact that most of Forsyth's (county) economic development came without importation of capital from outside the region." Hypotheses relating to the changing economic and social patterns, such as interaction brought by the trading network, the forced interaction brought about by the Revolutionary War, the influence of the Industrial Revolution, and others could also be tested with archaeological and historical data.

Further significance of the Industrial Complex lies in the educational opportunities of a possible continuing archaeological project. Being part of the Old Salem area where 82 historic structures are extant, and which has more than 135,000 visitors per year, a continuing project under a professional archaeologist could serve as a mechanism for visitors and students to become aware of historical archaeological methods and problems and become cognizant of the importance of site and artifact conservation.

In summary, the significance of the Single Brother's Industrial Complex...
Complex lies not only in its importance to the Salem settlement but also in the framework of industry, economics, the national and international trade patterns of Colonial America, and the cultural change from a communal, structured and closed settlement, isolated culturally and geographically from the mainstream of early American society, to a society caught up in the Americanization process of the post-Revolution era. Further significance lies in the possibility of educating the layman and student alike with a continuing archaeological project.

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REFERENCES

Albright, Frank P. and Frank L. Horton
1970 History of Properties in Old Salem. Research paper
on file, Old Salem, Inc.

Bivens Jr., John
1972 The Moravian Potters in North Carolina. University

Brown, S. C.
Scientist Vol. 66.

Clauser Jr., John W.
1975 Excavations at the Vierling House, Old Salem

Crittenden, Charles C.
1936 The Commerce of North Carolina 1763-1789. Yale
University Press, New Haven.

Deetz, James F.
1978 Late Man in North America: Archaeology of European
Americans in Historical Archaeology: A Guide to
Substantive and Theoretical Contributions. Robert
Farmingdale, New York.

Fries, Adelaide L. et al.
1920 Records of the Moravians in North Carolina. 11 Vols.

Fries, Adelaide L., Stewart T. Wright, and J. Edwin Hendricks.
1976 Forsyth, The History of a County on the March.
University of North Carolina Press, Chapel Hill.

James, Hunter
1977 Old Salem, Official Guide Book. Old Salem, Incorporated,
Winston-Salem, North Carolina.

Kapp, M. Keith
1976 The North Carolina Moravians in the American Revolution:
A Study of Pacifism in a Christian Communal Society.
Unpublished Honors Essay, Department of History,
University of North Carolina.
REFERENCES (Continued)

Lewis, Kenneth E.

Lewis, Kenneth E.

South, Stanley

Surrat, Jerry Lee

Teague, George A. and Lyentte O. Shenk

Woodall, J. Ned, Judith A. Newkirk and Brett Riggs
Introduction

In any archaeological study of sociocultural change, there is the underlying assumption, or hope, that materials found in the ground will reflect alterations in non-material phenomena of the people being studied. How materials change qualitatively and quantitatively is thought to bear some relation to the actual changes in a people's lifestyle. A number of studies have dealt with changes in the historical record, as reflected in material remains (Heizer and Mills 1952; Kraus 1944; Laguna 1960; Wedel 1936), but few scholars have rigorously addressed the problem of how sociocultural change can be revealed in the archaeological record. There are exceptions. In one study James Deetz (1968) has shown differential rates of change across sexual lines, and in another has effectively demonstrated the relationship between historically documented social disorganization and archaeological patterning (Deetz 1965), but no one as yet has been able to plot out, in specific terms, what changes would be observed on Indian sites whose occupants were becoming increasingly acculturated.

An early, generally neglected, attempt to measure sociocultural changes through the modification of materials is George I. Quimby's and Alexander Spoehr's study entitled, "Acculturation and Material Culture - I (1951)." The authors set up two major divisions of materials, each with a number of categories, and ranked the categories as representative of different degrees of acculturation. John White recently revived and refined the Quimby-Spoehr study in accord with his own investigations at the Russian settlement of Fort Ross, California (White 1975). In this paper I will review the Quimby-Spoehr-White model of acculturation in light of recent historic and archaeological research in the Lower Mississippi Valley (Brown 1979a). It is my belief that the above model is too general to be applied to all archaeological situations. In order to understand the effect of introduced materials on any people, it is necessary to examine how and by whom the merchandise was transmitted, and how the recipients, in turn, used and valued the goods.
Quimby-Spoehr-White Model of Acculturation

The Quimby-Spoehr-White acculturation model is summarized in Table 1. The first division consists of European artifacts which were either modified or not modified by the natives. In category 1 the European forms were not changed and they had native counterparts. According to the three authors, there may or may not have been a change in the use and meaning of such materials to the Indians, an example offered being the substitution of a gun for a bow-and-arrow. Other European items in this category are metal knives, trade beads, and European porcelain where a pottery tradition already existed. According to this model, these objects fall in the realm of substitution and are thus indicative of a low degree of acculturation.

Category 2 was set up by John White. It consists of unmodified European forms which did not have native counterparts. The items were additive and imply a greater degree of acculturation, because the culture must have developed a context in which the new artifacts had function and meaning. Characteristic of this category are glass bottles and iron nails.

Category 3 consists of new artifact types which were made from native materials, but were copies of introduced models. White further subdivided this category by making a distinction as to whether the techniques were introduced along with the new artifact, such as the skills necessary for making pottery, or whether the techniques came from the recipient group, such as the construction of a stone bullet mold in copying an introduced iron model. Materials of Category 3 were additive and are considered by the Quimby-Spoehr-White model to be evidence of a high level of acculturation. Other items recovered on historic Indian sites in the Lower Mississippi Valley which would fit in this category are native gunflints and ceramic copies of glass beads.

Category 4 consists of European artifact types decorated in the native manner. European clothing with shell pendants or sewn-on beads are offered as examples. White felt that artifacts of this category indicate a high level of acculturation.

Category 5 consists of new types of introduced forms where materials and techniques were imported, but local manufacture was involved. An example of this category, believed to be the highest reflection of acculturation, is weaving.

Division B consists of native types of artifacts which were modified as a result of European contact. The first category
Table 1
Quimby-Spoehr-White model of acculturation

<table>
<thead>
<tr>
<th>ARTIFACT MODIFICATIONS</th>
<th>NATIVE REACTION</th>
<th>MATERIAL EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A European types modified or not modified by natives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. European forms not changed (have native counterparts)</td>
<td>Substitutive (low degree of acculturation)</td>
<td>guns, metal knives, glass beads</td>
</tr>
<tr>
<td>2. European forms not changed (do not have native counterparts)</td>
<td>Additive (higher degree of acculturation)</td>
<td>glass bottles, nails</td>
</tr>
<tr>
<td>3. Native-made forms copying European forms (do not have native counterparts)</td>
<td>Additive (high degree of acculturation)</td>
<td>native gunflints, stone bullet, molds, clay beads</td>
</tr>
<tr>
<td>4. European forms decorated in native manner</td>
<td>Acceptance (high degree of acculturation)</td>
<td>European clothing with shell pendants</td>
</tr>
<tr>
<td>5. European materials and techniques but native-made forms</td>
<td>Acceptance (highest degree of acculturation)</td>
<td>weaving</td>
</tr>
<tr>
<td>B Native types modified by European contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. European materials replace native materials (no new skills involved)</td>
<td>(low degree of acculturation)</td>
<td>glass projectile points and scraper, porcelain gaming pieces, pipestem beads</td>
</tr>
<tr>
<td>2. European materials replace native materials (new skills involved)</td>
<td>(higher degree of acculturation)</td>
<td>metal projectile points and scraper</td>
</tr>
<tr>
<td>3. Native forms decorated in European manner</td>
<td>(high degree of acculturation)</td>
<td>foreign designs on basketry, pottery, etc.</td>
</tr>
</tbody>
</table>
includes native artifacts which were modified by the substitution of an imported material for a local material, the latter being either inferior in its physical properties or lacking in prestige. Examples of this category are glass projectile points, glass scrapers, gaming pieces of porcelain, and pipe stem beads. As techniques involved in adapting these new materials to the preexisting forms remained the same, all three authors interpreted this category to be evidence of a low-level of acculturation.

Category 2 of division B consists of native artifacts which were modified by new materials whose incorporation required different technological skills. Metal projectile points and metal scrapers are included in this category and are considered to be representative of a higher degree of acculturation than category B.1.

The last category of division B consists of old types of artifacts modified by the introduction of a new element of subject matter. Included in this category are foreign design elements on pottery and baskets. Such materials are considered to represent a high level of acculturation, comparable in intensity to category 4 of division A.

Quimby and Spoehr are somewhat conservative in interpreting what the observed differences in materials actually mean. They note that generally in the earliest stages of culture contact most artifacts were of the B.1 category, with new materials having been incorporated into old forms using the old technology. They also stress the persistence of both old and new forms. Native artifact types were modified by increased contact, but the forms tended to show great stability. Similarly, introduced forms exhibited stability, even when local materials were used. White advances beyond Quimby and Spoehr's cautious interpretations in stating that relatively high acculturation is represented at sites with abundant amounts of A.3, A.4, A.5, B.2, and B.3 artifacts. Conversely, occupants of sites with many A.1, A.2, and B.1 artifacts were at a less advanced state of acculturation.

Critique of Quimby-Spoehr-White Acculturation Model: Lower Mississippi Valley Case Study

The Quimby-Spoehr-White model addresses acculturation in very general terms. At no point in the two articles do the authors talk about the people who were being acculturated. Rather, the important points are the qualitative changes in the artifacts themselves and the relative quantitative changes in different categories. There is the implication, particularly in the White
article, that historic Indian sites can be arranged according to degree of acculturation solely on the basis of material modification. Not considered anywhere in the Quimby-Spoehr-White model, however, is the notion of function. The fact that materials can function quite differently when placed in different contexts (Binford 1962) is not discussed at all. It is also assumed that an adoption or modification of an artifact type by one people has the same effect as its adoption or modification by another. We cannot automatically assume that the presence of identical artifact types on two or more archaeological sites reflect similar histories of use and value of those objects. Rather, the ethnohistorical record of specific regions must be closely examined to determine the possible ways in which such artifacts may have functioned in the local aboriginal lifestyle.

In my own archaeological research in the Lower Mississippi Valley, I have approached the study of sociocultural change by closely examining the role of European materials in the ethnohistorical record (Brown 1979a;b). The transmission of material culture and the way it was received was directly affected by the agents of sociocultural change. The trader, administrator, missionary, and explorer all had numerous and often quite diverse reasons for making contact with the Indians, and the nature of the contact situation no doubt affected the rate and direction of sociocultural change (SSRC Summer Seminar on Acculturation 1954:981). Even after materials were transmitted, they were often used and valued in manners varying from the ways in which they were originally designed. This is not the place to give a full review of the varying functions of each European artifact type in the Lower Mississippi Valley, but it may be of some interest to examine several artifact types which the Quimby-Spoehr-White model offers as key indicators of acculturation levels.

Glass trade beads are included in category A.1 and are thought to be indicative of a low degree of acculturation, merely substituting for native counterparts. In the Lower Mississippi Valley, however, the introduction of glass beads may have severely affected sociocultural change. The Indians of Louisiana had a multitude of uses for glass beads (Swanton 1911:137), but they were generally employed in personal adornment. The Great Sun of the Natchez wore beads in his feather crown (Ibid:106) and Choctaw chiefs used beads in their headdresses (Swanton 1931:102). Women often wore their hair braided in tresses interlaced with blue, white, green, or black beads (Swanton 1911:51) and both men and women wore beads around their neck and in their ears (Ibid.: 55, 133).
Glass beads probably replaced similar native shell or stone ornaments (Ibid.:56). The Chitimacha, for example, are reported to have had beads of such materials in prehistoric times (Ibid.:345). Wood, chinquapin nuts, and red haw seeds were employed as beads by the Choctaw (Swanton 1931:43). Pearls, however, appear to have been the most common bead material in protohistoric times, and there is good evidence that there was a status differentiation in the use of such beads in the Lower Mississippi Valley. Pearls came primarily from the Gulf Coast (Swanton 1911:259) and, much to the chagrin of the early explorers, they were generally tarnished, "because they pierce them with red-hot iron (Tonti in Swanton 1911:260)."

There seems to have been two types of pearl beads. One type was exclusively the property of the elites while the other type was worn by commoners. The latter form was recorded by Nicolas de la Salle in 1682 as being typically worn on the necks and in the ears of many Taensa Indians (Ibid.:261). Such beads were often traded for European items of little value (Ibid.:328). Pearl beads owned by the elite, however, were carefully guarded and only reluctantly given to the European explorers. A wife of a Taensa chief, for example, did not want to give Monsieur de Tonti her pearl necklace, even in exchange for 10 yards of blue glass beads (Ibid.:261). Father Gravier similarly found it very difficult to purchase a small string of pearl beads from a Natchez chief's wife in 1700 (Ibid.:158). The value of this particular type of pearl bead is clearly evident when, in the first encounter between Le Moyne d'Iberville and the Natchez in 1700, he and each of his companions were given but a single pearl bead (Ibid.:190). André Pénicaud revealed the significance of these pearls to the Natchez:

They have similarly a necklace of fine pearls, which they received from their ancestors; but they are all spoiled, because they have pierced them by means of a hot fire. Two or three are placed around the necks of the infant nobles when they come into the world; they wear them to the age of 10 and then they are replaced in the temple. At all the audiences of the female chiefs this necklace is placed around their necks until the ceremony is finished. Then they take it back to the temple. It is kept in a coffer as a very precious relic (Pénicaud in Swanton 1911:159).

This type of pearl bead appears to have had religious significance to the Taensa Indians also, as related by Monsieur
de Tonti in his visit to their temple:

These old men showed me a small cabinet within the walls, made of mats and cane. Desiring to see what was inside, the old men prevented me, giving me to understand that their god was there. But I have since learned that is the place where they keep their treasure, such as fine pearls, which they fish up in the neighborhood, and European merchandise (Tonti in Swanton 1911:260).

It is perhaps significant that pearl beads are seldom mentioned in the ethnohistorical record of the Lower Mississippi Valley after the turn of the 18th century. Glass beads, being the most typical European trade item, were readily given to both commoners and elites by missionaries, traders, and explorers (Swanton 1911:56, 91, 120). As time passed and European contact increased, it is probable that the ready availability of glass beads served to undermine the socioreligious importance of certain pearl prototypes.

Another European artifact type which appears to have also had socioreligious significance in the Lower Mississippi Valley is bottle glass. This material is included under category A.2 of the Quimby-Spoehr-White model. It is considered to have been additive and of a higher degree of acculturation than glass beads. The model would have to be adjusted for the specific Indian groups in question, however, as ceramic bottles existed protohistorically in the Lower Mississippi Valley. Glass bottle fragments found on archaeological sites in the region would thus be considered substitutive and reflective of a low level of acculturation. The problem with such an interpretation is that it is based upon the assumption that glass bottles in both Western European and aboriginal societies functioned in the same manner. Although the Indians of Louisiana rapidly learned to drink and enjoy the contents of glass bottles, there are strong indications that bottle glass, when first introduced, functioned in a religious context. Monsieur de Tonti, in the late 1690's, reported the presence of European merchandise in the Taensa temple, and Father Le Petit elaborated upon the contents in 1699. The temple contained:

...a bottle and the foot of a glass, which they guarded as very precious (Le Petit 1730 in Thwaites 1896-1901, 68:124-125).

Le Moyne d'Iberville, among the Bayagoulas Indians in 1699,
FIGURE 1: Suggested effect of European items on sociocultural change in the Lower Mississippi Valley as reconstructed from the ethnohistorical record.
also noted the presence of a double glass bottle in their temple. It is possible that the glass in the Taensa temple may have taken on a value which had formerly been given to rock crystals. Such materials, which have been found on historic Indian sites in the region (Quimby 1942:270, pl.XVII-5-6), were observed in both the Natchez and Taensa temples (Swanton 1911:269; Thwaites 1896-1901, 65:140-141). There is some indication that guns may also have had a religious function when first introduced. Nicolas de la Salle, for example, observed an old Spanish sword and three old guns in the Taensa temple in his first visit among these Indians (Swanton 1911:258, 263).

According to the Quimby-Spoehr-White model, beads, bottle glass, and guns were merely substitutive. These authors, however, assume substitution in a socioeconomic context when, at least in the early contact period, the functional context of these materials in the Lower Mississippi Valley appears to have been socioreligious. As shown above, a review of the ethnohistoric literature for a specific region can indeed reveal ways in which local aboriginal groups were affected by introduced European materials. In the Lower Mississippi Valley (see Brown 1979a) some items appear to have been accepted very slowly (Fig. 1). Nails, hoes, hats, and shoes are the principal items, and their rejection or slow acceptance is no doubt related to the absence of aboriginal prototypes. Other items were rapidly accepted, but seem to have merely substituted for native forms. They probably had little effect in producing sociocultural change. Included in this category are metal knives, tinklers, bells, springs, bracelets, vermilion, and axes. Axes appear to have been substitutive in terms of warfare. As regards construction, however, they were much more efficient than earlier stone forms and may have contributed greatly to changes in economic organization.

Other European items certainly contributed to such changes. Kettles were rapidly accepted. Copper kettles were often cut up to make tinklers, but iron kettles probably did much to make obsolete large native ceramic cooking vessels. European ceramics probably also contributed to the degeneration of native ceramic skills, but not to the same extent as kettles. There is abundant historical evidence suggesting that Indians would have gladly accepted European ceramics if they were available, but they no doubt had to compete with French settlers for these same items. Transportational difficulties seem to have limited the amount of European wares carried to distant posts (Gayarré 1846:176,184; Surrey 1916:252). Archaeology, in fact, has revealed
that Frenchmen at frontier settlements like Fort St. Pierre, often had to use native-made wares for various functions (Brown 1977; 1979a).

The two most valued items of European material culture in the Lower Mississippi Valley appear to have been guns and fabric. Both were, for the most part, readily accepted. As stated earlier, guns may have had a religious significance when first introduced, but eventually substituted for the bow-and-arrow in both hunting and warfare. It is not known whether or not warfare increased as a result of this introduction, but hunting certainly became more efficient. Improved ways of depleting local faunal resources no doubt contributed to changes in economic organization. Fabric was also readily accepted and probably would have, like European ceramics, resulted in severe changes in economic organization were it not for the fact that clothes rapidly wore out and France lacked the capability of keeping the Indians supplied with fabric. The natives, therefore, constantly had to resort to using their own resources and skills. As the 18th century progressed, with increasing amounts of fabric and European pottery introduced, native skills regarding the production of clothing and ceramics seem to have declined.

Conclusions

As revealed in this brief study of the Lower Mississippi Valley Indians, European materials were not necessarily valued in the same manner through time. Nor can it be assumed that the function of these objects remained constant. The functional context and the value of the merchandise were interrelated, and the manner in which the two components changed through time also affected the course and rate of sociocultural change. The Quimby-Spoehr-White acculturation model erroneously assumes that function and value of each European artifact, or modified aboriginal artifact, remained the same through time. Accepting the assumption, the degree of acculturation is calculated by a quantitative analysis of these artifacts on archaeological sites. A more blatant assumption is that material adoptions or changes are thought to have affected any and all aboriginal groups in the same manner. In order to construct models of sociocultural change, we must be constantly aware of the context in which such changes took place.

To understand observed quantitative and qualitative material changes on archaeological sites, and how such changes are related
to non-material aspects of aboriginal culture in a specific area, it is necessary to examine the roles of the transmitters of material culture, the nature of the contact situation, and the use and value of the transmitted materials to the Indians themselves. This information can be filtered out of historical documents. Archaeology can contribute immensely to this study by once again closely examining the context of the finds. Merely counting the artifacts from a site and recording qualitative modifications is inadequate. The archaeologist must investigate which artifacts are commonly associated in certain contexts, as these associations are reflections of behavior at any one time. Recording the patterning of materials in such contexts and the changing patterning over time will be a major contribution of archaeology to understanding cultural processes in the contact period.

Most importantly, it is the combination of archaeological and historical research, framed within a strong foundation of cultural anthropology, that will contribute most to the goal of understanding cultural processes in European-Indian contact. We must also talk more in terms of specifics. Only when strong models of sociocultural change have been established for a number of different regions will we be able to confidently construct general models such as that proposed by Quimby, Spoehr, and White.

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REFERENCES

Binford, Lewis R.

Brown, Ian W.


Deetz, James J.F.


Gayarre, Charles

Heizer, Robert F. and John E. Mills

Kraus, Bertram S.

Laguna, Frederica de
1960 The story of a Tlingit community: A problem in the relationship between archaeological, ethnological
Laguna, Frederica de (cont.)

Le Petit, Father

Quimby, George I.

Quimby, George I. and Alexander Spoehr

SSRC Summer Seminar on Acculturation

Surrey, N. M. Miller

Swanton, John R.


Wedel, Waldo R.

White, John R.
1975 Historic contact sites as laboratories for the study of culture change. The Conference on Historic Sites Archaeology Papers 9:153-163.
FORT JACKSON: A NON TRADITIONAL FRONTIER FORT

James W. Parker

History

In April of 1814 a force of volunteers and Regular army units from Tennessee and a like aggregation from the Carolinas and Georgia met near the head of the Alabama River (Map 1). These armed columns were part of the forces afield facing the hostile faction of the Creek Indians in the Creek War of 1813-1814.

The Tennessee contingent was commanded by General Andrew Jackson and were fresh from a decisive victory at Horseshoe Bend (Remini 1977:217). General Jackson had ordered the two forces to meet near the village of Taskigi. At this place it was expected to encounter further Indian resistance. Instead of battle the soldiers encamped near the site of the French Fort Toulouse which had been abandoned in 1763 at the close of the French and Indian War (Thomas 1960:203-06).

The militia from Tennessee marched homeward within a week. They left their fellow veterans, the 39th U.S. Infantry, to band with the fresher troops from the east. The Carolina Brigade they shared camp with were commanded by a veteran of the Revolutionary War, General Joseph Graham. This aggregation began the construction of a defensive edifice atop the French remains which was christened Fort Jackson (Graham Papers, April 20, 1814; Mahon 1951:421-22).

The works begun by the Carolinians were refurbished and enlarged by the 3rd U.S. Infantry and other garrisoning units. It was listed on the War Department Rolls until 1817 when the need for a strong military posture in the central Alabama region had lessened.

The lands around the post were sold and the plow furrowed the fort remains. In 1905 the fort site was still known to the local populace. A visitor from the north came to the area and noted that there were still visible entrenchments and powder magazine in the midst of a cotton field (Parker 1978: 17-18; Sayler 1905:8-27).

Six years later the State of Alabama purchased the property where the Creek War defenses and its French predecessor had stood. In 1971 the Alabama Historical Commission became the owner of the parcel. The following year archaeological investigations
CREEK WAR SITES IN ALABAMA
were begun under the direction of Dr. Donald P. Heldman.

An extensive testing program was structured to ascertain the extent of the remains present. It was found that sufficient evidence was still present to warrant a large scale archaeological and reconstruction program. The digging and building is still progressing with the cooperation of the Alabama Historical Commission and the Department of the Interior.

Research

In the Histories of the Creek War little data concerning the physical aspects of Fort Jackson is available. Those works that give descriptions state that the fort was of a stockade fashion with blockhouses (Pickett 1851:593). Dr. Heldman postulated that the Creek War post was the size of a bastion of the earlier French defense and of picketted construction (Heldman 1976:143-44).

The conclusion that the tall, ten to fifteen feet high, picketted style wall was used can well be understood following a study of the defensive architecture used on the southern frontier in the late Eighteenth and early Nineteenth Centuries (Robinson;133-40).

Forts Mitchell, Claiborne and Stoddart all built in Alabama in the same decade as Fort Jackson had picketts as the principle defensive barrier (Graham 1814; Chase 1974:29-31; Bassett 1922:15).

These views were still adhered to by the author and Mac Brooms when the archaeological investigations were placed under their supervision. Soon a new perspective began to take shape, first archaeologically then archivally.

Excavations along the east curtain line of the French fort uncovered two areas of disturbances not previously noted. The first was near the Northeast Bastion (Fig. 2). A series of post molds in a trench that began near the moat scarp edge continued eastward into the partially excavated moat. In the ditch fill adjacent to the molds were remains of burned logs laying parallel to the scarp edges and covered with loam silt. Across from the post remains was a post mold and a hole.

To the south a grey-brown silt filled moat-like deposit that ran perpendicular to the defensive ditching. The soil comprising the fill of the depression was contemporary with the
Figure 2

FORT TOULOUSE
EAST CURTAIN EXCAVATIONS

Figure 2

French Remains Deleted
fill within the moat. The feature was also exposed along the
counterscarp to the east (Fig. 2). It was felt the silted
deposits were related to Fort Jackson but no form could be
perceived using the previous conceptions.

While the excavations along the east curtain were being
carried forward work had begun in the Southeast Bastion locale.
In this corner defense Heldman had found and totally exposed
the remnants of a Jacksonian era wood floored powder magazine
and picketed wall lines in a diamond pattern (Heldman 1976:82-97).
The 1977 investigations found the wall line and it was seen that
portions of several timbers were still present with excellent
molds in association. Stratigraphic sections along the north
flank and east face of the bastion showed a difference in the
fill on the exterior and interior of the post line. This fill
also was on each side in such a manner that the uprights were
intrusive into natural subsoil and a dark grey loam midden but
were inclusive to the fill surrounding them (Fig. 3).

At this time the archaeologists had become befuddled
at the findings and were hoping for answers as the excavations
progressed. The findings took on new light when the archival
search found the papers of General Joseph Graham. In these
documents were sketches of Forts Decatur, Bainbridge, Burrows,
and Jackson. Descriptions accompanied the drawings.

Fort Jackson was depicted as a moated rectangular
defense with four bastions, two magazines, and a detached
work to the east with a sub-terranean passage leading to it
(Fig. 4). Graham's compass points were askew but the Coosa
River was in the proper location.

The newly found fort plan was compared with the archaeo-
logical data with the magazine in the Southeast Bastion and
the moat lines serving as datums. The findings were that
the silt filled depression was Graham's "covert way" which led
to the outerwork. The post mold series and charred logs were
remains of the drawbridge (Fig. 2).

The inclusive post molds of the bastion were identified
as part of earthworks. General Graham shows the dirt curtain
walls wood backing as being laid horizontally (Fig. 5).
The excavations along the curtains found no remains of a
picketted wall of French or American origin. The difference
in the bastion may be that there was differing in the construction
so the corners were more formidable as is proper fortification
FORT JACKSON

COOSA RIVER

HIGH BLUFF

BOAT LANDING

MOAT

PARAPET

BANQUET

PICKET WALL

CANTON PLATFORM

ROAD TO THE TALLAPOOSA AND CAMP

PARKER AFTER GRAHAM

NOT TO SCALE

FENCE

127
Fig. 5

Common picketted tall curtain wall conjectural

Author's interpretation of Fort Jackson's curtain walls
technique. General Graham states that the curtains were "... proof against field artillery...the floor of the bastions are raised as high as the banquet and the parapet around them somewhat higher than the other..." (Graham 1814, Letter Book).

It appears that a pickett was raised and the fill from French period moats and earlier deposits was used to affect the dirt face of the defense. The red clay found on the interior came from the excavation of the powder repository to raise the floor of the bastion and provide a firing platform.

Conclusion

The Fort Jackson component at the Fort Toulouse site provides an example of the archival record adding to the archaeological interpretation and excavation data proving the validity of documents. The information gained provides insights into a deviation of a style of architecture by peoples with a set of experiences unlike the frontier inhabitants and applying foresight.

Joseph Graham or Major James C. Warren, his engineer, were not frontier residents at the time of the Creek War. Graham had received his military training during the Revolutionary War. In the Southern campaign where he served with General Nathaniel Greene, earth works had been used. The knowledge of the defenses' effectiveness and how they could be raised quickly was assigned a factor in the plan of the forts raised by the Carolina Brigade. The form used in the plan of Fort Jackson is a deviation from the posts of Fort Decatur, Fort Bainbridge, Fort Hull, or Fort Burrows. At these works reintrant angles and star configurations were used instead of bastioned rectangles (Graham 1814, Letter Book). The change was probably based upon the existance of the earlier French forts outline being visible.

If the defenses erected by the Carolinias were not necessary to be "proof against field artillery" it was because the natives lacked this weaponry. Graham knew of the Anglo threat from Florida and anticipated the possibility of the combined British and Indian forces moving into the Alabama Country. It is of note that as the post at the junction of the Coosa and Tallapoosa was being raised a British officer was reporting to his superiors how easy it would be to ascend the Alabama River with gunboats and reduce the wooden forts of the Americans (Owsley 1976:26-34).
From a site well within the hinterlands of the Old Southwest it can be seen how influences can be introduced from areas not usually associated with the usual cultural manifestations of a region. The author has not initiated a comprehensive study but feels that this phenomena will be exhibited at military sites in greater frequency than at settlements following the established frontier advancement.
REFERENCES

Bassett, John S.
1922 Major H. Tatum's Journal While Acting Topographical Engineer (1814) to General Jackson, Commanding 7th Military District. Smith College Studies in History VII.

Chase, David W.

Graham, Joseph

Heldman, Donald P.

Mahon, John K.

Owsley, Frank L. Jr.

Parker, James W.

Pickett, James Albert
1878 History of Alabama and Incidentally of Georgia and Mississippi, from the Earliest Period. Roberts Printing, Birmingham, Alabama.

Remini, Robert V.
REFERENCES (Continued)

Robinson, Willard B.

Thomas, Daniel H.

Sayler, H. L.
1905 Little Tallassee. Private Printing, Chicago.
According to Webster's Dictionary, kilns are "furnaces of brick or stone, or heated chambers, used for hardening, burning, or drying anything." Usually the name of the article which is to be processed (such as lime, cement, brick, or pottery) is included to make the kiln type more specific. In this instance we shall discuss pottery kilns although identical kilns were frequently used to burn brick and other ceramic objects such as vitrious pipe. Formal pottery kilns have some permanent structural features and remains of these may be encountered archeologically. In North America informal kilns with no permanent structure, in other words bonfires around stacked pots, and extremely primitive kilns with one firemouth and permanent wall structure only may be seen even at the present time being used for the burning of the very soft unglazed or lead glazed earthenwares characteristic of the native Indian cultures of the Southwestern United States and Mexico.

It is not this sort of pottery tradition which historical archeologists interested in the colonial and post-colonial archeology of the United States and Canada may encounter. Our predominantly northern European colonists brought with them the established ceramic traditions of their native lands, primarily England and Germany. These traditions encompassed the use of the potter's wheel as well as various forms of molds to prepare vessel forms from potter's clays, a rather sophisticated knowledge of the preparation or production of glazes for both earthenwares and stonewares, and knowledge of both the manner of construction and operation of formal kilns used to burn both types of pottery ware. In some instances simplification or regression of kiln structures, probably from necessity in this technically under-developed nation, may be seen, especially during the 19th century. The Groundhog Kiln is an example of such a change.

In spite of the fact that pottery manufacture was discouraged in the American Colonial Period, small potteries are known to have existed here during the seventeenth and early part of the eighteenth Century and two early kilns have been excavated in Virginia. It was after the American Revolution, however, that the ceramic industry began to develop and consequently most of the remains of potteries which are now encountered date
from the late eighteenth and the nineteenth centuries. A study of kilns of the twentieth century is helpful in that more entire remains are often present and give us keys to the structure of the earlier kilns.

In this discussion we are concerned with kilns of the periodic type rather than the continuous type. Continuous kilns were developed during the nineteenth century and are now used by many large ceramic manufacturers; they consist of tunnel like kiln chambers through which loads of ware are passed on carts moving at a very slow speed along a track. The firing chamber in the midsection of these kilns burns continuously. All of our early kilns were of a periodic type, each firing of ware consisting of one cycle of loading, burning, cooling, and unloading. For the purpose of this paper, details of kilns using very modern types of fuel such as electricity, crude oil, natural gas, and bottled gas will also be excluded. The fuel governs some of the construction details and most of the kilns to be discussed here were wood fired. A few later potteries, especially those verging on industrialization, used coal as fuel. Strangely, either the earlier discouragement of the British, or the great development of the British ceramic industry was such that most fine tablewares and decorative ceramic wares used in this country continued to be imported from other countries, mainly Great Britain, until the beginning of the twentieth century. The American potteries produced mainly utilitarian ceramic wares, brick, sewer pipe, and tile.

Most kilns are constructed of rock, brick, or a combination of the two. I have seen 18th century lime kilns constructed of only earth or clay, but no pottery kilns. The combination of brick and rock was commonly used in the United States during the 19th century. In the simpler kilns used by small or early potteries the brick was usually hand made brick prepared at the site. Many types of rock deteriorate in high temperatures and are not suitable for kiln interiors. If rock was easily available in the area the outer walls and buttresses were frequently made of rock and only the inner surfaces of the kiln were lined with brick. Fire brick or high temperature brick for American pottery kilns was a late 19th century development. Since ordinary lime mortars are decomposed by heat, clay mixed with sand was the mortar of choice in construction. As the round kilns, in particular, became more highly developed and larger in diameter, iron bands or chains were used around the exterior to counteract the expansion of the kiln during firing. Iron grates in the firebox were used in more sophisticated kilns to aid combustion. Flat rocks or pieces of clay tile were used in the early period on top of the chimneys as dampers to control
the temperature and the combustion rate. These developed into sophisticated damper systems, particularly in downdraft round kilns. Last of all, iron doors lined with firebrick replaced the traditional loose bricking up or sheet metal covering of the firebox doors to control cooling. The loading entrance door is still bricked up in many instances.

The position of the kiln in reference to the ground level is not constant. Most are above ground. One or two round kilns dug into the earth have been found in Tennessee. Earthen banking of the walls of rectangular kilns was common in the early Rhenish kilns and is seen in most kilns of the Groundhog type. This banking of the sidewalls gives both support and insulation during the firing process.

All historic periodic pottery kilns had at least one of the following components: a firebox or combustion chamber in which the fuel was burned; some arrangement, often in the form of formal flues, to allow the flames and heat to travel to the firing chamber; the firing chamber itself in which the ware was stacked for the "burning"; and some arrangement for excess heat and flames to exit after they had passed through the wares. This last component might be a very informal sort of single hole in the superior portion of the roof in updraft kilns or a sophisticated set of underfloor flues connected to a terminal chimney in downdraft kilns. Other features frequently seen are permanent or removable baffle or bag walls at the inner end of the firebox. These prevent the hottest flames from contacting the ware directly and also tend to direct the flames toward the dome in some kilns. Movable dampers over openings in the roof or chimney were also used to control the rapidity of the exit of heat from the kiln. The manner in which the ware was placed or stacked within the kiln was important to achieve proper burning but we shall not discuss that matter here. Full muffle kilns, these in which no flames or fumes are allowed to enter the firing chamber, will not be discussed here. Accessory doors also developed as the kilns grew larger and more sophisticated. The more elementary kilns had one door which served for loading, as the firebox mouth, and unloading (Fig. 1). Potters generally use the term "setting" for loading and "drawing" for unloading.

The two basic geometric forms in which kilns were constructed - circles and rectangles - had developed into quite basic patterns by the time of the Roman conquest of Northeastern Europe. Roman kilns of both types have been excavated in England and on the continent and undoubtedly influenced the potters who
ROUND AND RECTANGULAR SIMPLE UPDRAFT KILNS

FIGURE I
followed this period. The rectangular form was preferred for the burning of brick and tile and the round for the burning of pottery in the conquered nations during the Roman occupation period. John Musty's classification of English Medieval kilns indicates that both forms persisted and that in England the rectangular form remained associated with brick and tile burning and the round with pottery burning. At some time after the thirteenth century the use of rectangular kilns for pottery seemed to have developed on the continent. In the Pays du Bray area near Bouvais, France, rectangular kilns used for pottery wares as early as the 14th century have been excavated. Rectangular kilns were used at Seigburg and Raeren in West Germany for stoneware. Almost triangular and oval kilns fired in the manner of rectangular kilns have been excavated at Frechen just outside of Cologne, Germany. These well constructed kilns were used at least as early as 16th century for salt glaze stoneware. In southern Germany a rectangular form has persisted until the present time in the Westerwald and areas just south of the Rhine. This form has been used for both stoneware and earthenware, though each type has some specific characteristics. In Great Britain, on the other hand, round kilns have remained the usual kiln used for the firing of pottery wares and immense development of the round kiln has taken place. Rectangular kiln forms for brick and tile burning remained popular in Great Britain. Musty's classification of the types of Medieval Kilns encountered in England - by the number of fireboxes and the number of flues and their direction is accurate for all simple updraft kilns even today. The development of the downdraft kiln during the 19th century, possibly from the Cassel type of rectangular kiln, has given us additional categories. We therefore have round kilns of updraft and downdraft types and rectangular kilns of updraft, cross-draft, and downdraft forms.

**Round Kilns**

Round kilns are always round or oval in form and may have one or several fireboxes. These kilns are fired from the firebox toward the center and all accessory fireboxes are arranged opposite one another. In the case of the early single firebox these kilns are small in diameter - up to no more than eight feet - so that the heat and flames will fill the informal space beneath the firing chamber completely and then ascend. The lack of uniformity in firing Round Kilns from one firebox led to the early development of two or more fireboxes arranged around the outside of these kilns. These usually open into the kiln beneath the level of the firing chamber floor. A permanent
roof structure to help contain the heat within the kiln as well as a system of flues to distribute it more evenly were developed by the 15th century. In all round kilns of the updraft type the flues are directly attached to the fireboxes and serve to distribute the heat as it ascends. The floor of the firing chamber in which the ware is burned must have openings in it which will allow this ascension. The earliest forms simply had solid central loading platforms with channel like openings circling the platform. The development of flues in the form of channels cut from the fireboxes towards the center of the kiln and bridged with brick or tile set with small openings between them or the construction of a gridwork of three or four layers of unmortared brick called a "checker" set up from the floor of the kiln at the level of the fireboxes made the heat distribution much more even (Fig IIa). The checker is such that its top serves as the floor of the firing chamber and it need not be rebuilt after each firing. As the diameter of the round kilns increased to accommodate larger amounts of ware, so did the height. In the English "Bottle Kiln" the addition of the coneshaped chamber above the basic round domed updraft kiln both aided in the creation of the good draft and protected the true dome of the kiln from weather (Fig. IIb). The fact that there was a great deal of heat in this upper chamber which was not being utilized prompted the development of a second firing chamber in this upper area which could be used for the lower temperature firing of biscuit wares in fine pottery production. This type of dual kiln, I suspect, would be rare in this country in the 19th century period because the utilitarian stonewares commonly produced here were completed in one firing, never bisqued, and its technical advantages were not necessary to produce common earthenwares.

The development of the downdraft form of kiln in the 19th century brought about some structural changes in round kilns. The recirculation of the heat through the pottery so that its exit from the kiln was near or below the firing chamber floor produced much more even heating of the ware and was also more economical in the use of fuel than a simple updraft kiln. Several ingenious manners of accomplishing this downdraft may be seen in existing kilns and published kiln plans. One form has circumferential fireboxes entering at the firing chamber floor level and a central chimney. The heat rises into the kiln from the fireboxes, directed upward by baffle walls. As it strikes the now completely closed dome the draft created by the chimney draws it down through the wares and into flue openings around the base of the chimney (Fig. IIIa). These are sometimes just above the firing chamber floors but more often below the
A. Round or oval simple updraft

B. Bottle simple updraft (multiple fireboxes & flues)

C. Round downdraft with remote chimney (multiple fireboxes & flues)
firing chamber floor with excavated flues bridged by slightly separated brick or tile. In a second type of downdraft kiln the wall of the kiln may have flues built within it, the hollow wall chimney downdraft. In this instance the terminal flues appear as a series of small chimneys around the kiln between the fireboxes. These are fed by flue channels beneath the firing chamber floor, again bridged by separated brick or tile (Fig. IIIb). The third form of round downdraft kilns is the most common type of round kiln still in use today in the United States. It is the round, multiple-flued downdraft kiln with a remote chimney. The fireboxes remain at the firing chamber floor level and the chimney flue or flues are fed by a series of flues under the floor, which feed into one flue channel leading into the base of a chimney (Fig. IIC).

All of this may seem very difficult and confusing to one not familiar with kilns, but one simple fact can be used to separate updraft and downdraft kilns (round or rectangular). Fortunately this is evident in the lower levels of construction and usually survives beneath the ruins. If the fireboxes are connected with any type of flue channels or informal flue system beneath the firing chamber the kiln was fired as an updraft kiln; if a flue system is connected to some form of chimney base, the kiln was fired as a downdraft kiln. One may not be able to determine whether or not the usually destroyed upper structure was a simple beehive or more elaborate a bottle form, but the basic dimensions and manner of function can be determined.

Rectangular Kilns

Rectangular kilns, square kilns, and a few oval kilns (the Frechen type of German kiln) are fired from front to back. One firebox, which occasionally may be divided by supporting arches into two or more parts, appears at the mouth of these kilns (Fig. IVa). Some kilns used to fire large amounts of brick may consist of parallel groups of rectangular kilns, each having its own firebox and firing chamber. These may also be called parallel flued kilns. Within a single rectangular kiln there may be two or three sets of parallel flues originating from the single front firebox and passing through the firing chamber. These are most frequently seen in the simple updraft rectangular kilns used to fire salt-glazed stoneware after the German fashion. The flues are channels constructed at a lower level than the main floor of the firing chamber and are bridged with slightly separated brick or tile. The flues ascend towards the rear of the kiln in the earliest forms.
TWO OTHER COMMON METHODS OF CONSTRUCTION IN ROUND DOWNDRAFT KILNS

FIGURE III
Most of these kilns had a permanent roof when used for stonewares, though the original Roman tile kiln of this type did not. In the dome a number of openings are covered with round or square tiles which serve as dampers and are adjusted as desired. These openings are also used to put the salt into the kiln during this portion of the firing when it is used as a glaze. Although this is a simple updraft kiln, the flames also travel somewhat longitudinally in the sub-floor flue, then directly upwards. The cross draft rectangular kiln is demonstrated by the American Groundhog type. In these kilns no flues lead under the firing chamber, but the flames travel upwards in the firebox and a bag or baffel wall directs them up and over into the firing chamber. The construction of the baffle may be solid or reticulated. The reticulated types allow some of the heat and flames to enter the firing chamber near the floor and eliminate the problem of a cold anterior floor to some extent. The manner in which the wares are stacked is also very important in the firing of these kilns. If there is a large opening into the chimney, it must be well filled with pots so that the exiting draft is not too strong. Later modifications in chimney openings drew the exiting heat more or less downward. All of these kilns have a terminal chimney, but there are several variations in the flue openings into the chimney (Fig. IVb).

The downdraft is accomplished in a rectangular kiln by using the same sort of firebox and baffel construction as the Groundhog, but depressed flues are excavated in the area beneath the firing chamber floor. These flues draw the flames and heat which have risen over the baffel down through the wares and out to a chimney. The flues in this instance, just as in the downdraft round kilns, lead into the chimney. The modified German Cassel or the Newcastle kiln of the 19th century is an example of the downdraft rectangular form. Today many gas-burning kilns in small art potteries are constructed in this same manner - usually with a frontal door and gas fireboxes in the side walls in the larger kilns (Fig. IVc).

Variations

In all of this discussion I can only urge that the excavator remember that these descriptions represent basic patterns of construction. Almost every kiln will have some slight variation from the examples presented. The location of the firebox or fireboxes, chimney footings when present, the flue pattern, and the contour of the kiln are the most important points in the discovery of the type of kiln being excavated. I can only point out the Kirbee kiln, a rectangular Groundhog.
CROSS SECTIONS OF THE VARIETIES OF DRAFT IN RECTANGULAR OR SQUARE KILNS

FIGURE IV
with a second firebox and a second firing chamber, as a prime example of variation. It was a real surprise to all of us.

Associated Structures

Structures used to shelter the kiln may be of importance in excavation. Various forms of "hovels" or "lean-to covers" have been used to protect the kilns and the potters. Solidly structured hovels providing a covered walkway around the kiln may be only just high enough to walk beneath or may cover the entire kiln in a bottle form. All will show a foundation line circling the outer kiln wall with walkway space between. Kilns in northern climates were often built within a shop of some sort, while in the more temperate southern climates open metal roofed sheds were popular. The latter flimsy sheds often leave no visible remains unless post holes are carefully looked for. Many kilns have stood completely in the open with no protection at all.

Other structures once existing in the area of pottery kilns were shops and lean-to structures to contain the clay and the equipment for preparing it. A shop in which the wheels stood with space for drying racks to hold the wares was always present. Other working rooms in potteries which did molding or decoration and an area in which the glazing was done, if glazes other than salt were used, were all necessary. Their size depended upon the size of the pottery. One small dirt floored shop some ten by twenty feet was all that was absolutely necessary. Footings for foundations of these structures may be discovered in excavation. This may, however, be difficult when the shop was nothing more than a shed upon wooden post foundations. Dwelling places are frequently not in the close vicinity of the pottery because of the danger of fire. This latter fact accounts for the near absence of artifacts useful for dating in most excavations of pottery shop remains.
REFERENCES

Barka, Norman

Beckman, Bernhard
1978 Personal Communication regarding the kiln excavated at Seigburg.

Brears, Peter

Cordew, Michael

Cartier, Jean
1976 1978 Personal communication regarding rectangular pottery kilns excavated at Beauvios, France.

Dale, L. C.

DeRidder-Blenska, G. Mayer, O. A.; and Papleux, J.

Dobson, Edward

Freckmann, Klaus
1977 Rheinisches Töpferhandwerk-Eifel, Mosel, Hunsruck, Nahe, Rheinhessen, Rheinland-Verlag GMBH, Cologne, W. Germany.

Göebels, Karl
1971 Rheinesches Töpferhandwerk, Frechen, W. Germany
REFERENCES (Continued)

Greer, G. H.

Hamer, Frank
1975 The Potter's Dictionary of Materials and Techniques
Watson, Guptill, N.Y.

Harvey, Lt. Col. R. J.

James, Arthur E.
1945 The Potters and Potteries of Chester County, Pennsylvania
Chester Co. Historical Society, Chester, PA.

Kelso, William and Chappell, Edward A.

Lepper, Herbert; Hellebrandt, Heinrich; Mayer, Otto Eugen; and Hugot, L
1977 Steinzeug aus Dem Raerener und Aachener Raum, Aachen, W. Germany.

Musty, John

Outlaw, Alain C.

Rhodes, Daniel
1968 Kilns, Chilton, Philadelphia.

Rupp, David W.
REFERENCES (Continued)

Savage, George and
Newman, Harold
1974  An Illustrated Dictionary of Ceramics, Van Nostrand,
Rheinhold Co., N.Y.

Schiffer, Huberg
1887  Die Alte und Die Neue Kunstpferei Raerens Aachen,
Germany pp 9-12.

Sheldon, Harvey
1976  "Highgate Wood Roman Kilns", paper presented at the

Smith, Sam and Rogers, Steven
1978  Personal communication about potteries in Tennessee.
MAGNETIC ANALYSIS: A USEFUL TOOL FOR DEVELOPMENTAL PLANNING AND INVESTIGATION ON HISTORIC SITES

Gordon P. Watts, Jr.

Introduction

For two decades proton magnetometers have been utilized to assist archaeologists in the location of cultural material. The value of magnetic remote sensing has been well documented on both terrestrial and underwater archaeological site identification surveys. Although widely accepted as "perhaps the most effective and most versatile" (Arnold 1976:3) of numerous electronic instruments designed to locate buried cultural material, archaeologists have only recently begun to utilize the magnetometer's potential. Today highly sensitive portable magnetometers and systematic methods of data collection and abstraction can provide historic site managers and archaeologists with valuable information which can be effectively employed in both developmental planning and pre-excavation analysis.

Documentation

The initial application of magnetic remote sensing on archaeological sites appears to have occurred in Europe. M. J. Aitken reported on early experiments in an article titled "Magnetic Prospecting" which was published in 1958. Two years later, C. M. Lerici published a brief report on magnetometer-assisted archaeological survey activities carried out in Italy. In 1962 Aitken and M. S. Tite published findings from a magnetometer survey of early British hill forts. That same year Glen A. Black and Richard B. Johnston reported the results of experiments designed to test the magnetometer as a tool for archaeological investigations.

By 1966 I. Scollar and F. Kruckeberg detailed the computer treatment of magnetic data collected on archaeological sites and such authors as C. J. Clausen, J. N. Green, and E. T. Hall were publishing articles on the magnetometer's application in underwater archaeology. M. S. Tite and C. Mullins' 1971 study of the "Enhancement of Magnetic Susceptibility of Soils on Archaeological Sites" is indicative of the increasing refinement of magnetometer applications on archaeological sites. Two years later, in 1973, S. Breiner published a comprehensive Application Manual for Portable Magnetometers detailing theory, function, and application. A report presented by J. B. Arnold and G. B. Kegley at the Annual Meeting of the Society for
American Archaeology in 1974 illustrates the instrument's practical application.

**Instrument Function**

The proton precession magnetometer is a sophisticated instrument designed to utilize the precession of rotating protons in a hydrocarbon fluid to measure magnetic intensity. Each proton acts as a revolving dipolar magnet which can be polarized by a current-generated magnetic field. When this current is removed, the revolving protons precess in the direction of the earth's ambient magnetism. This process generates a small but measurable potential. The frequency of this potential is directly proportional to the total ambient magnetic intensity and can be measured within a general accuracy of one gamma in a field of approximately 50,000 gammas. (Breiner 1973:3).

**Application**

The presence of certain cultural materials has a measurable effect on the ambient magnetic field. Magnetic anomalies of cultural origin appear as a result of contrast between the magnetic intensity of features or artifacts and that of the surrounding overburden. Anomaly intensity "is a function of the concentration and the thermal and mechanical history of the magnetite present in either the cultural material or its burying medium." (Breiner, 1973:46). Generally, anomalies of cultural origin are the result of induced, remanent, and/or permanent magnetization.

Induced magnetization is a result of the presence of magnetite, one of the most common magnetic minerals. In the presence of magnetite, the ambient magnetic field can be enhanced and the magnetite reacts in much the same manner as a magnet. Anomalies created by induced magnetization are a direct factor of magnetic susceptibility: the ability of magnetite to enhance the local ambient magnetic field.

Archaeological features frequently create anomalies because man's activities have disturbed magnetite-bearing materials present at the site. Construction related ground disturbances represents a case in point. While the effect of induced magnetization is perhaps less important to the archaeologist than remanent and permanent magnetization, its influence is a factor in magnetic surveys of historical period sites.
Thermoremanent magnetization has been found to be independent of the earth's present magnetic field and is generally more dominant than induced magnetization. High intensity remanent magnetization is generally related to heating. Prior to heating, domains within each magnetite crystal are randomly oriented. Molecular activity associated with heating permits a reorientation. During the process of cooling, these domains tend to align themselves in the same general direction as the ambient magnetic field. The parallel orientation assumed by these domains creates in intense magnetization within the object itself.

Because a wide variety of objects produced and utilized by man were created by heat treating magnetite-bearing materials, thermoremanent magnetization is of particular importance in the conduct of remote sensing surveys on historic period sites. Prominent anomalies can be created by brick, tile, and igneous rock (e.g. certain types of ballast stones) associated with construction activities. Ceramics almost inevitably associated with historic sites can likewise produce a detectable signature. Kilns and other structures designed to employ high temperatures as well as those destroyed by intense fire are known to produce significant anomalies. Magnetic surveys of prehistoric habitation sites indicate that even small fire sites may be reliably detected (Arnold and Kegley 1974).

Remanent magnetization and susceptibility of surface soils are also important considerations. Organic activity associated with soils rich in humus has been accredited with the formation of maghemite, a magnetic mineral. Because maghemite is detectable it is of assistance in isolating humus concentrations associated with habitation. Remanent magnetization in surface soils is also of considerable importance. Although the reason for its presence has not been clearly established, it is common in the upper layers of most soil. When disturbed by construction, cultivation, or other land use activity the integrity of the surface strata is destroyed, creating an anomaly which can be detected.

Perhaps the most readily detectible anomalies on historic period archaeological sites are created by permanently magnetized ferromagnetic material. Permanent magnetization, like thermoremanent magnetization, is a result of the molecular activity associated with the heating and cooling of metals. Magnetic intensity evolves as a factor of the "thermal, mechanical, and magnetic history" (Breiner 1973:8) of the material and its metalurgical composition.
Ferromagnetic metals, iron and later steel, have been used extensively in the manufacture of weapons, tools, utensils, hardware, and construction materials. Artifacts from each of these categories are generally well represented on historic period archaeological sites. Although ferromagnetic material in quantity can completely mask more subtle anomalies created by induced and remanent magnetization of materials and soils, it produces prominent detectible anomalies.

Survey Methodology

Several factors must be considered in determining the most appropriate survey methodology for a given site. Perhaps the most important consideration in determining survey methodology is the level of sophistication at which the data is to be analyzed and abstracted. If the survey objectives are limited to the location of cultural materials at the site the method of data collection differs considerably from that which must be employed if complex magnetic profiles are to be produced and nature of the anomaly analyzed.

Where survey objectives are location oriented, a form of random "prospecting" can be effectively employed. Informal data collection stations can be established according to the nature of the artifacts or subsurface features to be located. While this methodology would not be appropriate for locating and identifying subtle anomalies associated with soil disturbances it would be more than adequate to locate concentrations of artifacts, structures, and features composed of or including thermoremanent or permanently magnetized materials.

More analytical objectives demand a more systematic approach. Production of complex magnetic contour maps essential to interpretation of subsurface anomalies requires that data collection stations be uniform and accurately located (Fig. 1). Again, the nature of artifacts, structures, and features to be located and identified will dictate both the number and relationship of data collection points. As might be expected, the more subtle the magnetic change to be detected the more data collection stations are required. Likewise, more stations will be essential for accurate contour mapping of identifiable features. Survey methodology should be determined in light of both the available historical source material and the complexity of the desired results.
To conduct magnetic remote sensing at Fort Branch in Martin County, North Carolina, archaeologist employed a wheel barrow to transport the required equipment. The magnetometer sensor was deployed by students and data collection was made at grid stations located for the purpose of preparing a topographic map of the site. Less than two field days were required to collect magnetic data on the four and one half acre site.
Field Procedure

Once the survey methodology has been established the most appropriate field procedure can be determined. Small, lightweight, portable magnetometers make data collection relatively simple. "Prospecting" for anomalies of cultural origin can involve little more than walking over the site and observing changes in the magnetic field. One individual can easily transport the instrument and record the necessary data. Care must be taken to ensure that the operator is free of any materials which might be detected by the magnetometer if 1-gamma sensitivity is desired.

For increasingly sophisticated survey activities, more formal control of the data collection is required. Sample stations must be accurately tied to a map of the survey area to facilitate interpretation. Frequently the magnetometer survey can be carried out in conjunction with initial topographic survey activities, eliminating the necessity for more than one on-site grid system. Where necessary, this initial grid can be broken down for more accurate definition. In the absence of an existing grid, data collection can be effectively controlled utilizing a transit and tape (non-magnetic) or alidade and plane table.

While the instrument can be transported from each data collection point to the next in a manner similar to that employed in "prospecting", more accurate measurements can be obtained by employing an assistant to move the sensor. By utilizing a non-magnetic tripod the sensor can be positioned over each data station in a uniform orientation and at a consistent height. Its elevation can also be controlled to minimize contamination from magnetic surface materials. The magnetometer operator is then free to quickly record the coordinates and gamma intensity at each location.

Data Analysis

Once raw data from the field survey is available, a magnetic contour map of the survey area can be compiled. Each survey data collection station is plotted along with its appropriate magnetic value. Intensity levels for plotting can be selected according to the data collected and the desired level of sensitivity. By interpolating linearly between all of the raw data values, preselected gamma contours can be produced. With the completed contour map available, anomalies can be analyzed according to intensity, configuration, and association with the remainder of the contour (Fig. 2). Where sufficient
Figure #2

On site compilation of the magnetic data produced a detailed contour map of Fort Branch. Anomalies created by concentrations of ferromagnetic material dating from the period of occupation, soils altered by thermoremanent magnetization, and modern contamination are clearly evident. A test excavation corresponding to one of the major anomaly concentrations revealed the remains of a burned subsurface structure containing numerous projectile fragments.
funds are available computer programs can be utilized to convert raw field data and produce contour or three dimensional projections for interpretation. The software necessary to rapidly process magnetic data is readily available and has proven effective (Arnold 1975 and 1976). In addition to examining the total magnetic picture of the site, individual anomalies may be isolated for analysis. Examination of the anomaly profile can provide insight into its size, composition, shape, orientation and depth. Depth, for example, is generally represented by a broad wavelength anomaly. This information can be invaluable when analyzed in light of existent historical data concerning the site.

Limitations

Unfortunately, the magnetometer cannot provide reliable analytical data in every situation. Some sites do not lend themselves readily to magnetic survey. The presence of ferromagnetic structures in the vicinity of the proposed survey area can completely mask more subtle archaeological anomalies. Likewise, the presence of alternating current electrical power sources render a small signal from cultural material or features immeasurable. In some areas background noise generated by natural magnetic materials may virtually eliminate detectible magnetic contrast. In addition, material associated with more recent on-site activity may contaminate the survey results. Fortunately, for the most part, these influences can be identified before a decision to employ magnetic surveying has been made.

Conclusions

In evaluating the usefulness of magnetometer surveys in pre-excavation site analysis and planning, it is first obvious that the method cannot be successfully employed on every site. Limitations in the function of the instrument, the magnetic nature of the natural environment, and/or man made contamination may preclude the collection of meaningful data. However, this is not generally the case and valuable insight into the location, nature, and extent of cultural material and archaeological features on historic period sites can be derived from magnetometer surveys.

The fact that much of the cultural material and many of the types of features found on historic period archaeological sites are readily detectible makes the magnetometer a particularly valuable tool for the archaeologist. In fact technological development and industrial production greatly increased the
amounts of detectible material found on archaeological sites. Thus, at least in theory, the later the site the more likely it can be detected. Magnetic remote sensing also makes it possible to detect material and features on sites where surface conditions or vegetation prohibits visual identification of cultural material.

In a search mode the magnetometer can be employed to locate concentrations of material or more distinct feature generated anomalies. Search mode "prospecting" can be carried out quickly and without formal control of data collection. By utilizing a systematic site delineation survey mode the magnetometer can generate data to support the production of highly detailed magnetic contour maps, complex perspective representations, and graphic illustrations of anomalies. Because of the systematic nature of data collection considerable field time can be saved by coordinating the on-site magnetometer work with topographic mapping or other surveying activities. Laboratory time can be reduced considerably by computer reduction and display of the data.

Analysis of magnetic data presented in these forms can provide accurate information concerning subsurface material and features. This information is often sufficient to answer preliminary questions concerning material and feature locations, nature, and association without excavation. Where excavation is required magnetic analysis can be effectively utilized to plan research strategy and select excavation units. The value of such pre-excavation insight must be readily apparent.
REFERENCES


Clausen, C. J. "The Proton Magnetometer: Its use in Plotting the Distribution of Ferrous Components of a Shipwreck Site as an Aid to Archaeological Interpretation." *Florida Anthropologist* 19 (1966):77-84


PETTUS AND UTOPIA:
A COMPARISON OF THE FAUNAL REMAINS FROM
TWO LATE SEVENTEENTH CENTURY VIRGINIA HOUSEHOLDS

Henry M. Miller

Introduction

Food is an often neglected subject in the study of the seventeenth century Chesapeake, and many fundamental questions about it remain. What was the diet of planters in the region like? Which domestic animals were most important in providing meat? Were wild animals widely consumed? How did food consumption vary between the economic groups in Chesapeake society? These are significant problems to be solved, for they are essential in understanding household economics, the state of nutrition, and the overall quality of life during the period. In this paper, the animal remains from two sites are analyzed and compared in an attempt to begin answering these questions.

The Pettus Plantation and Utopia Cottage sites were excavated during the Kingsmill Archaeological Salvage Project under the direction of Dr. William Kelso. Both sites are located along the northern shore of the James River, a short distance downstream from Jamestown. They were apparently occupied by persons of differing status during the second half of the seventeenth century, thereby providing a good opportunity to compare the diet of two different households during the same period.

Pettus Plantation was built by Col. Thomas Pettus sometime after 1640. Following Col. Pettus' death in 1669, the property was inherited by his son, Capt. Thomas Pettus, who lived at the plantation until he died in 1691. His heirs sold the land in 1700 to James Bray II who built a new plantation house elsewhere on the property (Kelso 1973:4-8). The Pettus family was quite wealthy with vast landholdings in Virginia: clearly they ranked high on the colonial social scale. The main structure at the site was a large post-supported building with numerous additions, and its ground floor space totaled some 2,500 square feet (Kelso 1974:4).

Unlike the above, Utopia Cottage is poorly known historically. It is located approximately 3/4 mile downstream from the Pettus site on land known to have been owned by the Pettus family. In the 1691 inventory of Capt. Thomas Pettus, some of his cattle are listed as being at Utopia. Unfortunately, these are the
only historic references to the site. Artifacts suggest that it was occupied between the years 1660-1700. The main structure at this site was much smaller than the one at Pettus with approximately 550 square feet of ground floor space (Kelso 1976). This significant difference in structure size and the knowledge that the Utopia occupants did not own the land indicated that they were considerably lower in economic status.

This conclusion has been confirmed by ceramic analysis of the two sites by Outlaw, et al. (N.D.). It was clearly demonstrated in their study that the ceramic assemblages from the sites were different. Utopia had fewer vessels than Pettus, lacked specialized vessel forms, and had a higher percentage of Colono-Indian pottery. These ceramic distinctions, along with the architectural and documentary evidence, have enabled Outlaw, et al. to suggest that Utopia could have been a slave quarter of the Pettus Plantation.

The Slave Diet

If the hypothesis that Utopia was a slave quarter is correct, how would this be reflected in the faunal remains at the two sites? There is, unfortunately, an almost total lack of information on this subject since little research has been conducted on the diet of slaves or servants in the seventeenth century. Because of this, it was necessary to consult references to the slaves' diet in travelers' accounts and plantation records to gain some impression of what to expect.

A relevant observation on this subject was made by a Dutch visitor, Jasper Danckaerts, in 1679. He noted that:

"For their usual food the servants have nothing but maize bread."

(Danckaerts 1913:111)

A French traveler to Virginia in 1687 confirmed this when he wrote:

"With this (corn) soup, they feed the slaves and it costs very little to maintain them, particularly the negroes, for in some places, they are given bread and meat only on Christmas Day."

(Durand 1934:16)²

Another nearly identical observation was made by John Lawson in 1709. Lawson reports that he found corn to be a
most nourishing grain and,

"...those poor Christian servants in Virginia, Maryland... that have been forced to live wholly upon it, do manifestly prove that it is a most nourishing Grain for a Man to subsist on, without any other Victuals, And this assertion is made good by the Negro-Slaves, who in many places, eat nothing but this Indian Corn and Salt."

(Lawson 1966:75)

Other early eighteenth century travelers such as Michel (1916) and Grove (1977) provide much the same picture of a diet composed predominantly of corn. 3

Also writing in the early eighteenth century, Hugh Jones provides a more detailed description of the slave diet. He tells that from corn is made

"...Hominy for the Negroes, which with good pork and potatoes...with roots and pulse are their general food."

(Jones 1956:78)

The practice of providing pork for the slaves was further elaborated on by Joseph Ball in the eighteenth century when he gave instructions that every year sixty pounds of pork were to be given to the working Negroes, but only thirty pounds to the younger men. He also ordered that the slaves were to receive only the poorer cuts of pork (Noël Hume 1978:18). 4 Ball further commanded that the slaves should be given calves' heads during slaughtering and the old ewes and rams (Noël Hume 1978:15, 19).

Wild foods probably made up a portion of the slaves' diet as well. The slaves may have trapped small mammals such as rabbits, raccoons or opossums, and they probably fished. Turtles were definitely eaten as Michel notes (1916:42) and Grove tells us that "The negroes eat them, but few of the English" (1977:40).

All of these observations are in general agreement and strongly suggest that the slaves' diet had the following characteristics:

- It was primarily vegetable.
- It was high in carbohydrates, particularly corn.
- The primary meat consumed was pork.
• Butchering waste and old or diseased animals were occasionally eaten.
• The diet was supplemented by wild mammals, turtles, and fish.

With these characteristics in mind, the bone remains from the sites can now be considered.

Faunal Analysis

Pettus yielded a total of 707 identifiable bones which were recovered from a cellar, trash pit, and several smaller features. The Utopia sample consisted of 997 identifiable elements from a cellar, a well, and a large drainage ditch. All of the bones included in the study are from contexts dated to the last quarter of the seventeenth century.

Tables 1 and 2 show the kinds of animals and the number of remains identified at Pettus and Utopia. Domestic cattle, sheep, swine, horse, cat, chicken, and turkey were present at both, along with wild animals including deer, raccoon, opossum, and cooter turtle. While a few additional species such as rabbit, squirrel, duck, and goose were identified at one site or the other, there is considerable similarity in the sites' species compositions, with the exception of fish. Pettus contained only one identifiable spine from a catfish. In contrast, Utopia yielded the remains of four species, and each was represented by several bones. Elements of at least one sturgeon, two long-nosed gar, a striped bass (rockfish), and two red drum were identified. Since both sites were excavated in the same manner, this difference suggests that fish were of greater importance in the Utopia diet.

Simply knowing that a particular animal was present, however, tells nothing of its frequency of use or prominence in the diet. Some understanding of this can be achieved by comparing the number of identified bones for each animal. Figure 1 illustrates the percentage of cattle, swine, sheep, and total wild animal bones from each site; remains from domestic non-food species, chickens, and turkeys were not included. This graph reveals that cattle bones comprised over half of all bones identified at each site. Swine elements were quite common; sheep bones were infrequent. The combined number of wild animal elements at each site made up approximately 5% of the total sample, implying that they were of only marginal significance to the overall diet.
### TABLE 1: SPECIES IDENTIFIED AT PETTUS PLANTATION

<table>
<thead>
<tr>
<th>Animal</th>
<th># Bones</th>
<th>%</th>
<th>M.N.I.</th>
<th>Lbs.</th>
<th>Meat</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>405</td>
<td>57.28</td>
<td>13</td>
<td>4700</td>
<td>66.00</td>
<td></td>
</tr>
<tr>
<td>Swine</td>
<td>226</td>
<td>31.97</td>
<td>21</td>
<td>2000</td>
<td>28.08</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>25</td>
<td>3.54</td>
<td>3</td>
<td>70</td>
<td>.98</td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>4</td>
<td>.56</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cat</td>
<td>2</td>
<td>.28</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td>2</td>
<td>.28</td>
<td>1</td>
<td>2.5</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>2</td>
<td>.28</td>
<td>1</td>
<td>7.5</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Deer</td>
<td>21</td>
<td>2.97</td>
<td>3</td>
<td>300</td>
<td>4.21</td>
<td></td>
</tr>
<tr>
<td>Racoon</td>
<td>6</td>
<td>.84</td>
<td>1</td>
<td>15</td>
<td>.21</td>
<td></td>
</tr>
<tr>
<td>Opossum</td>
<td>3</td>
<td>.42</td>
<td>1</td>
<td>8</td>
<td>.11</td>
<td></td>
</tr>
<tr>
<td>Rabbit</td>
<td>6</td>
<td>.84</td>
<td>1</td>
<td>1.5</td>
<td>.02</td>
<td></td>
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<tr>
<td>Catfish</td>
<td>1</td>
<td>.14</td>
<td>1</td>
<td>2</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Cooter</td>
<td>3</td>
<td>.42</td>
<td>1</td>
<td>5</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>Snapping</td>
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<td>.14</td>
<td>1</td>
<td>10</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>Turtle</td>
<td></td>
<td></td>
<td></td>
<td>707</td>
<td>99.96</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7121.5</td>
<td>99.97</td>
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</table>
### TABLE 2: SPECIES IDENTIFIED AT UTOPIA COTTAGE

<table>
<thead>
<tr>
<th>Animal</th>
<th># Bones</th>
<th>% H.N.I</th>
<th>M.N.I.</th>
<th>Lbs. Meat</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>556</td>
<td>55.93</td>
<td>16</td>
<td>5350</td>
<td>67.10</td>
</tr>
<tr>
<td>Swine</td>
<td>232</td>
<td>23.34</td>
<td>22</td>
<td>1950</td>
<td>24.45</td>
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<tr>
<td>Sheep</td>
<td>45</td>
<td>4.53</td>
<td>6</td>
<td>160</td>
<td>2.01</td>
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<td>Horse</td>
<td>35</td>
<td>3.52</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dog</td>
<td>4</td>
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<td>1</td>
<td></td>
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</tr>
<tr>
<td>Cat</td>
<td>39</td>
<td>3.92</td>
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<td></td>
</tr>
<tr>
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<td>8</td>
<td>.80</td>
<td>2</td>
<td>4</td>
<td>.05</td>
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<tr>
<td>Turkey</td>
<td>7</td>
<td>.70</td>
<td>1</td>
<td>7.5</td>
<td>.09</td>
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<tr>
<td>Goose</td>
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<td>.10</td>
<td>1</td>
<td>7</td>
<td>.08</td>
</tr>
<tr>
<td>Deer</td>
<td>22</td>
<td>2.21</td>
<td>3</td>
<td>300</td>
<td>3.75</td>
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<tr>
<td>Raccoon</td>
<td>9</td>
<td>.90</td>
<td>2</td>
<td>30</td>
<td>.37</td>
</tr>
<tr>
<td>Opossum</td>
<td>3</td>
<td>.30</td>
<td>1</td>
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<td>.10</td>
</tr>
<tr>
<td>Squirrel</td>
<td>3</td>
<td>.30</td>
<td>1</td>
<td>1</td>
<td>.01</td>
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<tr>
<td>Duck sp.</td>
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<td>.10</td>
<td>1</td>
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<tr>
<td>Sturgeon</td>
<td>4</td>
<td>.40</td>
<td>1</td>
<td>100</td>
<td>1.25</td>
</tr>
<tr>
<td>Gar</td>
<td>5</td>
<td>.50</td>
<td>2</td>
<td>8</td>
<td>.10</td>
</tr>
<tr>
<td>Striped Bass</td>
<td>9</td>
<td>.90</td>
<td>1</td>
<td>20</td>
<td>.25</td>
</tr>
<tr>
<td>Red Drum</td>
<td>5</td>
<td>.50</td>
<td>2</td>
<td>20</td>
<td>.25</td>
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<tr>
<td>Box Turtle</td>
<td>5</td>
<td>.50</td>
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<td>.8</td>
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<td>Cooter</td>
<td>1</td>
<td>.10</td>
<td>1</td>
<td>5</td>
<td>.06</td>
</tr>
</tbody>
</table>

| Total        | 994     | 99.95   |        | 7973.3    | 99.96 |
What is most curious about Figure 1 is that the Pettus and Utopia samples are so similar. Percentage figures for cattle and sheep are almost identical, and swine bones are only slightly less common at Utopia. The wild animal percentages are also much the same, but it must be remembered that the Utopia sample represents many more species. This similarity between bone frequencies might be misleading, though, since many cattle could be represented in one sample, while an equal sample of cattle bones at another site could be from only one or two animals.

To control for this, the minimum number of individuals for each species has been determined, and this M.N.I. figure was converted into the estimated pounds of meat from each species available for consumption. The percentage of total meat contributed by cattle, swine, sheep, and the combined wild animals is shown in Figure 2. It is immediately apparent that beef was the most abundant form of meat at both sites, and when other products such as butter and cheese are included, cattle stand out clearly as the most important source of animal protein. Pork was also of considerable importance at each site, accounting for over a quarter of the meat. Even though there were twice as many sheep at Utopia, their meat contribution was equally minimal at both sites. Wild animals provided a small but probably significant variety of meats to the diet with venison, coon, and opossum consumed by both households, and fish adding a notable diversity to Utopia's victuals.

The similarity between these two sites in bone and meat percentages is striking and unexpected. However, the possibility remains that there was a real difference in the quality of the meats consumed. The Utopia cattle bones could all be from butchery waste, such as hoofs and skulls. To determine whether this was the case, the bones of cattle and swine were classified in three categories:

- Poor quality skull and neck elements.
- Meat-rich bones from the main body.
- Lower leg and hoof elements.

This division allows a comparison of the frequencies of the high versus low quality elements.

The distribution of cattle elements in Figure 3 indicates that high quality meat elements constitute the major proportion of bones at each site, with only an 8% difference between the two. There is a greater frequency of hoof elements at Utopia, but the proportions of skull/neck bones are identical. Among the meat
Figure 1

Percentage of Total Bones

- Pettus
- Utopia

%:

- Cattle
- Swine
- Sheep
- Wild
Figure 2

Percentage of Available Meat

- Pettus
- Utopia

<table>
<thead>
<tr>
<th>Animal</th>
<th>Pettus</th>
<th>Utopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>70%</td>
<td>20%</td>
</tr>
<tr>
<td>Swine</td>
<td>30%</td>
<td>10%</td>
</tr>
<tr>
<td>Sheep</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Wild</td>
<td>5%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Figure 3

Percentage of Cattle Bones by Body Section

Pettus

<table>
<thead>
<tr>
<th>%</th>
<th>Skull</th>
<th>Body</th>
<th>Hoof</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>50</td>
<td>30</td>
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Utopia

<table>
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<td></td>
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</tbody>
</table>
elements, bones were present from all sections and sides of the body including femurs, humeri, lumbar and thoracic vertebrae, pelves, scapulae, and tibias. Thus, even choice round, rump, and sirloin cuts were apparently consumed at both sites. Butchery patterns, which were not identical, did indicate a common usage of boiling and/or roasting cuts. Animals from Pettus and Utopia had been butchered with axes or cleavers and no sawn bones were observed at either site.

The swine bone distribution in Figure 4 shows that more cranial elements were recovered at Utopia. Body elements, however, constituted approximately one third of all the bones, and there is less than a 6% difference in the proportion of meat-rich elements between the two sites. While differences do occur in the specific frequencies for cattle and swine, the overall patterns at both sites seem remarkably similar.

In spite of the above findings, it is still possible that significant differences might exist in the quality of meats eaten at each site. Potentially, the Pettus beef could have been from tender prime steers while the Utopia beef was all from old, tough, diseased animals ready to die. To test this, age charts were prepared using bone fusion and dental eruption sequences for cattle and swine. On the basis of Figure 5, it seems that Utopia's beef was equally as tender as that eaten by Pettus. Cattle at both sites were generally mature (48 months or older) when slaughtered. A few calves died or were killed at both sites; the graph suggests that veal might have been served somewhat more frequently at Pettus. While most of the cattle were mature, analysis of their dentition indicates few animals at either site lived to an advanced age, since heavily worn, decayed teeth were infrequent. Such an age distribution might suggest that cows were being bred and used for dairy purposes for several years before slaughter. Males may have been turned into steers for beef or possibly to serve as draught animals. Thus the cattle husbandry practices at these sites seem to have had much in common.

On the other hand, swine husbandry practices seem to have been different. Based upon the sequence of eruption and wear in swine teeth, Figure 6 indicated the percentage of individuals killed within specific age groupings at each site. The most pronounced distinction is that the Pettus hogs were selected for slaughter by age. Relatively few were killed in the first year of life, but after that, they were slaughtered with increasing frequency into their third year.

Differing from this pattern, the Utopia swine display a
Figure 4

Percentage of Swine Bones by Body Section
Figure 5

Percentage of Cattle Killed by Age Ranges

Pettus

Utopia

Months

0-18 24-36 36-48 48+

%
notable lack of selection in slaughter age. The graph indicates nearly equal percentages were killed in each age group, strongly implying that Utopia's occupants had only poorly organized swine husbandry. A potential explanation for this might be the manner with which each household kept its hogs. Pettus may have had the labor to keep some of his swine penned, thus allowing a more accurate knowledge of age and more control in selection. Utopia's hogs, on the other hand, may have been allowed to run in the woods and marshes of the area in a semi-wild state. This form of husbandry would have made it quite difficult to accurately judge their ages, especially as they were driven, mud-covered and snorting, from a swamp to be killed.

In summary, the foregoing analysis has revealed only a few differences between the sites. Fish and possibly other wild animals seem to have been more prominent in the Utopia diet. Swine were apparently much less carefully selected for slaughter at Utopia and the animals may have been kept in a manner different from Pettus. However, meat and bone percentages were extremely similar, and while minor differences were seen in the comparison of cattle and swine bones, the overall patterns are very much alike. Finally, the ages at which cattle were slaughtered and the probable ways in which they were used are remarkably comparable.

Discussion

It is strikingly clear that the bone sample from Utopia does not fit the historical model of a slave diet. Is it possible that all the seventeenth and early eighteenth century writers were totally wrong in their observations? Or were the people living at Utopia not slaves? A reconsideration of the evidence is in order.

The architecture and ceramics from Utopia provide solid proof that its occupants were less wealthy than Pettus. History indicates that the Utopia land was owned by Pettus and some of Pettus' cattle were on the property in 1691. But do these facts necessarily imply slaves? Since the land was owned by Pettus, tenant farmers are a reasonable possibility, though the presence of Pettus' cattle is a problem.

To clarify this point, types of tenant lease agreements of the period were investigated. This revealed that a landowner's breeding cattle were occasionally included in lease agreements. Tenants were to care for the animals and milk the cows. In return, they received most of the dairy products and from 1/4 to 1/2 of the herd increase for their own use. Hence,
Figure 6

Percentage of Swine Killed by Age Group
the presence of Pettus cattle at Utopia is as much an indication of an occupation by tenants as slaves. Indeed, when all the historical, archaeological, and faunal evidence concerning these sites is combined, the most likely explanation is that tenant farmers, rather than slaves, lived in Utopia Cottage.

A conclusion such as this is fascinating for it suggests that tenant farmers in the seventeenth century Chesapeake were eating quite well. In fact, the meats consumed at Pettus and Utopia were extremely similar in both quality and variety. Unfortunately, it is not possible to accurately determine the quantities or frequencies at which meat was consumed. But comparable quantities of food bones were recovered at both sites and meat seems to have been a focal element in the general colonial diet. This lack of distinction between the meat diets of a major planter and his probable tenant is both surprising and puzzling.

There does exist some support in the historical record for such an interpretation, though. A late seventeenth century traveler to the Chesapeake apparently observed this phenomenon and commented that:

"As to Cattle raised for food, however rapidly they may multiply, Their number is kept down, for there is not a house so poor that they do not salt an ox, a cow and five or six large hogs."

(Durand 1934:123)

In an analysis of 154 tenant inventories dating to the second half of the seventeenth century from St. Mary's County, Maryland, Carr and Menard found that 84% of the tenants owned livestock (Carr and Menard N.D.:Table VI). Indeed, livestock comprised the major economic asset in most of the poorer inventories. In another analysis of the St. Mary's County inventories from 1670-1705, Barbara and Cary Carson have found evidence which suggests that an improvement in diet may be the first change made as a household begins accumulating wealth. They discovered that, as estates moved up the wealth scale, the first consistent addition of household equipment was in cooking utensils such as frying pans, skillets or spits, and in bedding (Carson N.D.: 10-11). Poor households generally owned only kettles or pots for boiling. If cooking gear is one of the early material improvements, it seems reasonable that an improvement in the quantity and quality of food may be one of the very first changes made as a home rises above the lowest wealth levels.

This behavior is understandable because food was probably
one of the few aspects of life over which a household could exercise more or less direct and effective control. Declining tobacco prices in the later seventeenth century, which resulted in a long term economic depression, made the accumulation of wealth and land a slow, difficult, often impossible task for those with little capital. This led to a rise in tenancy during the last decades of the century, and by 1706, over 30% of the Maryland households were established on leased land (Menard, Harris, and Carr 1974). Diet was one area of life that was probably only marginally affected by the tobacco depression since the Chesapeake planters were apparently self-sufficient in food production. There were, no doubt, differences between rich and poor sot-weed planters in the use of imported spices, the elegance of food preparation, and the frequency with which certain dishes were served. Archaeological evidence, however, strongly suggests that even the households with little wealth had a solid, nourishing diet.

Conclusions

Analysis of the faunal materials from these sites has resulted in two major conclusions:

- The occupants of Utopia seem to have been tenants rather than slaves.
- The diets of rich planters and persons with only modest wealth were apparently quite similar in terms of meat.

If correct, these findings have a number of important implications. The tentative identification of Utopia as a tenant site demonstrates that the analysis of a household's food remains can be an important tool in defining status. When combined with information from other artifacts, faunal remains can significantly contribute to more dependable and valid interpretations of sites.

The undifferentiated nature of the meat diet has equally significant implications if it accurately reflects nutritional patterns in the Chesapeake. It suggests that the impact of diet on mortality rates may not have increased with declining levels of wealth; rather, the diet may have been a constant factor for planters above the bottom economic stratum.

The possibility should also be explored that this was an important advantage of immigration and household formation. While dietary studies in England are incomplete for this period, it is possible that the poor Chesapeake colonist had an opportunity to eat substantially better than his English contemporaries.
Clearly, these findings suggest that the meat diet was not closely linked to status display, and they argue for a more homogeneous social environment. This correlates well with an observation made by Carr and Walsh that there was a certain "lack of distinctions between wealth groups and a peculiar homogeneity of Tidewater Chesapeake Culture" (Carr and Walsh N.D.:7-8). The Carsons have also concluded from their study that being rich in the seventeenth century Chesapeake did not mean being different from others; it merely meant having more of the same (Carson N.D.:13).

The faunal remains from Pettus Plantation and Utopia Cottage strongly support these observations.
FOOTNOTES

1 The author would like to gratefully acknowledge and thank Dr. William Kelso and the Virginia Research Center for Archaeology for the generous support which made this research possible. A special debt is owed to Merry Abbit Outlaw and Beverly Bogley who shared their laboratory space and charmingly endured the eccentricities of a bone man. Thanks are also owed to the staff of the St. Mary's City Commission who kindly critiqued this paper and generously provided technical support.

2 Durand apparently refers to both indentured servants and negroes when he uses the word "slaves" in this passage. Elsewhere he refers to houses built for Christian Slaves and Negro Slaves (1934:119).

3 Michel, who traveled in Virginia in 1701-02, noted that corn was "...mostly the food of servants" (1916:31). He also states that he was given "...some food, a species of small white beans, cooked with bacon, which had been prepared for the overseers of the slaves. It was good. The food prepared for the negroes that worked was pounded Turkish maize, cooked in water, called hominy, a healthy food" (1916:114).

Grove traveled through Virginia in 1732 and he wrote that corn "Tis the only support of the Negroes, who Roast it in the ear, Bake it for Bread, Boyl it when Hulled." (Grove 1977:33).

4 This reference was quoted by Audrey Noel Hume in her booklet entitled Food, Colonial Williamsburg Archaeological Series No. 9. The original manuscript is Joseph Ball's Letterbook - 1743-1780. Library of Congress.

5 It should be noted that the relative scarcity of fish and bird bones from each site may be partially the result of a sampling problem, since neither site was screened. However, late seventeenth century deposits from the St. John's site in St. Mary's City, Maryland, which were carefully screened, showed a similar lack of bird and fish remains. In any case, Pettus and Utopia were excavated with the same methods, making the two samples comparable on that basis. Also, the excavation techniques should not have significantly distorted the recovery rates for the larger mammal remains.

6 In order to make the meat percentage figures as accurate as possible, age was used as a criterion in determining a species meat contribution. Thus, the two calves at Pettus and one at Utopia were assigned a meat figure of 150 lbs. Mature cattle were counted at 400 lbs. per animal. Swine less than one year of age were estimated at 50 lbs. of meat, while those over one year were given a meat weight of 100 lbs. The one year age was readily determined for swine since the M.N.I. calculations were based on mandibular remains at both sites. The Pettus
sample contained two immature hogs, and Utopia yielded five. Mature sheep were rated at 30 lbs. of meat, and the single lambs at each site were calculated at 10 lbs. each.

7 Figure 5 is based on bone fusion sequences. Dates and sequences of fusion are taken from Silver, I., A., "The Aging of Domestic Animals." In Science in Archaeology, ed. by Brothwell and Higgs. Praeger. New York.

8 An agreement made in 1656 at Kent Island, Maryland specified the tenants could live on the plantation for 15 years, and they were provided with 5 cows in calf, and hogs for use during the full 15 years, along with the female increase. Maryland Archives, Vol. LIV, pages 79-80.

A 1660 agreement also on Kent Island gave the tenant the use of 5 cows and all male increase. Maryland Archives, Vol. LIV, pages 201-202.

In 1680, another agreement was made in St. Mary's County, Maryland. This 5 year lease specified that the owner would provide 6 sows and 4 cows and calves for use. The tenant was to receive 1/3 of the increase of hogs and 1/4 the cattle increase. Maryland Archives, Vol. LXX, page 87.

Finally, a 14 year lease is described by Michel in 1702. The tenants, apparently living in Gloucester County, Virginia, were to keep 2/3 of the cattle increase in this arrangement. Michel 1916:117-118.
REFERENCES

Carr, Lois Green and Russel R. Menard  

Carr, Lois Green and Lorena S. Walsh  

Carson, Barbara and Cary Carson  

Danckaerts, Jasper  

Durand  

Grove, William Hugh  

Jones, Hugh  

Kelso, William M.  


1976 "An Interim Report, Historical Archaeology at Kingsmill: The 1974 Season." Virginia Research Center for
Lawson, John

Menard, Russell R., P.M.G. Harris and Lois Green Carr

Michel, Francis Louis

Noel Hume, Audrey

Outlaw, Merry Abbit, Beverly A. Bogley and Alain C. Outlaw
The Collier-Boone House

Bascom McDonald Brooms

In the spring of 1974, the University of Alabama Office of Archaeological Research was requested by Mr. and Mrs. James Boone to research the grounds of an abandoned house in Tuscaloosa, Alabama, which they had recently purchased. At the outset, it was known that the house was constructed in the first half of the 19th century and that the house or a part thereof had once been the residence of Governor Henry Collier.

The decision of the Boones to authentically restore this house necessitated the professional expertise of archaeologists and architectural historians. The Boones acquired the services of Mr. Edward V. Jones and Mr. Odolf Bullock as architectural historians. With the help of these two men, local historians and architects, interviews with elderly members of the community, and a literary search through 150 years of records, deeds, and wills, it was discovered that the house had undergone five major transformations. These five major phases reflected the social, economical, and sometimes political, events of the families which occupied the house during its 158 years of existence.

The History

Pleasant Dearing, one of the earliest Tuscaloosa settlers, arrived in 1817. He described the small settlement by the falls of the Black Warrior River as simple and crude—a community whose inhabitants lived in small log cabins with mud and stick chimneys. If Dearing was correct, there was not a single brick in the entire settlement, much less a brick chimney, basement or dwelling (Clinton 1958). In Reminiscences of a Long Life, William R. Smith (1889) describes the shops around the central part of the growing town as having partial brick fronts, but not until 1821. We are not sure when the first all brick home was built, but the second and third were constructed in 1822.

In the early 1820's a number of wooden frame houses with brick chimneys were begun, but these were usually simple one-story affairs with one or two rooms covered by a steeply sloping A-shaped roof (Smith 1889). Since the wood and brick for these early frame houses was imported via the Black Warrior from St. Stephens, local building supplies were relatively expensive and in short supply. Sharing was the order of the day. The sharing of scarce resources forced even the most ambitious home builder to construct a modest first house which
could be expanded later when more supplies arrived (Clinton 1958). Then, too, for the first five years of Tuscaloosa's history no resident had legal title to the land he occupied. Tuscaloosa had grown from a log cabin frontier settlement to a quasi-legal cluster of single story wooden frame houses.

The land on which the Collier-Boone house sits was first purchased by James Saunders Walker on November 6, 1821. According to the original plot and survey of the city, Walker bought lots number 364 and 365 (United States Land Office Records, Montgomery, Alabama 1821). On his newly acquired property Walker built one of the early two room, one-story, frame houses described by Smith as the predominant type in the community. Walker did not, however, have long to enjoy his new home for he died before April of 1826, leaving Peyton Bibb as the executor of his estate (Tuscaloosa County Deed Record, Book E 1821). Bibb sold the property to an able young lawyer named Henry Watkins Collier.

Collier bought the Walker property for $135.00 (Tuscaloosa County Deed Record, Book E 1826) on April 3, 1826, and later that same month, the 25th, married Mary Ann Battle (Owen 1949). Walker's original two room frame house apparently was not large enough for Collier's growing family or for his expanding prestige. Soon after his purchase, Collier began a one-story wooden frame addition to the original house.

Collier was elected to the state legislature in 1827, and in 1828 that body elected him to the Supreme Court. When the Supreme Court was separately constituted in 1832, Collier lost his position as Supreme Court Justice, but continued to serve in the Alabama Circuit Court. In 1836, Governor Clay appointed him to the new Supreme Court, a position to which the legislature elected him in 1837. In 1838 Judge Collier became Chief Justice of the Alabama Supreme Court, a responsibility he shouldered for twelve years (Owen 1949). Judge Collier's political success was not without its financial rewards, some of which were reflected in his life style. Collier was able to extend his house to the ample two-story wooden frame structure that now faces 21st Avenue (Figure 1). This addition was more sumptuous than any before or after. It was done in Doric style and, among other luxuries, contained four marble fireplaces and a graceful yet imposing spiral staircase. Jones (Personal Communication) estimates an 1835 date for this work, and if he is right, Judge Collier's home did indeed mirror his success in politics, law and government service.

Tuscaloosa became the capital of Alabama during Collier's career and, as such, was the hub of the state's social, economic and political life. The homes which now graced the community were a far cry from the collection of log cabins they replaced, and the life styles of their owners were equally distant from the rough behavior of frontier America. To be received or enter-
tained in Judge Collier's home was a social highlight for Tuscaloosa residents and visitors.

Judge Collier labored with great diligence to achieve his judicial reputation, as 35 volumes of Alabama Supreme Court reports testify. He did not, however, stay on the bench because in 1849 he was elected Governor of Alabama, a post to which he was re-elected in 1851. His contributions to the state included such notable projects as the public school system and the state hospital for the mentally ill in Tuscaloosa (Owen 1949). At the end of his second term as governor, his health impaired, Collier retired to private life. His retirement was mercifully short. He died August 28, 1855, at Bailey's Springs and soon thereafter was buried in Tuscaloosa (Owen 1949).

At Mary Collier's death, the estate was sold to General Phillip Dale Roddy in 1871. General Roddy was a gallant figure in Alabama history. He so distinguished himself during the Civil War that he won the title "Defender of North Alabama" (Clinton 1958). He died in London, England, in August, 1897, where he was negotiating the sale of a patent for a new water pump (Brewer 1872; Owen 1949). At the time of their father's death, all three of Roddy's daughters had married and moved from Tuscaloosa. The three sisters had no need for the large house and it was sold on July 25, 1901, to Henry A. Jones (Tuscaloosa County Deed Record, Book 54 1901). Jones was a local contractor who specialized in the purchase of old houses which he renovated for resale. After he made additions and improvements to the house, Jones sold it to Pocahontas Whitt on August 13, 1901.

Mrs. Whitt died on February 8, 1933, after which her property was divided among her nephew, Virginius Overby, his wife Annie, and Pauline Overby, Mrs. Whit's niece. Since Pauline Overby was married and living in Florida, she sold her half of the house to Annie Overby's sister, Myra Palmer and her husband, Lester Ferguson on September 16, 1935. The Overby's and the Fergusons combined their financial resources to renovate the house in 1935. Parts were torn down and sections were added until the house was completely rearranged to accommodate two individual families. Soon, however, only Mrs. Annie Overby remained and upon her death in 1968, her brother, Billie Palmer, sold the house to its present owners, Mr. and Mrs. James Boone.

The Archaeology

The first archaeological research conducted on the property was devoted to the backyard, a considerable portion of which was excavated in search of evidence of former carriage houses, storage sheds, wells, and privies. None were found,
however, since the majority of the original backyard was sold and now is the location of several 20th century residential structures. Although the backyard excavations failed to produce outbuildings, unexpected wall trenches and a brick cellar to an earlier structure on the property were discovered adjacent to the existing house. Since these features did not have a contemporary association with the existing structure, excavations were continued beneath the house. After trowelling away dust and dirt in the basement and crawlways, foundations, support columns, and fireplaces of an earlier building were defined. A study of the bricks, mortar and bond in all foundations suggested a five-phase building sequence. Further excavation and a careful search of relevant documents confirmed the following five-phase sequence.

**Phase I, Circa 1821**

Beneath the southeast portion of the house two brick walls were found which joined to form a corner. These apparently superfluous prior walls had been partially destroyed when more recent basement walls were built across them. The two partially destroyed early walls were, however, rediscovered in the backyard excavations where they lay in a red clay matrix 22 centimeters below the ground surface. These walls were the remains of the basement beneath the two room wooden house built by Walker in 1821.

The entire south and east walls of the basement were exposed and the rubble fill was excavated to the red clay sub-soil below. This red clay sub-soil marked the floor of the builder's original basement excavation. The full height of the remaining basement walls was exposed which determined the builder's basement excavating depth and provided a cross-section view of debris deposition in the basement which was the result of the Overby's 1935 renovation process. An inspection of the basement fill revealed a nine strata deposit (Figure 2). The floor midden contained a glass vase fragment, two bottles, two iron fireplace flue liners and a hearth cover, and eighty-four whole and cut chicken, cow and pig bones. The vase bottom was of lead glass and lay in the northeast corner of the basement over a rat hole containing chicken, cow, and pig bone fragments. One of the two bottles was a wine bottle made of "black glass". The bottom had a very crude pontil mark typical of bottles made in the early 1800's. The other bottle was an amber medicine container which had been fashioned from a single piece of glass blown in a two piece mold. This piece was hand finished around the top and carried the embossed label "Foley's Kidney & Bladder Cure" on the front. On the side was printed "Foley & Co., Chicago, U.S.A."
The iron flue liners and matching hearth cover were lying in front of a basement fireplace. These were ornate specimens which were apparently forged by a local smith. The cut and whole bones scattered about the floor suggest that the basement may have been used at one time as a smokehouse.

The basement was constructed by first digging a rectangular hole 6.47 meters wide 7.22 meters long and 1.74 meters deep. It may be reasonably assumed that this hole was excavated with hand tools and the spoil dirt was removed in buckets or by wheelbarrow. The walls of the hole, with the exception of an entrance passage, were next faced with courses of bricks which were presumably laid parallel to and abutting the excavation face rather than built as free-standing walls within the excavation. The bricks were laid in a common, or American, bond and the brick work was skillfully executed. The interstice mortar bonding these bricks, for example, ranged from 1.25 to 1.50 centimeters in thickness.

The outside entrance to the basement lay beside a fireplace apparently built when the basement walls were laid (Figure 4). The location of this entrance is shown in Figure 3 (Point A). To form the entrance, step-like benches were dug from the red clay sub-soil and timbers were laid on the red clay to form steps. Fragments of these timbers were found in their original position. The basement fireplace is illustrated in Figure 3 (Point B). The fireplace was built of the same type brick as the cellar walls. Basement fireplaces were common in the early 1800's. They were often used for cooking and sometimes were used to convert the whole basement into a smokehouse. That this basement may have been so used is suggested by the bone fragments in the cellar floor midden. Ground level fireplaces were almost always built above their basement counterparts, most probably to connect the two hearths with a common chimney (Bullock, Personal Communication).

When the basement walls were laid, one was two bricks wide, the other three were three bricks wide. The reason for this variation could not be ascertained, but some years later the two-brick-wide wall began to bow inward. To correct this apparent weakness, an additional course of bricks was laid against the first two (Figure 3, Point C). This repair could not be dated, but the bricks used did not resemble those from any other period of construction. The mortar used in this repair was a mixture of sand and lime. By 1901, hydrated lime was available and most probably would have been used. Hence it is inferred that the repair was a pre-1901 attempt to reinforce the sagging cellar wall.
Fig. 3. Phase I: A, Basement Entrance; B, Fireplace; C, Repair.
Fig. 4. Phase I: Basement Entrance.

Fig. 5. Phase I: Basement Fireplace.
The bricks in the cellar were the largest and earliest found on the site. Both bricks and mortar were made from a clayey limestone (lime carbonate) called "natural cement". This substance was manufactured by burning clayey limestone at low temperatures (i.e. 700 to 800° Centigrade) in an oven kiln. The resultant cement sets rapidly but does not attain great strength (Eckel 1922). The bricks formed from this mixture were pressed in wooden molds 21.5 centimeters long, 6.5 centimeters high and 11 centimeters wide. They were then sun dried (most contained pig feet prints), stacked and lightly fired in a bonfire kiln (Maxwell, Jones, Personal Communication). Since the bricks were lightly fired, they were soft, sandy and light orange in color but held together remarkably well. The mortar on the other hand was reduced to sand, the limestone in the original cement having leached out.

The 1821 cellar's rubble fill was deposited during later work when the two room wooden frame house was dismantled in 1935. The brick chimney and ground floor fireplace were demolished and the bricks piled or pushed into the open basement below. As the 1935 renovation progressed, plaster and brick fragments were piled above the chimney and fireplace debris leaving a shallow rectangular hole where a full cellar had once stood. This hole apparently remained open long enough for a thin stratum of brown soil to wash in after which the scrap wood was thrown in and burned. The spoil dirt from the 1935 furnace excavation was probably thrown into the remaining cellar depression where it settled over the burned scrap wood layer to form the redeposited red clay zone noted in the profile (Figure 2). Finally, yellow clay was imported and laid over the redeposited red clay and the whole deposit was sealed with a layer of topsoil.

Phase II, Circa 1826

In 1826, Henry Collier built a single story rectangular wooden addition to the 1821 house. A distinctive kind of brick and mortar marked the 1826 foundation. While the standard brick size measured was 5.7 by 9.5 by 20.3 centimeters, the 1826 bricks in the Collier-Boone house were 5.7 by 10.5 by 21.0 centimeters. These oversize bricks ranged in color from dark grey to dark burgundy and contained within them fragments of gravel, an undesirable inclusion at best. To produce a brick of standard quality the gravel should be removed by hand if necessary, before the brick clay is pressed into a wooden mold, left to sun dry, and then is placed in an oven kiln to be fired. The 1826 bricks were a darker color and were of greater strength than their 1821 counterparts as a consequence of longer firing at a higher temperature, but were not of the same exacting quality if the gravel inclusion is considered.
The mortar bonding these 1826 bricks was a soft, sandy, lumpy light red substance known as lime-sand mortar. Lime-sand mortar was produced by placing quarried limestone in an open top intermittent kiln where it was heated for three to four days by a wood fire. The white powder thus produced was next mixed with sand and water to form the mortar. If the heat in the kiln is not sufficient to reduce all the limestone to a fine white powder, small limestone inclusions will remain. The 1826 mortar used for the Collier-Boone foundation contained limestone inclusions and was lumpy probably because the lime, sand and water were mixed by hand rather than by a mule-powered mechanical mixer (Maxwell, Personal Communication). The above descriptions apply to all the 1826 foundation features including veranda supports, support walls, back step supports and fireplaces. The bond used was the common, or American, bond like that in the 1821 basement, but in this case the workmanship was shoddy. The bricks were not neatly bonded and the mortared interstices were ragged and uneven (0.5 to 1.5 centimeter variations were common).

The north foundation wall of the 1826 building was the only one consistently three bricks wide. It ran the full length of the structure, and for this length averaged 104 centimeters high from the ground surface to the hand-hewn floor beams it supported. The south foundation wall also extended the full length of the rectangular building, but a part of it was destroyed when a basement was dug in 1935. The dashed line in Figure 6 shows the area presumed destroyed by this later construction. The western half of this south foundation wall was three bricks wide but contracted to a two brick width for a short distance along its mid-portion and a one brick width for the greater part of the eastern half until it ultimately joined the original 1821 house. The east wall’s middle section, which was three bricks wide, supported a wooden floor beam but the south part of this wall was only two bricks wide and apparently could not stand the stress. In 1935 a new support column was added here to relieve the strain. The two brick wide northern portion of the east wall was not used for support. Instead, it formed a nine-brick-high fireplace barrier which protected the basement behind it from the heat, ashes, and coals of a hearth.

The east wall fireplace barrier served the fireplace shown as Point E in Figure 6. The fireplace remains consisted of a two-brick-high fragment and a builder’s trench outline. This evidence suggests a fireplace 196 centimeters long and 88 centimeters wide. Another smaller fireplace also lay along the east wall near the building’s southeast corner. At the time of this inquiry the southern arm of this fireplace was only one or two bricks high; the northern arm was represented by a builder’s trench. Judging from this evidence the fireplace was 88 centi-
Fig. 6. Phase II: D, Foyer Fireplace; E – F, Large Fireplaces; G, Basement Entrance; H, Front Entrance; I, Step Support; J – K, Veranda Supports.
meters wide and 147 centimeters long. Mrs. Norred, a frequent guest in the house in the early 1900's, remembers this hearth as being small and located at the end of a long foyer. Point F in Figure 6 indicates the third fireplace in the 1826 structure. It was located along the west wall directly across from the Point E fireplace which it duplicated in shape and size. This third fireplace was torn down to a height of 92 centimeters and converted to a floor beam support during the 1835 renovation.

The outside entrance to the 1826 basement is shown as Point G on Figure 6. Two brick support columns flanked this entrance, one positioned immediately west of the Point E fireplace; the other abutting the inner edge of the east wall a meter to the north. The column near the Point E fireplace was replaced in 1935 but its base remained intact. Although actual steps were not found, their former position was clearly outlined in the red clay sub-soil. The entrance was divided into 4 steps which traversed 132 centimeters from the ground surface to the basement floor below.

The basement served by this entrance (Figure 6) was partially destroyed when the 1935 basement was dug. The 1826 basement was 133 centimeters deep from ground surface to brick floor. Only a portion of the floor brick remained, but to judge from these remains the bricks in the floor were not laid in regular course nor were they bonded with mortar. The basement walls were unfaced red clay, i.e. they were the unadorned sub-soil walls of the builder's excavation. The basement was 404 centimeters wide, its measurable length was 437 centimeters.

A free-standing T-shaped column of bricks (Point I in Figure 6) stood half a meter east of the east foundation wall. These columns may indeed have supported the steps for a first floor rear entrance but positive evidence has been destroyed by extensive remodeling. Mrs. Norred (Personal Communication) does, however, remember a first floor rear entrance in this location.

Two other free-standing brick columns (Points J and K on Figure 6) were found approximately 2 meters north of and parallel to the north foundation wall. An 1887 map of Tuscaloosa (Wellge 1887) shows a small veranda adjoining the house along the north wall. It is assumed that these columns supported this veranda.

Collier's 1826 addition produced a structure with little in the way of stylish frills. The basement beneath it was an unfaced, rectangular hole with a loose brick floor which was irregularly placed. The foundation walls and other brickwork could not be commended. The bricks used were of questionable quality, the mortar bonding of inferior composition and shoddy
application. All in all, the questionable workmanship in the foundation suggests the use of unskilled labor, perhaps even slaves. The upper part of the house was apparently of better quality. The carpentry work which produced walls, roof and interior finishings was skillfully done. The house had two large fireplaces, one opposite the other, but each serving a separate ground level room. A third and smaller fireplace lay at the end of a long foyier onto which the two ground floor rooms opened and which itself opened to the exterior at the front entrance of the house. The chimneys for all three fireplaces were built outside the wooden house walls—an easier less expensive method than incorporating them in the walls or building them inside. The structure was finished with a steeply sloping A-shaped roof and a veranda along the north side.

Phase III, Circa 1835

A large two-story, four room addition (Figure 1) was built during the third construction phase. Sydnia Keene Smyth (1929) described this addition as Doric in style noting that:

The design is simple, to the extreme. The heavy square Doric columns support an unadorned cornice of a porch that runs the full width of the house. The wooden balustrade protecting the second floor balcony is the only feature of delicate detail to relieve the extreme severity of the elevation.

Jones's study (Personal Communication) of the molding, wood, doors, windows and hardware convinced him that this portion of the house was added about 1835. This was the largest, most elaborate construction in the structure's 158 year history. The addition contained two sizable rooms on each floor arranged about and opening upon a foyer. The foyer accommodated a large magnificent spiral staircase which rose gracefully from the ground floor to a second floor landing. Every large room was complete with a fireplace.

Like their earlier counterparts, the bricks in the 1835 foundation were oversized. They were 21.5 centimeters long, 7 centimeters high, and 10 centimeters wide, taller than the 1826 bricks but not as wide. The 1835 bricks were hard-burned and deep red; the mortar bonding them was soft, red and sandy but evenly mixed probably in a mule-driven mechanical mixer (Maxwell, Personal Communication). A lime-sand mortar was used, although cements were then available in New England and in Great Britain. Apparently this new building material was not introduced to Tuscaloosa until later (Jones, Personal Communication). The bricks were, however, laid in a neat American bond with interstice mortar uniformly 1.5 centimeters thick.
The north and south walls (Figure 7) of the 1835 foundation were not of identical construction or design suggesting that the plans were drawn by one artisan and interpreted by another. The north fireplace, for example, has an odd-shaped extension with no obvious structural purpose. Apparently, the builder began his work following the construction design for one wall, but later modified his construction practices to suit a different plan, perhaps his own. Then, too, joining the 1835 addition to the west wall of the 1826 building posed several problems which stimulated ad hoc solutions. The west wall fireplace of the 1826 house was in the way. Rather than build around the fireplace, thus incorporating it into the new joint structure, the builder dismantled the upper fireplace and converted the sub-floor portion to a support column. This fireplace remnant together with two rectangular brick support pillars (M and N in Figure 7) holds the wooden floor beams which support the portion of the 1835 structure which abuts and parallels the west wall of the 1826 house. The 1826 floor is higher than the 1935 floor by 40 centimeters, but the builder resolved this contradiction by providing a step which allowed the occupants easy access to both portions.

Two beams supported by brick columns (Point O in Figure 7) hold the two inner walls of the 1835 edifice. Five brick columns (Points P in Figure 7) hold the beams for the front walls. Four identical middle brick supports and two corner columns hold the west edge of the front porch. The two corner columns are not alike—another indication of divergent craftsmen's interpretations.

In addition to the 1835 two-story edifice, a veranda was attached to the south wall of the 1826 structure. The support columns for this veranda (Points L in Figure 7) were made from the same brick and mortar as the 1835 foundation. The column beside the 1821 building's west wall and the one beside the 1826 structure's south wall are still standing. Both these columns are eight bricks high, suggesting that the veranda was about 45 centimeters lower than the 1826 house floor. Mrs. Norred (Personal Communication) remembers that this veranda extended the entire distance between the 1835 and 1821 portions of the enlarged house. The veranda was torn down in 1935.

Collier's 1835 addition reflected the wealth, prestige, and esteem he had acquired by virtue of his business and political accomplishments. The new two-story attachment, which adjoined the humbler early buildings, was elegantly appointed. Black marble fireplaces graced each of four spacious rooms, two on each floor. A graceful winding staircase rose from the center of the ground floor to a second floor landing upon which the two upper rooms opened. A massive porch with Doric columns, second floor balcony, and delicately detailed balustrade fronted the house. A veranda flanking the south wall of the 1826 house completed the 1835 enlargement.
Fig. 7. Phase III: L, Veranda Supports; M - P, Floor Support Columns; Q - R, Fireplaces.
Phase IV, Circa 1901

Henry Jones was the next owner to modify the house. His additions were simple, but they increased the useable floor space considerably. Evidence for one of Jones’ modifications was discovered in the backyard excavations. This was a foundation trench filled with a brick and mortar rubble. The bricks contained in this trench were burnt red in color and measured 21.5 by 10.5 by 6.5 centimeters. The mortar securing these bricks was manufactured from hydrated lime, a substance produced by adding finely ground quicklime to appropriate amounts of sand and water. Hydrated lime mortar was easier to work and stronger than earlier sand-lime mortars, but did not have the strength of modern Portland cement (Eckel 1922). Indeed, the popularity of hydrated lime mortar dropped sharply in 1903 when Portland cement became available in Alabama. Portland cement was already in use in the northern states prior to this time.

Jones’ modifications destroyed the 1826 veranda and replaced it with another 3 meters wide and 16.5 meters long. The new veranda was only a few centimeters wider than the one it replaced but it was much longer. It extended the entire length of the 1826 structure’s north wall (Figure 8). Jones also made an addition east of the 1826 building as shown in Figure 8. This new section adjoined the veranda at a right angle. Mrs. Norred (Personal Communication) reports the division of this section into a dining room to the north and a hall to the south. The dining room had a fireplace along its east wall (Point S on Figure 8) whose excavation produced brick fragments and mortar rubble resembling that in the foundation trench. Although the fireplace had been destroyed its outline was easily defined by the burned sub-soil beneath it. The hearth thus marked was approximately 102 centimeters across and 34 centimeters deep. The complete fireplace had been 174 centimeters across and 83 centimeters deep.

The steps to the 1901 addition and the walkway leading to the steps was unearthed in the backyard excavations (Point T in Figure 8). All that remained of the steps was a 12 brick base constructed of the same materials as the remainder of the 1901 foundation. This brick step support was 154 centimeters long, 34 centimeters wide at each end, and 21.5 centimeters wide in the middle. The walkway was built of unbonded bricks unevenly set in an asymmetrical pattern whose design elements were not discernible.

A terra cotta drainage pipe crossed through the 1901 foundation trench (Point U in Figure 8). This drainage pipe was laid about 1910 when the first bathroom was installed on the south veranda. When the pipe was installed it must have been hung beneath the floor supports because no trace of it
Fig. 8. Phase IV: S, Fireplace; T, Steps Support; U, Drainage Pipe Break.
was found on the house side of the 1901 foundation wall trench. Another terra cotta drainage pipe found at the northeast corner of the 1901 wall trench also connected with the city sewer system and probably carried rain water from the roof gutters.

**Phase V, Circa 1935**

The Overbys inherited the Collier-Boone complex in 1935, and after negotiating with their relatives, the Fergusons, decided that two families could share the large home. Unfortunately the dwelling was not suitable for two families without modifications. The work, which converted the house to two identical halves, began almost immediately. The 1835 section was not renovated for it had originally been built with identical rooms both upstairs and down. Odd-shaped or separate sections of the complex were, however, destroyed with the 1821 section removed first and the 1901 section destroyed later. These two structures were, in fact, so completely leveled that evidence of their prior existence could not be seen before excavation. The 1835 back veranda was also removed (Point L on Figure 8) as were two 1826 fireplaces (Points D and E on Figure 6). They were replaced by a coal furnace over which were built two identical kitchens. Since the four 1835 fireplaces were not obstacles to construction and since their chimneys were interior, they were left intact.

Several additions were made to the structure in an attempt to equalize floor space (Figure 9). The 1901 veranda was replaced with a shorter one, the third veranda in this location. The area between the east wall of the 1826 building and the extreme east wall built in 1935 serves as a back porch. This covered porch was built with two doors, each leading to one of the separate kitchens. A new section was built between the 1826 south wall and 1935 south wall thus converting the 1826 foyer into two identical rooms. This additional floor space was, however, provided at the expense of the 1835 veranda which was covered over in the process. Above these rooms the Overbys and the Fergusons built a second floor divided into identical bedrooms and bathrooms. A new staircase was installed between these rooms allowing one family to use the front stairs, the other to use the back staircase.

The 1935 foundation wall (Figure 9) runs along the back porch and around the south side addition except for a break to provide a coal chute. This wall cuts through the west and north walls of the 1821 basement. It ranges from 102 centimeters to 110 centimeters in height from the ground surface to the wooden support beams. The wall is a single brick wide and was laid in an American bond much like the foundations constructed before it. The bricks in this wall are 21.5 centimeters by 6.5 centi-
Fig. 9. Phase V: V - W, Repairs; X, New Support Column; Y, Repair; Z, Heat Flue.
meters by 10.5 centimeters; the mortar bonding them is Portland cement. Portland cement was cheaper and stronger than hydrated lime, but was not widely used in Alabama until the first quarter of the 20th century (Maxwell, Personal Communication; Eckel 1922).

1935 style brick, mortar and bond are also evident in support columns built to replace their weakened predecessors. Point V in Figure 9 indicates a replacement for a large section of the 1826 east wall. This replacement consists of two brick columns adjoining one another at a right angle. Both columns sit upon the ruins of the 1826 wall that once supported floor beams. The two points marked W in Figure 9 are replacements for 1826 supports. The east-west half of the L-shaped support columns is positioned on the 1821 basement wall; its north-south half sits on the base of an 1826 column. The rectangular column designated W is also placed above the base of the 1826 foundation. Both this column and the L-shaped one support the wooden beam that forms the southern extremity of this section of the house. Point X on Figure 9 marks the brick column that supports the back staircase. The last 1935 support to be described is a replacement for the column at the entrance of the 1826 basement (Point Y on Figure 9). This new column was not built to support the basement entrance which was no longer in use, but to support the floor above it. Point Z in Figure 9 is a brick heat flue built in 1935 to accommodate the coal furnace. It rises from the basement, through both floors to the roof and slightly beyond.

Conclusions

The 1821, 1826, and 1835 portions of the Collier-Boone House were, in effect, a time capsule mirroring the social and economic growth of Tuscaloosa. The original 1821 structure exemplified frontier simplicity. The 1826 expansion had greater pretensions, but also had an overbearing simplicity not far removed from frontier simplicity. The 1835 addition displayed the elegance befitting an Alabama Supreme Court Justice's home in the capital city of a prospering state. The years of General Roddy's ownership of the house following the Civil War reflected the state of affairs of the defeated South. The 1901 modifications were designed to maximize living space while minimizing construction costs. This construction technique is exactly what one would expect in a commercial endeavor. The 1935 construction activities entailed an adaptation of the house to a two family dwelling. Although these activities helped to assure the preservation of the 1826 and 1835 portions of the house by the replacement of support columns and other much needed repairs, the 1821 structure was dismantled and thus one of the oldest houses in Tuscaloosa was destroyed.
Today the Collier-Boone House stands very much as it did in 1835. The 20th century additions have been removed, and those portions of the 1826 and 1835 structures which were destroyed during the 1935 renovation have been recreated.
BIBLIOGRAPHY

Brewer, Willis.  

Bullock, Odolf.  
1974 Personal Communication.

Clinton, Mathew W.  

Eckel, Edwin C.  

Jones, Edward V.  
1974 Personal Communication

Maxwell, Fred.  
1974 Personal Communication.

Norred, S.B.  
1974 Personal Communication.

Owen, Marie B.  

Smith, William R., Sr.  

Smyth, Syndia K.  

Tuscaloosa County Deed Record.  
1826 Book E, Tuscaloosa County Court House, Tuscaloosa, Alabama.  
1901 Book 54, Tuscaloosa County Court House, Tuscaloosa, Alabama.
United States Land Office Records.
1821  Montgomery, Alabama.

Wellge, Henry.
American archaeologists have generally ignored the urban environment, thereby leaving it relatively unexplored and overlooking the city's asphalt as fertile archaeological ground. The British have been well aware of the city's archaeological potential for years, and through large-scale projects (e.g. York, London, and Lincoln) they are marshaling data which directly bear upon problem-oriented research (Barley 1977). Until quite recently, however, most work conducted in American cities has been oriented towards reconstructions (South 1967) or public interpretations of particular historic sites (e.g., Independence Hall and Franklin Court). Since many of the artifacts recovered from such projects relate to the upper socio-economic stratum of society, a skewed picture emerges which is unrepresentative of the behavioral patterns within the city as a whole. Furthermore, this information is merely idiosyncratic since no framework exists in which to insert such studies. Despite pleas from archaeologists, neither research questions nor theoretical constructs are generally recognized in historic urban archaeology (Fairbanks 1968; Salwen 1973, 1978). The result has been a particularistic approach to an extremely complex environment - an approach which has been oriented towards individual sites rather than to general process of human behavior.

Recently there have been two developments which have begun to attack this problem. An increasing awareness of the urban resource base has occurred concurrently with a greater concern among historical archaeologists in conducting problem-oriented research. Where the latter change can be accounted for by the theoretical growth occurring in the archaeological community as a whole, the boon to urban archaeology has come through federally required assessments which have produced important archaeological sites. Such surveys have demonstrated that there is more out there than just a few buildings linked to famous people or events, disturbed cultural strata, and asphalt. Work in Tucson, Arizona (Ayers 1968); Lowell, Massachusetts (Schuyler 1974a, 1976); New York City, New York (Schuyler 1974b, 1977; Salwen and Bridges 1974a, 1974b); Paterson, New Jersey (Rutsch 1975; Rutsch and Rutsch 1975); and Atlanta, Georgia (Dickens and Bowen 1978); demonstrates that the city has many resources.
for study. The recent urban archaeology symposium at the 43rd
Annual Meeting of the Society for American Archaeology in
Tucson underscores that we have progressed from looking at the
city merely on a site-by-site basis.

Yet, the preponderance of urban archaeology continues
to be associated with assessment surveys and mitigation rather
than with projects initiated to study behavioral questions.
This only serves to reinforce a short-term approach, rather
than provide a long-term perspective on urban historic and
contemporary processes. In effect, then, project assessments
have been just as much a boondoggle as a boon to archaeological
research. They arrived before archaeologists were knowledgeable
in urban resources, field techniques, and theory. The immediacy
of the early projects and their multiplicity in agency sponsor­
ship have precipitated a crisis approach in which few frameworks
are available either to initiate or to interpret individual
projects. The result is a series of uncoordinated projects
which lack nomothetic goals; and thus, their data only slightly
increase anthropological knowledge of processes operating
within urban centers.

Salwen evaluates the current situation:

Almost all of the recent urban archaeological activity
in the northeast has been initiated primarily for
non-archaeological purposes - usually as survey or
salvage in connection with construction projects. This
has meant that fieldwork, even if well planned and
conducted, often fails to provide the kinds of
samples needed to solve problems relating to socio­
cultural process. While this work may provide insights
into history, or even culture-history, the project
often ends at the very point where the archaeologist
has learned enough to begin problem-oriented data
collection (1978:15).

Concomitantly, the crisis approach has acted as a deterrent
to urban resource conservation and management. By investing
large amounts of time and funds in the mitigation of endangered
sites without knowing the full range and quantities of sites
within the urban environment, the long-term goals of comprehensive
conservation are jeopardized. Thus, the individual site project
serves neither the goals of systematic research nor conservation
and management.
In effect, federal dollars and assessments have jolted the archaeological community into recognizing the city. However, the severe limitations imposed by the lack of research foci and testable models; the city's high population density, internal complexity, and size; and the continual crisis in an evolving site combine to retard archaeologists from moving into what Salwen describes as the "archaeology of the city" rather than the usual "archaeology in the city" (1973:151).

It has been through this work, however, that definite improvements have been made in site survey techniques and in the interpretation of assessment related projects (Dickens and Bowen 1978). And, at last there is problem-oriented research being conducted within specific areas of contemporary cities (e.g. Rathje's Tucson Garbage Project 1974, 1977; Schuyler's work at Lowell, Massachusetts 1974a; and Deagan's projects in St. Augustine, Florida 1974, 1977). Yet for the most part, archaeologists are not initiating projects explicitly to study the city as a site in order to determine processes of urban development and the adaptations of urban socio-economic and ethnic groups. The need for theoretical frameworks in which to conduct research is recognized; however, we clearly have neither devised ourselves nor borrowed from other disciplines these theoretical constructs.

From the growth in urban archaeology and from our own theoretical development, archaeologists realize that they need to attend to both research questions and imminent crises. But the immediate problem is now to integrate the two orientation with different methods and goals in order to understand and manage one area. That is: how can an urban project be designed which incorporates a research orientation as well as the pragmatic concerns of crisis and conservation? The interaction between these spheres is critical. If the crisis approach dictates where research is conducted, the opportunity for large-scale sampling design is eliminated. Thus, data collected in this manner cannot be used for generalization to city-wide patterns. Long-term research goals are then severely limited and behavioral study is impossible. Concomitantly, without a research design for the area in question there is little basis for making decisions on how best to invest energy and funds in crisis situation. Ultimately then, the problematic research perspective aids both long (conservation) and short (crisis) range, pragmatic management needs.

A problematic and pragmatic urban archaeology project requires the following components:
1. Problem-oriented research goals which define the city as a site, representative of a settlement type within complex society. Such an orientation necessitates survey to locate different loci of human activity, and it allows the study of urban dwellers' behaviors based upon specialization and stratification.

2. Theoretical constructs which can be tested archaeologically. These can be newly created, extant in anthropological literature, or borrowed from other disciplines.

3. Methods of integrating the project's research questions with (a) immediate crisis situations and (b) long range impact areas for a management plan.

4. Methods of integrating the research and management results into city government planning decisions to conserve archaeological materials. Additionally, these results should be made available to the public and to private developers, since much urban damage is done by non-federally funded activities. It should also be stressed that inclusion of other historic and human resources into this planning is an important goal.

An outline is easily produced. The problems arise when it is operationalized in a community project. The research orientation is paramount, and extant models in the social sciences need only be formulated into hypotheses testable through archaeologically derived data. However, the reality of working on a site which is extremely complex and still evolving requires new methods. And when working with local preservation planning, archaeologists need to translate obtuse terminology into issue-oriented reports and public-oriented formats. Summarizing, theory is primary; but methodology which balances professional, pragmatic, and public needs may well determine the success of an urban project.

To this end, a model for an urban research design should incorporate research problems; hypothesis testing of models applicable to archaeological data; a sampling strategy which includes archival, architectural, oral, and archaeological sources; knowledge of contemporary and future impact areas; mechanisms for incorporating archaeological management into urban planning processes; the personnel and space to conserve, process, analyze, and curate great quantities of recovered materials; and avenues for public participation and interpretation. The Alexandria Urban Archaeology Project has been created to implement such a model.
Prior to outlining the Project, however, Alexandria's temporal and spatial characteristics should be described. Alexandria, Virginia is located within the Chesapeake Bay region between Baltimore and Richmond, slightly downstream on the Potomac River from Washington, D.C. (Fig. 1). There is ample evidence that a sizable indigenous population inhabited the area (Humphrey and Chambers 1977). The European occupation of the area began with a small tobacco trading post on a river inlet in 1733. By 1749 the surrounding land was gridded and sold. This early section of the town was linearly oriented along the river, nestled between two large stream systems flowing into the Potomac. With the rapid mercantile expansion of the 18th century, Alexandria grew rapidly to a town approximately a mile by a mile and a half lying on an alluvial peninsula beneath the valley walls created by the ancestral river (Fig. 2 and Fig. 4). Hard hit by early 19th century war and embargo, the port never regained its vitality. A canal brought temporary prosperity, but the Civil War as well as Richmond's and Baltimore's more favorable locations and transportation networks minimized Alexandria's 19th century growth. The bulk of the 20 square mile city was annexed in the 20th century from Alexandria's non-urban hinterland (Fig. 2). Today Alexandria is primarily residential and retail in function, and the pre-20th century areas as well as the Historic District per se preserve much of their earlier structures and archaeological resources.

From a research perspective Alexandria is an interesting place to study due to its role in relationship to the nation's capital and to its rural hinterland, and also since it is a microcosm of urban processes. But archaeology did not come to Alexandria because professionals saw the research potential. Rather, it was Alexandria's citizens that sought out archaeology. The current Alexandria Archaeology Research Center (AARC) is the direct outgrowth of public concern for the destruction of local archaeological resources due to urban renewal in the 1960's. Faced with the destruction of six blocks within the Historic District citizens asked the Smithsonian Institution to undertake rescue work. After several years, however, the Smithsonian withdrew its financial support, and private citizens financed the effort until the City of Alexandria established an Archaeology Program and a public Archaeological Commission in 1974. The facility now employs three full-time archaeologists and the State of Virginia has added a fourth archaeologist to head the Alexandria Regional Preservation Office (ARPO). This office is funded by the Heritage Conservation and Recreation Service in order to monitor present destructive activities and to devise a model for managing urban resources. Through the
Figure 1
CHESAPEAKE BAY REGION
Figure 2
ALEXANDRIA SURVEY
growth
Archaeology Center and the Preservation Office a public archaeology program has been formulated which centers upon four goals: Research, Conservation and Management, Interpretation, and Education. Integration of these activities is provided through the Alexandria Urban Archaeology Project.

The education aspect of the Project will be discussed in a later paper, but it represents a continual commitment which takes the form of community classes, a large volunteer program, manuals and publications, public speaking, site and laboratory tours, and exhibits. If it were not for this education objective, the large scope of this Project would be impossible. In the one year in which the volunteer program has been operating over 400 professional, paraprofessional, and novices have participated. This represents minimally $38,000 in donated time and skills - a figure that almost equals the city's cash contribution. But it is the interrelationship of the other three goals (research, conservation, and interpretation) which I will address in the remainder of this paper.

The research problems of the Project control the methodological decisions in both the Conservation and Research components, since they fall within one design and interact at key junctures to formulate a management plan and a site interpretation (Fig. 3). The Alexandria Urban Archaeology Project focuses upon four research goals:

I. A. To describe the evolutionary growth of the City.
   B. To explain this development by testing the data against extant geographical and historical models (Haggett, Cliff, and Frey 1977; Johnson 1972).

II. A. To diachronically delineate the spatial distributions of land use, ethnic groups, and socio-economic status (Johnston 1966; Taeuber and Taeuber 1965; Rose 1969).
   B. To explain changes in these patterns by testing alternative models of human interaction (e.g. conflict vs. consensus theories) which can be operationalized in terms of material variables (economic, technological, demographic, and environmental). (see Coser 1956; Gluckman 1955; Fried 1967, 1978).

III. A. To determine the composition of historic "neighborhoods". This will be done by testing the congruence of land use, ethnic, and socio-economic zones with one another and with social networks seen through records of voluntary group associations, friendships (as determined through legal witnesses and estate executors), and affinal ties.
B. To determine different neighborhoods' relative persistence and provide explanations for their continuity and discontinuity.

IV. A. To test the degree to which historic urban processes are operative in creating contemporary changes in socio-economic and ethnic distributions.

B. To predict behavioral results of modern planning alternatives based upon the historic models formulated from the above research.

The first year's work consists of two co-equal surveys of archival and archaeological materials. Both data sources are necessary to explore the Project's research questions, but they are managed separately since methods and pace differ. This separation is also desirable, since there may be more to be gained by viewing the contradiction in the two sources, than in trying to force a complementarity.

The first year surveys are collecting data (1) ethnohistorically to delimit homogeneous zones of social stratification, land use, and ethnic affiliation in the 18th and 19th century area of the city (Fig. 10); and (2) archaeologically to record activity loci through a city-wide sampling strategy. In the second year, excavation and in depth ethnohistoric research will be conducted within selected areas determined through the surveys.

In systematic time intervals, the Ethnohistoric Survey collects data from tax assessment records, city directories, census schedules, and deeds. The result will be a series of synchronic maps color keyed for land-use, socio-economic status, and ethnic affiliation. These data will present broad diachronic patterns of urban change which can be tested against extant hypotheses. By overlapping the three variables homogeneous zones (e.g., mixed residential and commercial; middle class; Jewish) will be identified.

The Archaeology Survey is centered upon locating activity loci; testing hypotheses dealing with expected artifact assemblages of different socio-economic and ethnic groups; and producing a sensitivity map for cultural resources. A major goal is the implementation of local legislation that will provide incentives to private citizens and developers for cooperating with preservation efforts.

The greatest problem in the Archaeology Survey is the selection of a sampling strategy for a 20 square mile inhabited site. Although strategies exist for pre-historic surveys, the
ALEXANDRIA URBAN ARCHAEOLOGY PROJECT

CONSERVATION & MANAGEMENT - SITE SURVEY

1. Sampling design - archaeological.
2. Test hypotheses and predict.
3. Construct Sensitivity Map

TEST AREA

PRELIMINARY

PLAN

FORMULATE HYPOTHESES

ARCHAEOLOGICAL TESTING:

I. Central Place Theory - urban evolution.
II. Conflict Model - changing patterns of socio-economic & ethnic spatial distributions.
III. Material culture differences; intra-group diachronically inter-group synchronically

ARCHAEOLOGICAL REVIEW OF PROJECTS

MANAGEMENT PLAN

PUBLIC INTERPRETATION

BEHAVIORAL PROGRAM

RESEARCH

HISTORIC

1. Sampling design - archival.
2. Hypothesis testing.

PREHISTORIC

1. Define land-use over time.
2. Test hypotheses for tidewater adaptations.

CITY LEGISLATION, INCENTIVES

Figure 3

ALEXANDRIA ORGANIZATION CHART
scheme selected in Alexandria must take into account both prehistoric and historic settlement. Implementation of the survey also is a problem, since access must be gained to many private land parcels.

Two basic variables divide the City for sampling: Land Form (Fig. 4) and distance-from-city center (Fig. 5). They were selected for their predictive nature in locating both prehistoric and historic settlement. These are combined to create a series of permutations that become the basic, composite strata (Fig. 6). To our knowledge no American urban site has been sampled using a strategy that takes into account the entire settlement; therefore, there have been few guidelines to follow. Morris' (1975) work at Huánuco Pampa, Peru is one of the few urban surveys with a published sampling strategy. Since he deals with a significantly smaller site and stratifies on the basis of surface architecture, his work is not specifically applicable. Morris' comment on the problems of devising an urban survey is germane, however: "...the combination of large size and high variability makes it extremely difficult to approach a 'representative' sample of an urban site which can even come close to portraying its vast internal complexity" (1975:192).

To deal with the complexity in Alexandria two other variables have been selected. They are integrated into the design by their roles as special sampling units and overlay the basic strata. The variable, proximity to transportation artery, takes into account both river systems, early roads, and later innovations of a canal and railroad (Fig. 7). In effect, the Potomac waterfront and each river system will be surveyed as special linear units. A similar pattern is followed for early roads, the railroad, and the canal.

The second category of special unit consists of areas which will undergo adverse impact on the cultural resources. These impact areas are charted and intensive sampling is conducted in relation to the total sampling design dictated by the basic strata (Fig. 8).

The basic and special strata divide the city for sampling and take into account both modern land-altering activities and predictive research problems (Fig. 9). Each stratum is sampled with a particular size unit, at a set interval, and at a given percentage of the total area. For example, the area (the 18th and 19th century city) located within the alluvium and the first four concentric distance-from-center bands is being systematically sampled in transects which conform to the gridded blocks (Fig. 10).
Figure 4
ALEXANDRIA SURVEY
LAND FORM STRATA
Figure 7
ALEXANDRIA SURVEY
transportation arteries
Each sample unit is one block with the four facing half blocks. Within each concentric band radiating out from the center, a lower percentage of the total land will be surveyed, since the density of occupation decreases. Within each sample unit, alternating properties are selected for an archival overview. This determines the basic characteristics of the unit in relation to the Project's research questions. From that initial fifty percent sample, one-half of the properties are sampled systematically through field inspection. Each of these properties is given surface, subsurface, basement, and foundation examination. The completed sample unit within this stratum is ultimately sampled at the level of twenty-five percent.

The first unit has been completed within this sampling strategy. The undisturbed stratigraphy records early 19th century occupation through to the present. Archival work indicates that the block was an area of Free Black settlement during the early 19th century. Today it is part of the Community Development Block Grant (CDBG) redevelopment for lower income residents. The initial results of the test unit indicate that Free Blacks were living on the City's fringes as early as 1800. Artifact analysis is proceeding for testing hypotheses on material culture and diet. The nature of this evidence will be tested against urban black patterns noted by historians (Wade 1964; Goldin 1976).

The first sample unit has confirmed that it is possible to obtain archaeological and ethnohistoric data which directly bear upon the research questions governing the Project. Methods of field work have been refined and adapted to the urban environment. Subsurface excavation indicates that the cultural strata remain undisturbed to the present day. Yet, the crisis persists. The twelve block area surrounding the sample unit is slated for new housing within the next two years. On the basis of this test (as part of the city-wide systematic survey) additional energy will be spent upon this area through designating it a special impact sampling unit.

The Archaeology Center is still in the process of establishing necessary cooperative ties with neighborhood associations, private citizens, developers, and government offices as well as researching interdisciplinary knowledge of the city. We believe, however, that the Alexandria Urban Archaeology Project offers an optimistic model for studying the city as a site.
Figure 11: Outline of the Alexandria Urban Archaeology Project.
REFERENCES

Ayres, J.E.

Barley, M.W. (ed)

Coser, L.

Fairbanks, C.F.

Fried, M.H.


Deagan, K.A.


Dickens, R.S. Jr. and W. R. Bowen
REFERENCES (Continued)

Goldin, C.D.

Gluckman, J.

Haggett, Pl., A. D. Cliff, and A. Frey

Humphrey, R. L. and M. E. Chambers

Johnston, N. J.

Johnson, J. H.

Morris, C.

Rathje, W. L.

1977 In praise of archaeology: Le project du garbage. In, Historical archaeology and the importance of material things, edited by Leland Ferguson, pp. 36-42. Special publications of the Society for Historical Archaeology 2.

Rose, H. M.
REFERENCES (Continued)

Rutsch, E.S.

Rutsch, E.S. and M. J. Rutsch

Salwen, B.


Salwen, B. and S. Bridges
1974a Note on The Ceramics from the Weeksville Excavations Northeast Historical Archaeology 3(2):8.


Schuyler, R.L.
1974a Lowellian Archeology. Newsletter of the Society for Industrial Archeology. Supplementary Issue 7: 3-4


South, S.
1967 The Paca House, Annapolis, Maryland, ms. Historic Annapolis, Inc., 18 Pinkney Street, Annapolis, Maryland.

Taeuber, K.E. and A. F. Taeuber
1965 Negroes in Cities. Chicago: Aldine
REFERENCES (Continued)

Wade, R.C.  
Prior to 1740 settlement in the British colonial province of South Carolina was confined to the Atlantic seaboard. During the next half century it underwent a process of rapid expansion that extended its settled area to the inland borders of the modern state. The material record left behind by the colonization of the South Carolina interior has provided a potential source of information useful in the investigation of various phenomena associated with frontier development in this particular region as well as with processes of frontier change in general. Archeological data together with documentary source materials permit a wide variety of questions to be posed of the past. In this paper the results from preliminary studies of two settlements that were intimately involved with the colonization of the interior of South Carolina will be summarized. Additionally an attempt will be made to outline directions for further research with regard to the problems addressed in these studies.

The two archeological projects were conducted as the preliminary phase of research at the assumed sites of two functionally different types of settlements on the South Carolina frontier. Because of the extensive nature of these survey excavations, they were intended to provide only the most general information about the extent and contents of the sites. Questions regarding the functional nature of the settlements, then, must also be oriented to general considerations.

In formulating questions concerning the function of frontier settlements, it has been useful to employ a comparative model of frontier change that has been derived from cross-cultural studies of colonization (see Lewis 1975a; 1976). The development of the South Carolina frontier reflects changes that are associated with a process of change characteristic of frontiers whose principal unit of settlement is the farm or small plantation. This process is characterized by several conditions which reflect the attenuated ties between the frontier area and the parent state as well as the tendency of the former to become increasingly more tightly integrated as an element within the socio-economic system of the latter.
One of the most marked characteristics of a frontier involves the simplification of the settlement hierarchy relative to that in the parent state from which the colony originated. It has been observed that population density is directly related to the function of communities with regard to the areas they serve. Normally in a settled area a hierarchy of community types is present, each of which performs certain functions. As the population density of an area drops, an upward shift in these functions occurs so that services performed by a community at a lower level in the hierarchy must be carried out by one at a higher level (Berry 1967:33-34). As the population density increases, the opposite effect occurs. In a frontier area, the population density is initially too low to support an elaborate hierarchy. Most political, social, and economic functions are concentrated in key settlements called frontier towns. These settlements serve as centers of trade and communication within the colony, through their direct link with the colony's entrepot, connect the colony directly with the national culture of the parent state (Casagrande, et al. 1964:312).

The development of a frontier area is also accompanied by a continued influx of new settlers, bringing about a general increase in population density. This, in turn, places increased demands on resources as well as on the social, economic, and political institutions of the colony. The result is a restructuring of the trade and communications network and a shift in the pattern of central place settlements. The increase in the level of sociocultural integration that accompanies the "maturing" of an area of colonization affects the functions of settlements established during earlier phases of colonization and often brings about their growth or decline in response to the changing landscape (Casagrande, et al 1964:311).

The pattern of settlement within the developing colony evolves through several stages (Hudson 1969). The first is characterized by a random distribution associated with the initial stage of colonization. With additional population growth settlement spreads out from the older centers, producing a clustered distribution. Finally, as vacant land is occupied a readjustment in the pattern of growth takes place, bringing about a state of relative equilibrium with settlement size at an optimum. This phase of development marks the close of the frontier period and is characterized by an even distribution of individual settlements.

Documentary evidence indicates that the pattern of
settlement in South Carolina evolved from a random pattern in
the mid-eighteenth century to one typified by even spacing in
the early 1800's. In the eighteenth century the frontier
was characterized by an absence of substantial nucleated
settlements apart from the inland frontier towns and the
coastal entrepot of Charleston (Petty 1943:57). These
principal inland settlements were linked by an overland road
system directly to this port. The frontier towns developed
basically as economic centers whose positions on the inland
trading network allowed them to serve as loci for the collection
and processing of frontier agricultural commodities as well
as for the redistribution of manufactured goods imported
through Charleston (Sellers 1934:11). The frontier towns
also served as centers of social activity and, with the
establishment of the district court system in 1769, as political
centers as well (Brown 1963:111).

The form of the frontier settlement network in South
Carolina was shaped largely by the nature of its staple
crop, wheat. It has been suggested that wheat, as a perishable,
bulky commodity in the colonial South, required a relatively
complex system of transport involving storage facilities,
in-transit processing and packaging industries, and shipping
services, usually arranged in a linear network (Earle and
Hoffman 1976:11). The settlement pattern in eighteenth
century South Carolina had such a linear arrangement, with the
principal inland trading and reprocessing centers situated
on routes leading directly to Charleston and subsidiary
settlements located on routes that led, in turn, to the main
inland centers.

All of the centers of political activity were not, how­
ever, frontier towns. Instead, some of the district court
seats were established in new locations that were central to
the judicial regions they served. These isolated political
settlements were situated along the roads that tied the frontier
together, yet performed no other role apart from their
political function. As centers of a specialized activity
they existed in the area of colonization but were not linked
to the economic system that served as its principal means of
integration.

By the close of the eighteenth century increased settle­
ment in the interior, coupled with the expansion of cotton
agriculture and an accompanying shift in the transportation
network, had reshaped the settlement pattern of the South
Carolina frontier as well as the political and economic regions
established during initial colonization (Mills 1826:699). This change was accompanied by the rise of new centers of social, economic, and political activity and resulted in the decline, and often the abandonment, of many of the earlier settlements (Lewis 1976:26).

Archeologically the remains of these settlements are of interest because they offer a data base capable to providing answers to questions regarding the sociocultural system that produced the landscape of the frontier period. Archeological surveys have been conducted at the sites of two frontier period settlements in South Carolina in an attempt to provide basic information about their form, function, and spatial extent (Lewis 1975b, 1976, 1978). The remainder of this paper will be addressed to the results of these surveys and to the types of inquiries that might be made at these sites and others in the future.

The surveys were carried out at the sites of Camden, a frontier town on the Wateree River in central South Carolina, and Long Bluff, an isolated political settlement on the Pee Dee River. Camden arose as a commercial center in the 1750's. Its position in the inland transportation network allowed it to serve as a collection point for the processing of frontier wheat and other agricultural commodities and as a redistribution point for manufactured goods. (Ernst and Merrens 1973:561-562). Camden served as the focus of an inland trading network that extended over much of the central and northeastern parts of the province and into the neighboring province of North Carolina (Schulz 1976:95). The following decade saw Camden grow as a center for break-in-bulk and small-scale industrial activities, and with the establishment of the circuit court system in 1769 it became the seat of Camden District (Kirkland and Kennedy 1905:12). Camden prospered as a regional center until the close of the frontier period in the early nineteenth century when the town moved northward abandoning the old site (Schulz 1972:64).

The settlement of Long Bluff was located at the site of the Cheraws District courthouse (Gregg 1867:466). This district lay within a larger economic region dominated by Camden. By the time the judicial district was established in 1769, competition from a rival commercial network expanding out to Cross Creek, North Carolina had caused the contraction of the Camden network (Merrens 1964:165). Consequently, the site of the regional economic outlet at Cheraw, near the North Carolina border, was too far from the center of the new judicial
district to be considered a suitable location for the courthouse. The courthouse was constructed at an isolated location and attracted no substantial settlement during the frontier period. When the court districts were reorganized in 1799 the settlement lost its main judicial function and by 1816 the site was abandoned (Gregg 1867:195).

The distinct roles played by Camden and Long Bluff are known primarily through the documentary records. Because the archeological investigations were intended to identify the site as those of particular settlements, it was necessary to obtain archeological data that would permit the recognition of those functions associated with each settlement. The extensive nature of the survey explorations has made it necessary to confine this inquiry to hypotheses capable of being examined through an analysis of the broad types of patterning that the sampling excavations were likely to reveal.

The surveys at Camden and Long Bluff employed an excavation strategy designed of gathering a representative sample of the patterning of material remains distributed over extensive areas. This was accomplished through the use of stratified, systematic, unaligned sampling, a technique that has been shown to be successful in discerning patterning based on the examination of a small portion of the archeological record (Haggett 1965:192-194; Redman and Watson 1970:281-282).

Hypotheses for settlement function at this initial stage of archeological research centered around site form and size. The relative size of settlements in a frontier area is assumed to be directly related to position in the settlement hierarchy (Casagrande, et al 1964:312). Consequently, frontier towns would be expected to be larger than specialized activity settlements which, in turn, would be larger than semi-nucleated and scattered domestic settlements.

With regard to absolute size, it was estimated that the frontier towns in South Carolina would have been smaller than their contemporary European counterparts because the former would have lacked the presence of the large supporting population associated with the latter (Blouet 1972:4; Grove 1972:560). This condition is a result of the lower population density of the frontier which is occasioned by the rapid spread and wide dispersal of settlement accompanying initial settlement (Potter 1965:661). Rather than following the normal process of settlement evolution in which the settlement's relative status as a center of socio-economic activity develops.
in response to increased population density and economic complexity, the frontier town usually arises in its central role without first passing through intermediate stages of growth. A comparison of town plats and other documents indicated that the range of structures in the American South was substantially below that of European economic centers (Lewis 1978:50).

Isolated political centers, lacking the concentration of activities associated with the frontier town, were far below the lower limit of the range of structures present in frontier towns. Documentary evidence relating to imposed political centers in Europe and contemporary settlements of comparable function in the American South supported this assumption (Flatres 1971:176-179; Lewis 1978:51).

An examination of the distribution of architectural artifacts obtained in the surveys at Camden and Long Bluff revealed that both settlements fell within their predicted ranges. On the basis of size, then it is possible to conclude that each settlement fulfilled the function ascribed to it by documentary sources.

Because these conclusions are based on data obtained in initial exploratory excavations, the results by no means represent the limits of the information regarding settlement function that may be gathered through archeological means. Excavations conducted on a more extensive scale will permit the examination of intra-site variability capable of revealing activities and combinations of activities related to overall settlement function. At Camden an attempt to observe such activity patterning revealed variations in status and a distinction between the occurrence of domestic and non-domestic activity among structure-based loci within the settlement. Functionally-related intrasite activity variation has long been recognized in archeological research, although only recently have attempts been made to observe such activity patterning on the basis of quantitative analyses of artifacts from historic sites (see South 1977; Lewis 1976:118-126; 1977:84-91; Ferguson 1977; Carrillo 1977).

Based upon a knowledge of the roles played by different settlement types on the frontier, it should be possible through the use of documentary and archeological analogy to predict the nature, spatial distribution and association, relative importance, intensity of occurrence, and absence of different
types of past activities at particular sites. Utilizing a knowledge of those processes that govern the formation of the archeological record in sites occupied by particular cultural groups, it should be possible to predict the archeological form different activities will have generated.

The recognition of activity patterning within specific sites is only one aspect of archeological research that may be pursued relating to frontier expansion in South Carolina. Another area of perhaps greater interest is the discovery and recording of habitations outside of the nucleated frontier settlements. The scattered settlements of the frontier are largely undocumented and as yet have not been systematically investigated. Their form and overall pattern of occurrence are unknown. Although most research has been focused on the larger settlements such as those discussed in this paper, scattered settlements are assumed to have comprised the bulk of the frontier period occupation in South Carolina (Petty 1943:57; Woodmason 1953:23). For this reason their investigation is necessary to achieve an understanding of overall settlement patterning and density, their change through time, and the function of these settlements with regard to the rest of the area of colonization. The study of scattered settlements has only recently been undertaken in a systematic fashion by archeologists and the results of these initial studies, when completed, should be of great utility in the study of settlement frontiers.

The South Carolina frontier is still largely an unstudied phenomenon. The results of preliminary investigations, however, indicate that it shares many adaptive similarities with other frontier areas regarding form as well as its evolutionary sequence of development. Utilizing a comparative model as an explanatory tool, it should be possible to design and conduct research in a manner that will provide data capable of answering questions concerning the nature of the initial European occupation of the state.
REFERENCES

Berry, Brian J. L.

Blouet, Brian W.

Brown, Richard Maxwell

Carrillo, Richard F.

Casagrande, Joseph B., Stephen I. Thompson, and Philip D. Young

Earle, Carville and Ronald Hoffman

Ernst, Joseph A. and H. Roy Merrens

Ferguson, Leland G.

Flatres, P.
REFERENCES (Continued)

Gregg, Alexander

Grove, David

Haggett, Peter

Hudson, J. C.

Kirkland, Thomas J. and Robert M. Kennedy

Lewis, Kenneth E.

1975b Archeological investigations at the colonial settlement of Long Bluff (38DA5), Darlington County, South Carolina. University of South Carolina, Institute of Archeology and Anthropology, Research Manuscript Series 67.


1977 A functional study of the Kershaw house site in Camden, South Carolina. University of South Carolina, Institute of Archeology and Anthropology, Research Manuscript Series 110.

REFERENCES (Continued)

Merrens, H. Roy

Mills, Robert

Petty, Julian J.

Potter, J.

Redman, Charles L. and Patty Jo Watson

Schulz, Judith J.

1976 The hinterland of Revolutionary Camden, South Carolina. Southeastern Geographer 16(2):91-97.

Sellers, Leila

South, Stanley

Woodmason, Charles
THE PROBLEM OF ARCHAEOLOGICAL DIVERSITY, SYNTHESIS AND COMPARISON

Michael R. A. Forsman and Joseph G. Gallo

Introduction

Archaeological investigation of historic period sites in the Canadian West is a recent phenomenon in comparison to the long-standing interest that archaeologists have shown in prehistoric cultures. In Alberta, for example, the first major historic archaeology excavations were only carried out in 1962 and 1963 (Noble 1973). Since then there has been a growing public interest in western cultural development of the historic period. This has been exemplified by excavations at fur trade sites, North West Mounted Police posts, and ranch, farm, mining and community sites throughout the western provinces. These sites are but the remaining manifestations of broad social, cultural, and economic developments. As such, the archaeological information contained in the sites should contribute to a wider understanding of the major historical themes that they represent, for example, the fur trade, the development of law and order, etc. This is particularly true when we consider the rarity of undisturbed eighteenth and nineteenth century site locations and the inadequacy of early descriptive accounts to portray fully the many facets of life during those time periods. The data present in archaeological sites is often too important for its use to be limited only to site specific objectives, time and time again. In addition to contributing to a broader understanding of cultural events and developments, the information and interpretive statements generated would also be useful for determining future directions in thematic research.

For archaeologists, it is important to recognize the kinds of broad statements that can be made in regard to important historical themes. This topic is still under exploration, but material culture approaches will probably always have a key role to play in providing new insights to the existence and verification of cultural processes. The specific approach, or research design, will provide the frame of reference for examining, sorting, synthesizing and analyzing information derived from the artifacts. The quantified data resulting from these operations may then be manipulated by a variety of statistical techniques to support conclusions with a certainty that otherwise would not be possible. In order for broad statements to be made about cultural processes it will be necessary
to formulate research designs which can deal with more than one site at a time. Investigations of several sites may have to be undertaken before any general statements can be applied to the period or phenomena of which such sites are representative.

In order to determine the extent to which archaeology had contributed to the definition of important historic periods in the Canadian West, it was decided to undertake a review of the available archaeological literature. Most of the reports dealt with the fur trade era, and this era is the focus of the presentation.

Fur Trade Review

Fur trade archaeology has mainly concentrated on major forts of the contact and early post-contact period (Fig. 1). Many of these posts were fairly large in size, stockaded, cited in available documentation, frequently directed by a factor and sometimes served as operational bases for further exploration by famous personages. Fewer archaeology projects have excavated minor posts such as small supply depots, transfer points, outposts, and forts occupied by minor companies and independent traders. In addition, little work has been reported on ancillary aspects of the fur trade including contemporary native encampments and trapper's cabin sites. Because of the lack of archaeological activity at these sites, the full range of information and its importance to a broad interpretation of the fur trade is still unknown.

Most of the projects had site-specific objectives and were successful in determining the age and identity of sites, recording structural remains and recovering samples of fur trade artifacts. Artifact data was sometimes tabulated and typologies presented, but these frequently evidenced individual schemes for organization, description, and reportage. Furthermore, analyses, syntheses of analyses, and interpretation were seldom provided. The most notable effort was by Gertrude Nicks (1969, 1970) who formulated a trait list based on a few excavations of early fur trade sites. Her work, however, was viewed more as a tool for identifying company affiliation of individual sites, rather than as a statement of site content. The Provincial Museum did have intentions of undertaking a broad thematic archaeological approach to the fur trade (Kidd 1970:3), but which, unfortunately, did not materialize. No other agency, institution or individual had similar broad-scale objectives.
Figure 1. Location of fur trade posts
Synthesizing Historic Archaeology Data

If public and professional interest is being expressed in broader questions on various themes of cultural and historical development, and their significance, then there is an obligation to attempt to answer these problems. Clearly, single site investigations cannot hope to provide sufficient data for explaining phenomena for which the individual site is only one manifestation. A research design will be required to formulate questions, identify resources and define the procedures that will be necessary for achieving the objectives. Perhaps the most important effect of the research strategy is that data will have to be treated in a consistent manner, site to site, in order to provide comparative and synthesizable information. The compiled data and interpretive statements generated from such attempts would also be used for determining future directions in thematic research.

Syntheses of archaeological data, whether site types, artifact types, or attribute categories, have been infrequent. One of the more recent attempts at synthesizing cross-site data has been reported by Stanley South (1977, 1978). Sites were categorized into two groups on the basis of some historical differences and on the basis of differences in artifact class frequencies. The results provided quantifiable expressions which could be considered syntheses of the material culture phenomena which those sites represented.

By analogy, it was considered possible to synthesize the artifactual data recovered from early fur trade sites into a composite assemblage profile which could then be called an artifact pattern for forts of the early fur trade period. The resulting profile could then be used as a model for comparing artifact profiles from contemporaneous fur trade sites in the same region, and even from other settlement types. This application of the early fur trade profile would thereby become useful in explicating a particular phase of economic development at one important time period, and could serve as a comparative research standard for further investigations.

Formulating the Early Fur Trade Pattern

Fur trade sites of the contact period constituted a phase of Euro-Canadian exploration and enterprise which had broadly common objectives, resources, and limitations. Excavations at these sites exposed quantities of artifacts and structural remains which were then described in publications and
manuscripts. Information from some of these excavations have been synthesized into an artifact pattern that is representative of the period. In order to explain how this was accomplished, the major assumption and procedures must first be defined.

The major assumption focused on the comparability of artifact samples. Several sites were excavated under the direction of investigators with diverse experience, over a range of years and with a variety of techniques. The effect of these differences on the recovery of artifacts and the representativeness of the samples could not be accurately estimated. In order to provide a workable data base for this study it nevertheless had to be assumed that those projects which recovered more than 1,000 artifacts did obtain representative and, therefore, comparative artifact samples.

A second problem, also pertaining to artifact comparisons, was evident in the fact that many authors had categorized artifacts according to individual and, sometimes, very different schemes. In other words, comparisons at a group-level of organization could not be carried out until all of the artifacts were re-classified according to a single framework. Any of the frameworks used by the researchers might have been employed for this purpose, but the outline developed by Stanley South (1977) was used to permit even broader comparisons. Re-classification was based on available documentation rather than on re-examination of the artifacts. Difficulties with some of the artifact descriptions may have led to errors in re-classification, but these were presumed to be few and were estimated to amount to less than one percent of the total artifact assemblage from each site. Objects which could not readily be classified under South's system were not enumerated in the reorganized population.

All of the artifactually data had to be quantifiable. Those site reports which enumerated only some of the artifacts and described the rest by such terms as "numerous" or "many" could not be used in a statistical analysis approach.

The criteria governing the material culture information that could be synthesized effectively cut the number of useful site reports down to a population of seven, covering six sites. These included Rocky Mountain House (data combined from Noble 1973, and Steer and Rogers 1976), Fort George (Kidd 1970), Edmonton House III, Buckingham House (Nicks 1969), Sturgeon Fort (Barka and Barka 1976) and the Francois LeBlanc Post (Kehoe 1963).
From this data core, the procedure then consisted of tabulating the frequencies and percentages of artifacts in each group for the total site sample. The percentages of artifacts in each group were then considered to form the assemblage profile for that site. For a number of sites of similar historical derivation, function, and time period, such as for the early fur trade sites, the percentages for the eight artifact groups could be averaged across the six sites. The resulting synthesis was then viewed as a site-type profile or pattern. The assemblage profiles for the six fur trade sites and the composite profile are illustrated in Tables 1 and 2.

Research Design for Artifact Pattern Comparisons

Once the Early Fur Trade pattern had been formulated, it was immediately obvious that there were some differences to the Carolina and Frontier (Architecture) patterns. It was not apparent, however, that these differences were significant, and a question remained whether or not a totally new pattern had been identified. Furthermore, although South had recognized certain significant artifact group differences between his two patterns, his exposition did not include a statistical test of significance to compare the overall patterns. The statistical power, however, is available to undertake such a test and the application of this technique is of importance to archaeological science.

The Early Fur Trade pattern was derived from six sites, as previously detailed. To test the patterns, the Fur Trade profile was compared separately to the Carolina and Frontier patterns by subjecting them to Kendall's Rank Correlation Coefficient Test. Kendall's Coefficient of Concordance Test was used to test all three and was found to indicate that at least two patterns were unrelated ($x^2 = 12.37$, not significant). The calculations and data manipulation were accomplished by following the guidelines defined in Siegel 1956, pp. 213-238. Table 3 shows the artifact group mean percentages and ranking for the Carolina and Fur Trade patterns, while Table 4 compares the rankings for the Frontier and Fur Trade patterns. The null hypothesis, $H_0$, stated that the two artifact patterns were unrelated, and the alternate hypothesis, $H_1$, stated that the two artifact patterns were related. In order to reject the null hypothesis at the 0.05 level of significance, "p" must have had a value less than or equal to 0.05.
TABLE 1. Artifact Assemblage Profiles For Six Early Fur Trade Sites

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Kitchen</td>
<td>56</td>
<td>0.48</td>
<td>840</td>
<td>3.24</td>
<td>163</td>
<td>11.19</td>
</tr>
<tr>
<td>Architecture</td>
<td>146</td>
<td>1.22</td>
<td>873</td>
<td>3.36</td>
<td>326</td>
<td>22.39</td>
</tr>
<tr>
<td>Furniture</td>
<td>1</td>
<td>0.01</td>
<td>6</td>
<td>0.02</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Arms</td>
<td>235</td>
<td>1.97</td>
<td>832</td>
<td>3.21</td>
<td>77</td>
<td>5.29</td>
</tr>
<tr>
<td>Clothing</td>
<td>11,102</td>
<td>93.07</td>
<td>21,018</td>
<td>81.00</td>
<td>612</td>
<td>42.03</td>
</tr>
<tr>
<td>Personal</td>
<td>12</td>
<td>0.10</td>
<td>217</td>
<td>0.84</td>
<td>11</td>
<td>0.76</td>
</tr>
<tr>
<td>Tobacco</td>
<td>200</td>
<td>1.67</td>
<td>759</td>
<td>2.92</td>
<td>184</td>
<td>12.64</td>
</tr>
<tr>
<td>Activities</td>
<td>177</td>
<td>1.48</td>
<td>1,404</td>
<td>5.41</td>
<td>83</td>
<td>5.70</td>
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<tr>
<td>Total</td>
<td>11,929</td>
<td>100.00</td>
<td>25,949</td>
<td>100.00</td>
<td>1,456</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Noble 1963, Steer and Rogers 1976
(2) Kidd 1970
(3) Nicks 1969
(4) Nicks 1969
(5) Barka and Barka 1976
(6) Kehoe 1963
TABLE 2. The Early Fur Trade Artifact Pattern

<table>
<thead>
<tr>
<th>Artifact Group</th>
<th>Mean</th>
<th>Percentage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen</td>
<td>4.64</td>
<td>0.42-11.45</td>
</tr>
<tr>
<td>Architecture</td>
<td>6.79</td>
<td>1.22-22.39</td>
</tr>
<tr>
<td>Furniture</td>
<td>0.05</td>
<td>0-0.17</td>
</tr>
<tr>
<td>Arms</td>
<td>4.54</td>
<td>1.97-11.00</td>
</tr>
<tr>
<td>Clothing</td>
<td>65.50</td>
<td>41.26-93.07</td>
</tr>
<tr>
<td>Personal</td>
<td>8.22</td>
<td>0.10-35.60</td>
</tr>
<tr>
<td>Tobacco Pipes</td>
<td>6.12</td>
<td>0.28-14.07</td>
</tr>
<tr>
<td>Activities</td>
<td>4.14</td>
<td>1.48-5.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3. Ranking The Carolina And Early Fur Trade Artifact Patterns

<table>
<thead>
<tr>
<th></th>
<th>Kitchen</th>
<th>Architecture</th>
<th>Furniture</th>
<th>Arms</th>
<th>Clothing</th>
<th>Personal</th>
<th>Tobacco</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAROLINA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>(63.1)</td>
<td>(25.5)</td>
<td>(0.2)</td>
<td>(0.5)</td>
<td>(3.0)</td>
<td>(0.2)</td>
<td>(5.8)</td>
<td>(1.7)</td>
</tr>
<tr>
<td>Ranking</td>
<td>1</td>
<td>2</td>
<td>7.5</td>
<td>6</td>
<td>4</td>
<td>7.5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>EARLY FUR TRADE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>(4.64)</td>
<td>(6.79)</td>
<td>(0.05)</td>
<td>(4.54)</td>
<td>(65.50)</td>
<td>(8.22)</td>
<td>(6.12)</td>
<td>(4.14)</td>
</tr>
<tr>
<td>Ranking</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>
Working through the calculations for the Carolina and Fur Trade patterns (Table 3), it was found that $p = 0.274$. Because the test value of $p$ was greater than 0.05, we therefore had to accept the null hypothesis and conclude that the two artifact patterns were unrelated.

Testing the Frontier and Fur Trade patterns, (Table 4.), it was found that $p$ equaled 0.360, and that these two patterns, also, were significantly distinct.

As the previous testing had not been applied by South as an examination of overall pattern we decided to test the Carolina and Frontier patterns.

The resultant calculations gave a $p = 0.012$ which allowed us to reject the null hypothesis of unrelated patterns. Thus we concluded that as presently defined with data presented by South (1977) the Carolina and Frontier Patterns are not two distinct patterns, unless one examined the specific artifact group differences as South has done.

It has not been our intention to examine the specific differences and overall similarities of the Carolina and Frontier Artifact Patterns. Rather, we have attempted to identify a new artifact pattern, called the Early Fur Trade pattern, and to use a mathematical tool to aid in distinguishing this pattern from any other pattern, on an overall basis. Having done so, we could then ask, "What groups of artifacts contributed to forming the distinctive character of this pattern, and how could the frequencies represented in those groups be accounted for?"

Clearly, the Clothing group of artifacts was, numerically, the most important group for all six sites, whereas the Furniture group exhibited the lowest frequencies. Examination of the Clothing group quickly identified glass beads as the dominant class, constituting 99 percent of the groups, for all six sites. A number of other artifact groups, including Kitchen, Architecture, Arms, Personal and Tobacco Pipes, each represented at least ten per cent of an assemblage profile at one site or another.

Interpretation and Hypotheses

The low representation of the Kitchen and Architecture groups, in comparison to the Carolina or Frontier Artifact Patterns, could be interpreted as representing a rapid and exploratory phase of development, with a definite lack of commitment to
<table>
<thead>
<tr>
<th></th>
<th>Kitchen</th>
<th>Architecture</th>
<th>Furniture</th>
<th>Arms</th>
<th>Clothing</th>
<th>Personal</th>
<th>Tobacco</th>
<th>Activities</th>
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<tr>
<td><strong>FRONTIER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>(27.6)</td>
<td>(52.0)</td>
<td>(0.2)</td>
<td>(5.4)</td>
<td>(1.7)</td>
<td>(0.2)</td>
<td>(9.1)</td>
<td>(3.7)</td>
</tr>
<tr>
<td>Ranking</td>
<td>2</td>
<td>1</td>
<td>7.5</td>
<td>4</td>
<td>6</td>
<td>7.5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>EARLY FUR TRADE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>(4.64)</td>
<td>(6.79)</td>
<td>(0.05)</td>
<td>(4.54)</td>
<td>(65.50)</td>
<td>(8.22)</td>
<td>(6.12)</td>
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<tr>
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<td>Tobacco</td>
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</tr>
<tr>
<td>CAROLINA (X)</td>
<td>(63.1)</td>
<td>(25.5)</td>
<td>(0.2)</td>
<td>(0.5)</td>
<td>(3.0)</td>
<td>(0.2)</td>
<td>(5.8)</td>
<td>(1.7)</td>
</tr>
<tr>
<td></td>
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<td>4</td>
<td>7.5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>FRONTIER (Y)</td>
<td>(27.6)</td>
<td>(52.0)</td>
<td>(0.2)</td>
<td>(5.4)</td>
<td>(1.7)</td>
<td>(0.2)</td>
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</tr>
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<td></td>
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<td>6</td>
<td>7.5</td>
<td>3</td>
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</tr>
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</table>
to settlement. It could be argued that during the contact period of the fur trade in the Canadian northwest, there was no conscious attempt to visualize the activity as anything other than as an extractive, and temporary industry. The most commonly occurring artifacts were small, easily portable and could be considered to have some personal or trade value. One of the interesting aspects of the Early Fur Trade pattern is that it appeared to hold true for a time period from 1769 to 1821, over an immense territory that was occupied by a variety of native tribes, and for sites that were managed either by independent traders, by the North West Company or the Hudson's Bay Company.

Although the foregoing interpretation may not have been entirely correct or fully explained why the pattern existed, it nevertheless could serve as the basis for generating hypotheses and for undertaking more detailed investigation of specific artifact class frequencies between sites.

In order to test the stability of this pattern, it would also be instructive to compare data from other early fur trade sites located elsewhere, and from later fur trade sites in the same area.

Conclusions

It has been demonstrated that, for six contact period fur trade sites, there was a constant articulation of artifact groups to the extent that a pattern could be identified and defined in mathematical terms. This pattern was recognized in spite of the fact that the sites had been excavated by a number of archaeologists, and frequently with different techniques and objectives in mind. The Early Fur Trade Pattern does constitute a synthesis sufficiently close to each of the individual sites that it can be considered as a reflection of a single cultural phenomenon. In this regard, it represents a contribution towards the broader definition of a major historical period. Demonstrating the existence of the Early Fur Trade material culture pattern also provides one basis for undertaking further research into this period, particularly for examining the cultural processes tied to the manifestation of this profile, its changes and permutations.

The key to undertaking such analyses, as South has emphasized (1977:31ff), is the use of quantifiable approaches. In this regard, we have attempted to offer one viable statistical
approach to site pattern recognition. These efforts are but a start towards the identification, and examination of artifact patterns and cultural processes, and we welcome all contributions our colleagues can make to advance this most challenging aspect of archaeological science.
REFERENCES

Kehoe, Alice B.

Kidd, Robert S.

Nicks, Gertrude C.
1969 "The Archaeology of Two Hudson’s Bay Company: Buckingham House (1792-1800) and Edmonton House III (1810-1813)." M.A. Thesis. Department of Anthropology, University of Alberta, Edmonton.


Noble, William C.

Siegel, Sydney

South, Stanley


Steer, Donald N. and Harvey J. Rogers
DESCRIPTIVE ANALYSIS AND REPLICATION OF HISTORIC EARTHENWARE: COLONO WARES FROM THE SPIERS LANDING SITE BERKELEY COUNTY, SOUTH CAROLINA

Ronald W. Anthony

The Spiers Landing site (38BK160), located on the south shore of Lake Marion in Berkeley County, South Carolina, is a late 18th/early 19th century undocumented occupation. Research and analysis performed by Carolina Archaeological Services (Columbia, South Carolina) has indicated that the site represents occupation by persons of low socioeconomic status, probably plantation slaves (Drucker and Anthony 1979).

The purpose of this analysis is to provide comparative data on historic low-fired, unglazed earthenwares, herein referred to as Colono ware (Ferguson 1978), by presenting a general descriptive analysis of Colono ware from the Spiers Landing site. These sherds were found to represent 56% of the total historic ceramic assemblage from the site, and therefore provided an excellent artifact base for analysis and replication.

Ferguson (1978) has recently presented intriguing evidence suggesting that much of what has been traditionally called Colono-Indian ware (Noel Hume 1962) may represent a pottery tradition with West African roots, which was perpetuated by plantation blacks. This view reflects the growing recognition of certain formal, decorative and manufacturing characteristics of low-fired earthenwares which are atypical of market wares produced by native Americans during the early historic period. Since this low-fired unglazed earthenware is always found to be associated with at least partial black occupation during the 18th and early 19th centuries, Ferguson has proposed use of the term "Colono ware" to characterize these wares, since "Colono-Indian" is too limiting in terms of socioeconomic and cultural factors behind their manufacture and use.

Only limited descriptive analysis is currently available for low-fired unglazed earthenwares of the colonial period (Harrington 1908, Speck 1928, Noel Hume 1962, Baker 1972, South 1976). The Spiers Landing data will provide a body of detailed "type" description for a South Carolina Low Country locality. Specific information obtained through vessel replication addresses questions
of manufacturing technique and surface treatment, and should aid other researchers in describing, analyzing, and understanding the potting behaviors behind the production of similar ceramic assemblages at other sites.

A total of 1,230 Colono ware sherds were collected from Spiers Landing during excavation. This figure represents 56% of the total historic ceramic assemblage. On the basis of 222 rimsherds, a minimum number of individual vessels was estimated: twenty-two (22) unrestricted, flat-bottomed bowls; Twelve (12) jars with restricted necks or straight sides; and one (1) simple restricted, probably globular vessel (Shephard 1956: 225-231) (Fig. 1).

The Spiers Landing wares lack ring bases and surface decoration like those found on "Colono-Indian" ceramics made in imitation of some European forms (Noel Hume 1962, Baker 1972, South 1976). Although such attributes may be characteristic of early Colono wares of the 17th and early 18th centuries, there appears to exist variability in Colono ware technologies which may be related to local manufacturing traditions among a wider population than the dwindling Indian populations of the 18th century (Speck 1928, Fairbanks 1962, Noel Hume 1962, Baker 1972, South 1976). Vessel elaboration on the Spiers Landing wares was limited, the only appendages being three lugs and one flat-footed support. These appendages do not appear to be decorative, but functional, and suggest that these were utilitarian wares including footed, flat-bottomed bowls and/or pans, as well as handled jars.

The majority of measurable bowl diameters were within a range of 222-300 mm, or 8.66-11.8 inches; bowl depths ranged from shallow (3.6 cm) to deep (6.9 cm). Two reconstructivel restricted jars (Fig. 1) were estimated to have ½-liter and 3-liter capacities, respectively. Corresponding measurements for these vessels include: 1) diameter of orifice - small jar, 9.4 cm (3.7''); large jar, 11.5 cm (4.5 ' '); 2) neck diameter - small jar, 9.2 cm (3.6''); large jar, 12.7 cm (5.1''); 3) maximum body diameter - small jar, 13.2 cm (5.3''); large jar, 23.1 cm (9.25''); 4) estimated vessel height - small jar, 11.5 cm (4.6''); large jar, 21.0 cm (8.75''); 5) neck height (shoulder to rim) - small jar, 2.4 cm (.95''); large jar, 3.6 cm (1.4'').

Examination of the Colono ware collection from the site revealed that the assemblage contained a high degree of technological homogeneity. Two of the variables
FIGURE 1. Reconstructed Colono vessels from the Spiers Landing site. Left to right: small inflected jar with everted rim, shallow unrestricted bowl, large inflected jar with everted rim.
exhibiting a high frequency of occurrence were an exterior and interior smoothing, and laminar or layered-looking paste. These two attributes led the author to some experimental analysis involving the production of twenty-five (25) Colono ware-like vessels, including both coiled and hand-modeled varieties. In making these small replicas, an attempt was made to not allow construction bias—the vessels were simply made in a way that came naturally to the author. Raku potting clay was used; it is similar in temper and paste to the Colono ware clays from the site. A free standing brick kiln was built and sawdust was used as the major firing fuel, producing an uneven, low-firing atmosphere.

The major ceramic attributes which were examined follow. Italicized sections key in replicative findings.

Paste

The predominant paste colors ranged from red, yellow red buff and pink buff (10R 4/8, 5YR 5/6, 7.5YR 7/4) to dark reddish brown and dark grey (5YR 3/1, 5YR 2.5?2, 7.5YR 3/2) (Munsell 1973). Fire clouding occurred on several vessels. Most of the assemblage exhibited a medium sandy paste, and the majority of the sherds had a pronounced laminar or layered-looking paste (Fig. 2a). This laminar paste was reproduced in the experimental vessels (Fig. 2b) and only occurred in vessels that were hand-modeled rather than coil-made (Fig. 2c). The laminar structure therefore appears to be the result of lateral movement of the clay as the potter pulls the clay to form and thin the vessel walls. This conclusion is supported by finding a hint of laminar structure on a few coil-made replicas, but only near the surfaces of the vessels where the coils had been joined and smoothed over.

The only evidence of coil manufacture in the entire collection occurred on one basal sherd (possible two) and on one everted rimsherd. The rimsherd coil break, together with a thickened vessel wall at the inflection point on jar forms, suggests that a combination of hand-modeling and coiling characterized some of the large Colono ware jar forms (Shephard 1956: 248). Under replication condition, hand-modeled vessels were more sound than the coil-made ones; coil-made vessels had more points of weakness at which to break when dropped. Several of the Colono ware sherds and hand-modeled replicas exhibited breakage and/or deterioration parallel with the vessel wall (layered breakage—Figs. 3b, 5d); this form of breakage was never observed on the coil-made replicas. Hand-molded vessels were also found to be faster and easier to make than coiled ones, since there was less necessity for prolonged handling of the clay and less clay moisture loss. Small hand-molded forms may therefore represent a form-function relationship based on immediacy of need.
Hardness

The majority of the Colono wares from Spiers Landing exhibited surface hardness from 2.5 - 3.5 (Mohs scale).

Temper

Most of the Colono wares were sand-tempered, with moderate quantities of coarse sand or fine grit inclusions. Angular and sub-angular temper grains were mostly within a range of 1/4-1/2 mm (Fig. 5b; Table 1). One (possibly two) rimsherds exhibited crushed sherd temper or a reddish fired clay additive (10R 4/8) to the sandy paste, but this may represent a non-cultural inclusion.

Lip Form

The majority (66%) of the Colono ware vessel lips were rounded. Rounded lips were formed naturally in the process of reproducing a basic vessel, and required no special modification. The collection contained 23% straight flattened lips and 11% flattened lips oriented either toward the interior or the exterior of the vessel (Table 1). During the final stages of vessel construction, it was found that lip flattening could be reproduced by simply rubbing the finger across the wet clay rim, leaving a sharp, clean, flat surface. By fast-working the clay, partially rounded-partially flattened lips were also produced; such lips had also been observed on several Colono ware rimsherds. Flattening and pressing on the rim of a moist vessel also produced lipping, or clay overflow from the lip, like that observed on some of the Colono ware rimsherds (Fig. 3b; Table 1). This effect was duplicated by pinching the damp vessel wall and gently gouging the clay with a finger. Only two Colono ware rimsherds from the entire collection exhibited folding or doubling of the lip to form a thickened rim (Fig. 5a).

Rim Form

The majority of Colono ware rimsherds (75%) were direct rims (straight within 2 cm below the lip) and were most often associated with unrestricted bowls (Fig. 4; Table 1). Twenty-one percent (21%) were everted. Widely flared everted rims appeared to define inflected vessels, or jars. A limited number of inverted rims were also noted (nine, or 4% of the collection).

Vessel Thickness

Colono ware rimsherds were measured for thickness at a point 1 cm below the lip. Thickness at this point ranged from 5-11 mm, with the majority of rims falling within a 6-8 mm range (Table 1). This measure was found to
FIGURE 3. Colono rim characteristics.

a. Colono bowl rimsherd with lipping and hand-smoothing marks. b. Colono bowl rimsherd with "channeling" below rim.
**TABLE 1.**

Attribute List for Analysis of Colono Ware From the Spiers Landing Site

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th></th>
<th>Temper Size (mm)</th>
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<th>Surface Treatment</th>
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<tr>
<td></td>
<td>Less than 6</td>
<td>6-6.9</td>
<td>7-7.9</td>
<td>8-8.9</td>
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<tr>
<td></td>
<td>17</td>
<td>63</td>
<td>81</td>
<td>43</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>(7.6%)</td>
<td>(28.4%)</td>
<td>(36.5%)</td>
<td>(19.4%)</td>
<td>(8.1%)</td>
</tr>
<tr>
<td>N = 222</td>
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<table>
<thead>
<tr>
<th>Lip Form</th>
<th>Flattened/Exterior</th>
<th>Flattened/Interior</th>
<th>Flattened</th>
<th>Rounded</th>
<th>Folded</th>
<th>Lipped</th>
<th>Inverted</th>
<th>Everted</th>
<th>Straight</th>
<th>Channeled</th>
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<tbody>
<tr>
<td></td>
<td>2 (.9%)</td>
<td>22 (9.9%)</td>
<td>52 (23.4%)</td>
<td>146 (65.8%)</td>
<td>2* (4.0%)</td>
<td>13* (21.2%)</td>
<td>9 (4.0%)</td>
<td>47 (21.2%)</td>
<td>166 (74.8%)</td>
<td>10* (4.5%)</td>
</tr>
<tr>
<td>N = 222</td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Rim Form</th>
<th>Inverted</th>
<th>Everted</th>
<th>Straight</th>
<th>Channeled</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>9 (4.0%)</td>
<td>47 (21.2%)</td>
<td>166 (74.8%)</td>
<td>10* (4.5%)</td>
</tr>
<tr>
<td>N = 222</td>
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<table>
<thead>
<tr>
<th>Vessel Form</th>
<th>Unrestricted</th>
<th>Restricted</th>
<th>Inflected</th>
<th>Straight</th>
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</thead>
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<tr>
<td></td>
<td>189 (85.1%)</td>
<td>3 (1.4%)</td>
<td>28 (12.6%)</td>
<td>2 (.9%)</td>
</tr>
<tr>
<td>N = 222</td>
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</tr>
</tbody>
</table>

* Sub-attributes recorded on sample rim sherds.
be of little utility in determining vessel form or function, except on a gross scale. In fact, thickness varied as much as 4 mm on the same vessel in some cases. For the most part, however, vessel thickness on the same vessel was maintained within 1 or 2 mm. Interestingly, the greatest inconsistency in wall thickness occurred on bowls, which the everted rims of jar forms exhibited the most consistent wall thickness. This seems logical, since greater care and attention needs to be given to the shaping of a rim than to a vessel body, which is less fragile and vulnerable to breakage. An everted rim also takes more conscious effort to form, and therefore may naturally become more regular and even in thickness than would a shallow or straight body.

Surface Treatment

Over 85% of the Colono ware rim and body sherds exhibited light smoothing over their interior and/or exterior surfaces (Table 1). Smoothing marks were shallow, rounded grooves, spaced very close together, giving the impression of a light brushed look (Fig. 5b). Experimental brushing with broomstraw, an animal hair brush and mollusc shells produced deeper, sharper and wider impressions than those present on the Colono ware sherds. However, finger smoothing produced an almost identical width, depth and form of marks (Fig. 5c). A limited amount of pebble smoothing also appears to be present in the collection (Shepard 1956: 190-191). Vessel bases from the collection were predominantly flat and even. It was found during replication that basal flattening resulted from simply working the clay vessel on a flat, smooth surface, suggesting that no intentional flattening of Colono ware bases need have occurred after the basic vessel was formed.

A cluster analysis (OSIRIS) was performed on the basis of 220 observations (rimsherds) (Drucker and Anthony 1979). The cluster analysis substantiated the preliminary subjective groupings of ceramic attributes and refined the degree of association of others. Three Colono ware "types" were derived from the analysis. Very strong high negative correlations defined two of these clusters: 1) thick, coarse sand-tempered bowls with straight rims and flattened lips sloping toward the vessel interior, and 2) thin, medium sand-tempered restricted or straight-sided vessels with inverted rims and flattened lips which slope toward the exterior of the vessel. A third vessel type defined by the analysis was a moderately thick, fine sand-tempered jar with an everted rim and rounded lip. The two highest level positive attribute clusters occurred between everted rims and inflected vessels.
FIGURE 4. Colono ware rim profiles from the Spiers Landing site.
FIGURE 5. Selected ceramic attributes of Colono ware from Spiers Landing.

a. Colono rimsherd with folded rim.  
b. Colono rimsherd with hand-smoothing marks (NOTE grainy paste texture and medium sand temper).  
c. hand-modeled replica with hand-smoothing marks.  
d. Colono rimsherd with laminar breakage.
(jars) (proximity level = .73) and between straight rims and unrestricted vessels (bowls) (proximity level + .57).

A distinctly different clouded, low-fired earthenware type from the historic period was represented by sixteen burnished sherds (7 rimsherds, 9 body sherds), reflecting at most two vessels. These sherds were quite thin (averaging 5 mm thick at 1 cm below the rim), hard (3.5 - 4.0), compact and well-finished. All of the sherds exhibited a very fine untempered micaceous paste. Paste color ranged from black, dark brown and dark red brown (2.5YR 2.5/0, 7.5YR 3/2, 5YR 3/2) to red and pinkish buff (2.5YR 5/8, 7.5YR 7/4). Most of the sherds exhibited a non-laminar paste, and two rimsherds (probably from the same vessel) bore traces of a dark red paint (10R 3/6) on the interior of the rim. It appears that the vessel form represented by these sherds is a simple unrestricted bowl.

Because of their marked attribute differences relative to the remainder of the historic earthenware collection from Spiers Landing, these burnished sherds are interpreted as "intrusive" non-local manufactures, probably trade wares, which were not as heavily used (or as popular?) as the coarser, cruder earthenwares represented at the site. Thus, they are seen as corresponding to the type description of the traditionally designated "Colono-Indian" wares (Noel Hume 1962, Baker 1972).

A single rimsherd of well-made earthenware recovered from the site resembles the rim forms of San Marcos types from the Georgia and Florida coasts (Goggin 1952). The vessel form which usually defines this type is a shallow wide bowl with painted and geometric designs; a temporal context of the late 17th century is also associated. Except for this distinctive rim profile (Fig. 4d), the sherd from Spiers Landing resembles the other Colono wares from the site in paste texture, color, hardness and surface treatment, and may simply represent either an early trade ware or a local imitation of San Marcos rim forms. The type does not appear to represent a significant percentage of the Colono ware assemblage, in either case.

In summary, the Colono wares from Spiers Landing consist of very simple, predominantly hand-modeled, sand-tempered bowls and jars which are somewhat crudely made and finished. The subjective impression which one receives from them is that they were made strictly for
utilitarian purposes by a person or persons who were knowledgeable about pottery-making, but not striving for esthetic appeal or marketability. Indian-made earthenwares of the colonial period, on the other hand, appear to have been more carefully and finely made. These smoothed and decorated vessels were produced primarily as market wares for black and white consumption, although their ultimate function was apparently also utilitarian (Noel Hume 1962, Baker 1972).

There appears to exist a higher degree of variability among Colono ware assemblages than is presently acknowledged—variability not only in a temporal sense, but also in a geographical sense (regional and sub-regional). The Spiers Landing Colono wares exhibit attribute dissimilarities with other Colono ware assemblages within the same general region (Lynne Lewis 1979, personal communication), and suggest that further research on low-fired earthenwares will reveal variability within a relatively small geographical area—even from site to site—in terms of manufacturing techniques and surface treatments.

Patterned variability may also exist within the context of a single site, such as a relatively prosperous plantation unit with an internal socioeconomic hierarchy among its workers. This variability may be found to be due to ethnic as well as socioeconomic status differences. Current thinking would hypothesize an association of Colono wares with certain ethnic groups and perhaps more generally, with individuals of lower socioeconomic status (Noel Hume 1962, Ferguson 1978, Drucker and Anthony 1979). Further research should focus on discovering percentage occurrence differences in these wares between occupations by members of the same ethnic group who possessed different socioeconomic statuses (e.g., house servants vs. field workers vs. free blacks). Research questions which follow from an analysis of assemblage variability might be:

1. Does variation among adjacent sites exist with regard to percentage occurrence of Colono ware, and if so, can such variation be linked with socioeconomic factors, such as access to European vs. Colono wares or simple preference? Is the percentage variation more pronounced between sites associated with one ethnic/socioeconomic group or between sites associated with different ethnic/socioeconomic groups?

2. What were the economics of Colono ware production: were they produced on a family or an individual basis? Were there suppliers within a plantation
unit, and was there a local exchange or purchase network for locally made Colono wares?

3. How did Colono ware production levels and styles vary temporally and spatially?

The demonstrable attribute differences exhibited between the Spiers Landing Colono ware assemblage and others from the Atlantic seaboard support the need for these lines of research in the future, since the study of Colono wares appears to hold great potential in further understanding the social, cultural and economic correlates of status groups during the plantation period.

The careful study of low-fired earthenware collections and the isolation of patterned variation among and within ceramic assemblages holds great potential for approaching such questions as the ethnic and socioeconomic correlates of low-fired earthenware production. An important function of such study will be an increase in our ability to identify and predict the functional and socioeconomic type of occupation represented at the many small, undocumented 18th and 19th century sites which are falling prey to modern development at an increasing rate.

Acknowledgements

I would like to thank Leland G. Ferguson, Stanley A. South and Lesley M. Drucker for their review and comments on earlier drafts of this paper.
REFERENCES

Baker, Steven G.

Drucker, Lesley M. and Ronald W. Anthony
1979 "The Spiers Landing Site: Archaeological Investig­ations in Berkeley County, South Carolina."

Fairbanks, Charles H.

Ferguson, Leland G.

Goggin, John

Harrington, M. R.

Lewis, Lynne
1979 Personal communication.

Munsell, Albert H.
1973 Munsell soil color charts. Baltimore; Munsell Color.

Noel Hume, Ivor
1962 An Indian ware of the colonial period. Archaeological Society of Virginia, Quarterly Bulletin 17(1). Richmond.

Shepard, Anna O.

South, Stanley A.
REFERENCES (CONTINUED)

Speck, Frank G.
1928 Chapters on the ethnology of the Powhatan tribes of Virginia. Indian Notes and Monographs 1(5). Heye Foundation, New York.
AN ECONOMIC EXPLANATION OF MATERIAL CHANGE AT LIMERICK PLANTATION, SOUTH CAROLINA

William B. Lees

Limerick Plantation was located on the head branch of the Eastern Branch of the Cooper River, in the tide-water region of what is today Berkeley County, South Carolina (Fig. 1). As a landed entity, Limerick Plantation dates to at least 1709, when the plantation came into the possession of Michael Mahon, a former Barbadian merchant (O'Brien 1926: 211; SCRRSP-F: 13). Today, over 200 acres of the former circa 4,500 acre plantation is still referred to by the traditional name. Although the origins of Limerick's economy can probably be found in the cattle industry and in other low-energy adaptations, by at least 1754 Limerick's economy was focused on rice agriculture (Lees 1978; Lewis 1978). Rice agriculture remained the primary economic activity at Limerick until the decade following 1880—the decade during which South Carolina ceased to be the number one rice producer in the nation for the first time in history (Lees 1978).

The avenue of live oaks which once graced the approach to Limerick's early 18th century mansion house now graces the approach to the East Cooper and Berkeley Railroad. In an unfortunate chain of events, the South Carolina Public Railways Commission managed to finalize their construction plans for the railroad prior to the execution of an archeological assessment of a two mile section of the railway. When a survey was concluded, two important archeological sites—one prehistoric and one historical—had been located. At this point, due to the advanced stages of their plans the Railways Commission opted to fund research rather than to relocate the right-of-way. During the Fall of 1977, the Institute of Archeology and Anthropology conducted—under contract with the South Carolina Public Railways Commission—a program of archeological research at the adversely impacted portions of the Limerick Site (38BK223) (Lees 1978).

Archeological Inference: The Limerick Settlement Pattern

The Limerick Plantation Archeological Project was originally concerned with a 120 foot wide section of the
Figure 1. Location map of Limerick Plantation.
right-of-way of the East Cooper and Berkeley Railroad, and with an adjacent area designated as a permanent construction easement (Lees 1978). This permanent construction easement was intended as the location of residential access roads. During the course of the field work, the Railways Commission redesigned these permanent construction easements so as to avoid any adverse impacts, and the focus of the project was shifted to the right-of-way proper (Lees 1978). As such, the investigated portions of the Limerick Site represent a construction corridor through a larger settlement which was approximately five to six times the size of the impacted area (Fig. 2). While it is not the purpose of this paper to discuss the problems of corridor archeology, it is important to realize that by their very nature, corridor projects lead to the arbitrary selection of sites, and, with large sites such as Limerick, to the arbitrary selection of those parts of a site that are to be sampled. The resultant theoretical constraints are considerable, and have been discussed in detail by Goodyear (1977).

Within the originally defined impact zone at Limerick, the well preserved remains of three structures were encountered. The largest consisted of the 48 by 36 foot brick cellar/foundation of the Limerick mansion house (Fig. 3). This wood frame structure was probably constructed between 1710 and 1715, and was characterized by a typical lowland south plantation house floorplan (Historic American Buildings Survey 1940; Newton 1971: 12). This structure was apparently modified immediately following the American Revolution by the addition of a single tier encircling porch (Lees 1979).

Of interest, this modification was apparently contemporaneous with the construction of the two other well preserved structures (Lees 1979). These two structures were located to the rear of the main house, with their east walls being in line with the west wall of the main dwelling. They were both 18 feet square, and were apparently single story brick buildings. The structure closest to the main house is suggested as a kitchen for documentary as well as archeological reasons. Historical documents suggest that this structure—which was characterized by a large hearth and an interior well—may also have served as a wash-room. The function of the other dependency, located in line with and directly south of the kitchen, is currently uncertain (Lees 1979).

In addition to these three well preserved remains, the archeological record also supports documentary evidence for the existence of two other structures within the
Figure 2. Overlay of Hardwick's 1797 plat of Limerick on the right-of-way map of the East Cooper and Berkeley Railroad, showing the impact of the construction of the railway on the Limerick Site.
Figure 3. The Limerick mansion house in 1940, looking north-east. Photograph courtesy of the Historic American Buildings Survey (HABS).
the right-of-way. The first of these structures consists of what were apparently the badly disturbed remains of one of a pair of carriage houses located in front of, and to either side of, the mansion house. Unfortunately, archeological data on this structure is limited due to its former use as the intersection of two modern residential access roads. However, on the basis of documentary evidence, which is supported by the small sample of artifacts associated with what was left of this structure, it is suggested as having been built between 1786 and 1797 (Lees 1979).

The final structure, located east of the mansion house, was suggested by the occurrence of a high frequency of features and artifacts at a location where 18th century plats suggest a structure was located (Figs. 4 and 5) (Hardwick 1797: Purcell 1786). Due to the suggestion that the kitchen located to the rear of the mansion house was not built until the late 18th century, due to the fact that the artifacts associated with this hypothetical structure are predominately 18th century kitchen type artifacts, and due to the close proximity of this structure to the main dwelling house, this "structure" has been suggested as the location of the 18th century kitchen (Lees 1979).

Taken collectively, these five structures suggest two primary building episodes at Limerick. The first is associated with the circa 1710-1715 construction of the main dwelling house, and includes the mansion house itself and the hypothetical 18th century kitchen structure discussed above. The second is characterized by the immediate post-Revolution modification of the main house to allow the addition of a single tier encircling porch on the north, east and south sides, by the construction of the carriage houses in front of the main house, and by the construction of the two dependencies--one of which served as a kitchen--to the rear of the main house. This archeological model of Limerick's settlement pattern--although admittedly based on a small portion of the site--strongly indicates an elaboration and expansion of the settlement following the close of the Colonial era.

The question arises as to why the elaboration and expansion of Limerick's settlement occurred at this time, or at all. It could be possible to hypothesize a change in "world view" following the American Revolution as having led to this change. Deetz (1977) has recently attempted a similar hypothesis in which he offers a supposed cognitive shift from an organic pre-Georgian world view to a highly structured Georgian world view as the causes of observed changes in the material record of the 18th century. These material changes which Deetz seeks to "explain" by cognitive shifts are most clearly manifest in the transition from
Figure 4. Detail of Purcell's 1786 plat of Limerick Plantation showing the main settlement (38BK223) and Limerick's 10 tidally irrigated rice fields.
Figure 5. Limerick Plantation in 1797, based on a plat of Limerick prepared by John Hardwick in that year.
the clearly more "organic" Colonial style of architecture, predominant during the 17th century, to the highly symmetrical Georgian style of architecture of the following century. Despite the seductiveness of Deetz's argument, it would be entirely more reasonable to explain the material change at Limerick (as well as the cognitive changes that surely accompanied material change) as manifestations of broad range economic transformations following the American Revolution.

The strongest evidence for an economic transformation at Limerick following the American Revolution is provided by a comparison of "Colono-Indian" and "European" type ceramics (Noël Hume 1962). Colono-Indian ceramics represented a locally manufactured, inexpensive and readily available ware found in some parts of the southeastern United States, and have been shown to represent an integral portion of the so-called kitchen assemblage (Lees and Kimery-Lees 1978; South 1977). As such, Colono-Indian ceramics could reasonably be expected to serve as supplements to a planter-class ceramic assemblage when economic conditions would make European ceramics less available due to low imports or high costs, or both. If economic expansion did occur at Limerick following the Revolution, it could reasonably be expected that this would be reflected by correlative changes in the relative and absolute frequencies of Colono-Indian and European ceramics at Limerick. Clearly, we could expect Colono-Indian ceramics to play a larger role in the Colonial than in the Antebellum periods.

Such a change is clearly evident at Limerick. Prior to the American Revolution, a relative comparison of Colono-Indian and European ceramics reveals that the relative frequency for Colono-Indian ceramics is consistently higher than for European ceramics (Lees and Kimery-Lees 1978). This change in the relative importance of ceramics at Limerick mirrors the architectural changes at the site, and serves to substantially support the economic nature of this architectural change. Nevertheless, it might still be possible to suggest that both changes were in fact caused by a change in the "world views" of the planter and his family (Deetz 1977). This hypothesis does, however, lose considerable validity when the archeological record is compared to a historically based model of the economic development of the South Carolina tidewater.

The Economic Development of South Carolina: An Historical Model

Since 1670 and prior to the first few decades of this century, the economy of South Carolina can be characterized as having had a strong agricultural focus (Lees 1978).
This agricultural focus involved a number of export staples, whose presence and absence through time serve as a reflection of cultural processes more expansive than those found within the boundary of South Carolina.

Perhaps the most intriguing period of South Carolina's past--and also one of it's least understood--is the period of socioeconomic experimentation following the initial settlement of South Carolina by Europeans, which occurred in 1670 at Albermarle Point (Orvin 1974: 18-20; Wood 1974: 22). During this period, which lasted until the first decades of the 18th century, Carolinians would adopt those cultural preadaptations that would allow an orderly development of their colony (Lees 1978). Significant among these preadaptations was that of the plantation slavery system of agriculture, which had developed to an elaborate extent in the West Indies during the early and middle 17th century (Handler and Lange 1978: 15; McCrady 1897: 683-688). This preadaptation was undoubtedly transported to South Carolina by early emigrants, roughly 50% of whom came from the West Indies (Dunn 1971: 81). Another preadaptation of significance was a general familiarity with a vast number of economic pursuits and potential staple crops (Lees 1978).

The development of a "new" cultural system as the result of the interjection of a vast number of cultural preadaptations into a new and different ecological setting must have been initiated by a period of rank conscious and unconscious experimentation leading to the selection, rejection, modification and combination of particular cultural forms into a general cultural order. As I have previously stated, this period of initial economic experimentation lasted until the first decades of the 18th century, when an economy based largely on the production of rice and naval stores (tar, pitch, turpentine, rosin, hemp, masts and bowspirits) developed (Clowse 1971: 133-134). Prior to this date, experimentation with a vast number of economic pursuits was supported by a number of generalized and low-energy activities such as the provisions and Indian trade, both of which continued to be important during the 18th century (Clowse 1971).

Although the origins of rice agriculture in South Carolina are shrouded in an imprenetrable historical fog, most contemporary scholars appear to agree that commercial production of rice dates to at least 1690 (Carpenter 1973: 12; Salley 1911). Commercial production is certain by 1700, when the first rice export figures from South Carolina reveal that 330 tons of rice from the 1699 harvest had been exported from Charleston Harbor (Clowse 1971: 130).
Prior to the turn of the 18th century, rice was apparently grown on well drained uplands, a practice which was significantly inefficient when compared to later techniques (Lees 1978; Sellers 1934: 148). However, by about 1700, rice agriculture had shifted to the rich, wet upland swamps which abound around Charleston (Hewat 1836: 109; Meriwether 1940: 4). This ecological shift, which allowed greater and more efficient production, was undoubtedly important for the maintenance of rice agriculture as a primary economic endeavor.

About this same time, in 1704, the British Crown offered a bounty on naval stores, which transformed what had been a marginal economic activity into an important one (Clowse 1971: 133-134). Between this period and 1725, the economy of South Carolina can be thought of as developing around the production of rice and naval stores, which are largely complimentary activities. Also during this period, the plantation slavery system of agricultural exploitation became well established in South Carolina (Ver Steeg 1975: 114).

In 1725, the bounty on naval stores was rescinded, which effectively signaled the end of its profitable production (Clowse 1963: 167). Following this action, Carolinians attempted to fill the resultant economic void by increasing the production of rice. The subsequent increase of rice exported from South Carolina did, however, only succeed in oversupplying the market, effectively forcing prices down. The result was a general economic depression in South Carolina, which was not satisfactorily resolved for some 20 years (Clowse 1963: 169-170; Lees 1978; Meriwether 1940: 3).

In 1744, indigo was first successfully grown in South Carolina, and in 1748, England offered a bounty on its importation (First Session of Parliament, 1747: 887). The production of indigo in South Carolina successfully restored a healthy economy based on a dual staple system featuring rice and indigo (Lees 1978). This stable economy continued relatively unaltered for the balance of the Colonial Period.

South Carolina’s economy was once again crippled by the removal of half of its dual staple economy when the onset of the American Revolution prompted the loss of the English bounty on indigo (Ball 1932: 37; Snowden 1920: 472). However, at the same time, restrictions on the economy of South Carolina were removed, making the increased production of rice a viable strategy for quickly reestablishing a strong economy (Lees 1978).

Following the Revolution, rice production sky rocketed with an all time high being reached in 1850 (U.S. Census 1850).
This rapid increase in the production of rice was largely allowed by the adoption of a technological innovation of the mid-1700s, which took the form of "tidal rice agriculture" (Lees 1978). With this agricultural system, fresh water marshes were enclosed by earthen dikes and turned into rice fields that could be irrigated by the ebb and flow of the tides (Hilliard 1975). Production of rice by this technique allowed a greater production per acre, required less long range labor investment, and was not characterized by the exhaustion of agricultural fields (Lees 1978). This increased efficiency led to a great increase in rice production and to a concentration of rice plantations in the fresh water tidelands (Lees 1978). The efficiency of rice production was additionally increased by the widespread adoption of water powered rice-milling equipment in the 1780s (Lees 1978).

Clearly, during the first decades of the Antebellum period, the economy of the South Carolina tidewater was stronger and more expanded than it had ever been. The immediate post-Revolution adoption of tidal rice agriculture had allowed the major economic advance for tidewater South Carolina, the largest prior to the turn of this century (Lees 1978).

Summary and Conclusions

In this paper, I have discussed diachronic change in South Carolina as revealed by the archeological and historical records. The archeological record has suggested an elaboration and expansion of the built environment at Limerick Plantation following the American Revolution. This has been hypothesized as having been a response to changes in South Carolina's sociocultural system caused by changes in its underlying economic framework.

In an attempt to support this economic shift at Limerick, a comparison of the relative importance of Colono-Indian and European ceramics through time was conducted, and suggests an economic transformation following the end of the Colonial era. This change, which has been loosely associated with an expanding economy, has been used to support the causal role of economic change for the architectural patterning at Limerick, since both shifts were contemporaneous. However, since both architecture and ceramics are dependent parts of a larger sociocultural system, secondary verification was needed and was provided by the construction of a diachronic model of the South Carolina export economy as based on historical documents. An examination of this model reveals that the immediate post-Colonial period in South Carolina was the period
of the greatest economic growth and expansion in South Carolina prior to this century. This model serves to substantially support the economic explanation for the material changes observed at Limerick Plantation, and tends to reject other types of explanations, such as those recently proposed by Deetz (1977).

In this light, the architecture and ceramics at Limerick Plantation are viewed as dependent subsystems of a larger system known as Limerick, each effectively reflecting changes in the larger system. The cultural system known as Limerick is, however, itself revealed as a dependent subset of a larger system, known as South Carolina, with changes at Limerick as a whole being reflective of changes in the larger system. This process of change is by no means one way, though, as changes in a larger system by necessity elicit responses in all related systems or parts of those systems. A change in any part of a cultural system will therefore reverberate to all related systems, making culture change complex and at times subtle, and close to self-perpetuating as well. South Carolina, then, can best be viewed as a system composed of hierarchically ranked dependent subsystems operating within a multiple feedback framework.

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REFERENCES

Ball, William Watts
1932 The State that Forgot, South Carolina's Surrender to Democracy. The Bobbs-Merrill Company, Indianapolis.

Carpenter, J. G.

Clowse, Converse D.

Deetz, James

Dunn, Richard S.
1971 The English sugar islands and the founding of South Carolina. The South Carolina Historical Magazine 72(2):81-93.

First Session of Parliament
1747 An act for encouraging the making of indigo in the British plantations of America.

Goodyear, Albert C.

Historic American Buildings Survey
REFERENCES (CONTINUED)

Handler, Jerome S. and Frederick W. Lange

Hardwick, John
1797 A plan of Limerick, a plantation belonging to Elias Ball, Esqr. South Carolina Archives, Columbia. Microfilm.

Hewat, Rev. Alexander, D.D.
1836 An historical account of the rise and progress of the colonies of South Carolina and Georgia (1779). In Historical Collections of South Carolina, etc., B. R. Carroll editor. Harper and Brothers, New York.

Hilliard, Sam Bowers

Lees, William B.
1978 Old and in the way: archeological investigations at Limerick Plantation, Berkeley County, South Carolina. Institute of Archeology and Anthropology, University of South Carolina, Columbia. Xeroxed.

1979 The architecture of Limerick Plantation through time and space. Unpublished manuscript.

Lees, William B. and Kathryn M. Kimery-Lees

Lewis, Kenneth E.
1978 Commerical livestock raising at Limerick Plantation as an adaptive strategy. Institute of Archeology and Anthropology, University of South Carolina, Columbia. Xeroxed.

McCrady, Edward

Meriwether, Robert L.
REFERENCES (CONTINUED)

Newton, Milton B. Jr.

Noel Hume, Ivor

O'Brien, Michael J.
1926 "Lymerick Plantation" Berkeley County, South Carolina. American Irish Historical Society.

Orvin, Maxwell C.
1973 Historic Berkeley County South Carolina 1671-1900. Comprint, Charleston, South Carolina.

Purcell, Joseph
1786 A plan exhibiting the shape form of a body of land called Limerick. Color map 37 x 60 cm., scale 1:15,840. South Caroliniana Library, University of South Carolina, Columbia.

Salley, Alexander S., Jr. (editor)

SCRSSP (South Carolina, Records of the Register of the Secretary of the Province) Volume F., 1707-1711, South Carolina Archives, Columbia. Manuscript.

Sellers, Leila

Snowden, Yates

South, Stanley

Ver Steeg, Clarence L.
REFERENCES (CONTINUED)

Wood, Peter H.
Introduction

This report constitutes an evaluation of the cultural resources contained within a tract of land in the northeastern portion of Oakland Cemetery in Atlanta, Georgia. The evaluation, and archaeological investigations upon which it was based, was undertaken at the Cemetery's request, in preparation for potential development of the tract by the Cemetery. An assessment of the cultural resources was mandated by two factors: (1) Oakland authorities had applied for a federal grant for general improvements, which brought their proposed action under the requirements of the National Historic Preservation Act of 1966 (80 Stat. 915, 16 U.S.C. 470, as amended), and (2) the Cemetery recently had been placed on the National Register of Historic Places.

Historic Oakland Cemetery, Inc. (HOCI), a nonprofit organization interested in preserving the Cemetery's natural and cultural attributes, contracted with the Laboratory of Archaeology, Department of Anthropology, at Georgia State University to conduct an archaeological investigation in order to determine if there were cultural resources in the aforementioned tract and, if so, to evaluate their significance and recommend ways in which any adverse impact to the resources might be mitigated. The Cemetery's proposed uses of the land included the construction of above-ground mortuary structures, the sale of plots for subsurface interments, or a combination of both.

Roy S. Dickens, Jr., an archaeologist, and Robert L. Blakely, a physical anthropologist, served as co-principal investigators, combining the expertise necessary to fully carry out the contractual agreement with HOCI. Two Georgia State University anthropology majors, Catherine Lee and Neal Coogler, were employed as field supervisors, and a number of Georgia State University student volunteers also participated in the project during the summer of 1978.

THE STUDY TRACT

The study tract comprises 5.7 acres of undulating terrain in the northeastern section of the Cemetery (Figs. 1 and 2). It is roughly hourglass in shape, oriented northwest-southeast parallel to Boulevard Drive. The area, covered with grass and widely dispersed small trees, is impinged upon by two zones of modern disturbance: a three-foot deep, oval mound of refuse (city garbage) covering an area of approximately one-half acre between the constriction of the hourglass and the stone wall along Boulevard Drive; and a three-quarter acre dumping and storage area near the western periphery of the
Figure 1. Map of Oakland Cemetery. Study tract is the open area in the upper right adjacent to Boulevard Drive.
Figure 2. Portion of the study tract looking east. Houses in the background are part of the mill community known as "Cabbage Town."

Figure 3. Motor grader removing top soil in strips along a mapped grid. Building in the background is part of the Fulton Bag and Cotton Mill.
of the study tract adjacent to a greenhouse, maintenance shop, and parking facility.

The study tract was not part of the original Cemetery purchase (Moore 1976). Oakland Cemetery was established in 1850 for the purpose of interring Atlanta's deceased inhabitants. City officials obtained a six-acre parcel of land bounded to the south by Fair Street (now Memorial Drive), to the west by Elmore Street (Oakland Avenue), and to the north by Holcombe Street (no longer in existence) and the Georgia Railroad (Moore 1976). From its inception, the grounds (then known as Atlanta Cemetery) were utilized for the interment of many of the city's White citizens as well as its slave and "free Negro" population. The advent of the Civil War saw the expansion of the Atlanta Rolling Mill immediately northeast of the Cemetery; and war-related activities produced an influx of corpses, primarily Confederate soldiers and state- and military-owned Blacks, into the Cemetery. From a promontory adjacent to the western section of the study tract, Confederate General Hood and his staff observed the Battle of Atlanta 1.25 miles to the northeast (Garrett 1954). In September, 1864, the retreating Confederate army destroyed the Georgia Railroad and rolling mill.

Following the war, the Fulton Bag and Cotton Mill was established on the site of the demolished rolling mill and a mill community, known as "Cabbage Town" after the turn of the century, sprang up immediately east and northeast of the Cemetery (Moore 1976). Atlanta's rapid post-war growth and burgeoning need for burial space prompted the city to purchase the study tract in 1866. The uses to which this parcel of land was then put have remained problematic for more than a century.

Written documentation and detailed maps of the study tract appear to be nonexistent. Elderly informants, however, did indicate that they had been told that at one time the area had been known as the "potter's field" (personal communication: Oakland Cemetery Sexton Laura Barry, former Sexton Ed Walters, and Franklin Garrett). And there are written records that suggest that some portions of the Cemetery had been used for the interment of paupers, a practice that apparently continued until 1884 when Westview Cemetery was established for the burial of Atlanta's Black indigent population (Moore 1976). Writing of the period prior to 1884, Moore (1976:29) reports that

A dramatic increase in Atlanta's black population had been accompanied by related expenses for the city, which could more easily overlook the needs of blacks when alive than the need for the quick disposal of their corpses. The cost of pauper burial weighed on the budget (albeit comparatively lightly), and the space they required reduced Oakland's capacity and revenues. In 1879, for instance, black paupers accounted for nearly thirty-five percent of all Oakland interments and nearly eighty-five percent of the pauper interments.

Furthermore, records at the Cemetery contain the names of roughly 10,000 paupers purported to have been buried within its walls. On the
other hand, there is no mention of where these interments had taken place, and the scanty literature available suggests that many of the pauper remains may have been exhumed and removed to undesignated areas in Oakland or even taken to other cemeteries for reinterment (Moore 1976). A photograph of the study tract taken circa 1885, shortly after the cessation of pauper burial in the Cemetery, shows the area overgrown with scrubby vegetation (Sherry 1976: 14).

It is not unreasonable to suspect, however, that during the eighteen-year period from 1866 to 1884 the Cemetery, pressed for space in which to bury increasing numbers of dead, had utilized the acquired land to that end. And, in addition to the previously cited hearsay, other sources of circumstantial evidence strengthened this supposition: (1) the study tract exhibited several signs of subsurface disturbance, including a few scattered brick structures, occasional broken grave markers, some fragments of pottery and glassware, and rectangularly-shaped dense patches of grass; (2) former Sexton Ed Walters reported that he had stumbled upon what he assumed to be part of a wooden coffin near the stone wall along Boulevard Drive; and (3) excavation for the erection of a stone monument at the southeastern extremity of the study tract revealed what workers later described as "human bones."

It was probable, therefore, that there were nineteenth-century interments in that portion of the Cemetery. Furthermore, the general area had been one of historical significance dating back virtually to Atlanta's beginning. It seemed likely, for example, that the study tract might also contain features associated with Civil War activity and the establishment of the mill community. Clearly, an archaeological investigation was called for in order to evaluate these potential cultural resources.

**SAMPLING DESIGN**

Because this part of the Cemetery consists of several acres of uneven topography in an irregular shape, for sampling purposes it was decided to divide the study tract into three sections, labeled Area A, Area B, and Area C, proceeding from southeast to northwest and excluding the two major disturbed zones (Fig. 4). Area A, roughly triangular in shape, comprises 77,796 square feet (1.79 acres) of generally sloping terrain with its highest point southwest and its lowest point northeast (adjacent to the stone wall along Boulevard Drive). Area B, which is trapezoidal in outline, contains 38,736 square feet (0.89 acres) and slopes downward from due west to due east, with its lowest point also being at the Boulevard Drive stone wall. Area C, nearly rectangular in shape, consists of 78,804 square feet (1.81 acres) paralleling the stone wall next to the Georgia Railroad; it slopes gently from a high point at its westnorthwestern extension to a low point in the eastsoutheast, bounded by the oval refuse heap.

With the aid of a transit, each of the three areas was further divided by means of a rectangular grid system into fifty-by-fifty food units, which were marked by stakes. In Areas A and B, the axes of the grid were oriented north-south and East-west; in Area C, the long axis of the grid was oriented at 300°, so as to align with the configuration of this section of the study tract.
Figure 4. Map of the east end of Oakland Cemetery, showing the study tract, with sampling areas and grader trenches.
Figure 5. Grader trenches in Area A of the study tract. Photograph taken looking south from the roof of the Fulton Bag and Cotton Mill.

Figure 6. Marking features exposed by the motor grader in Area A of the study tract.
It was necessary to adopt a sampling strategy that permitted an adequate survey of possible subsurface intrusions without actually exposing the entire 5.7-acre study tract. Thus the objective was to devise a procedure that would maximize information retrieval at minimal cost and time, thereby insuring that the sample universe would closely approximate the total universe.

The technique settled upon was that of "strip sampling," which entails the use of a motor grader to remove top soil in shallow trenches in a systematic fashion according to the mapped and staked grid (Fig. 3). Motor graders are not new to archaeology. They have been employed to remove overburden, plow zone, mound fill, and roof fall (e.g., Coe 1964). Dickens (1976) utilized the technique at Horseshoe Bend National Military Park in central Alabama to search for subsurface evidence of an early nineteenth-century Indian fortification. At that site, parallel trenches were cut in what was thought to be a perpendicular direction to that of the linear fortification in order to transect the feature (which the grading eventually revealed).

Although discontinuous (nonlinear) features were anticipated in the study tract at Oakland Cemetery, it was felt that a similar approach could be successfully employed to locate small subsurface intrusions over a large area. With a skilled operator and careful monitoring by the archaeologist, sterile soil could be quickly removed to reveal a "clean," unobstructed surface on which subsurface intrusions could be readily detected. Little precision would be lost through this procedure, since each scraping would be controlled to within a depth of 0.2 foot. A fortuitous benefit of the strip-sampling technique at Oakland was that it resulted in negligible disruption for the Cemetery's visitors (living) and minimal disfigurement of the ground surface.

The City of Atlanta donated the use of the motor grader and the services of an operator. Parallel trenches were cut in all three areas of the tract (Figs. 4 and 5). In each area, the direction of the trenches was dictated by the predominant slope of the terrain, since stripping can be most effectively controlled when the long axis of the trench is perpendicular to the contour lines. Thus, in Area A, the trenches were oriented north-south; in Area B, they ran east-west; and in Area C they were oriented east-southeast to west-northwest (parallel to the Cemetery wall) in order to adequately sample that long and narrow section of the study tract.

By using a line of stakes as a guide, the grader operator was able to cut straight trenches. The blade of the machine, which is twelve feet wide, was angled away from the stakes, so that the loose dirt was pushed to the side of the trench opposite the stakes, producing a clean edge and a trench ten feet wide (Figs. 6 and 7). A total of thirteen trenches was excavated: six trenches, forty feet apart, were cut in Area A; four trenches, forty feet apart, were cut in Area B; and three trenches, twenty feet apart, were cut in Area C. Some trenches, or portions of them, contained areas disturbed by modern filling, roadbeds, walkways, and drainage lines, which required deeper
Figure 7. Trench 2 in Area A, showing exposed features. View is to the South.
Figure 8. Students using a ten-by-ten foot grid frame to map features.

Figure 9. Burial pit exposed by the motor grader. Note the symmetrical shape of the pit.
stripping in a second phase of the grader operation.¹

Upon completion of the grading, each exposed subsurface intrusion was carefully mapped on grid paper, indicating precisely the location, dimensions, and orientation of the feature. To facilitate this tedious and time-consuming task, a ten-by-ten foot grid frame was placed over each ten square feet of subsoil as they were mapped (Fig. 8). Positioning of the grid frame was controlled by triangulation from the stakes at the edge of the trench. Should a future investigator wish to relocate any of the features, he or she could do so quickly and exactly by consulting these maps.

**FINDINGS**

The grader operation revealed grave pits in all three areas of the study tract. In addition, some artifacts, such as a .58 caliber Union regular-issue minie ball, undoubtedly were associated with the previously described Civil War activities in and around the Cemetery. Several trash middens, which may have resulted from the nearby mill community, also were delineated. And a small, prehistoric Indian site in Area B attests to the longevity of human occupation in the area. This site, represented by a scatter of quartz cores and flakes, dates from the Middle Archaic Period (circa 4,500 B.C.), and probably belongs to the "Old Quartz culture" (Caldwell 1954). These findings notwithstanding, the major resources discussed herein are the human interments.

The grave pits were, in most cases, quite closely spaced. This was particularly true in Areas A and B, where they appear to have been placed, in some instances less than one foot apart, in systematically arranged parallel rows oriented north-south. Area C seems to have been less intensively utilized for burial purposes. The results in this area may be deceiving, however, because the grader encountered considerable modern disturbance, which excluded large portions of each trench from interpretation.

In Area A (Fig. 10), the motor grader exposed 5,200 square feet of subsoil in a tract of land encompassing a total of 77,796 square feet (6.7 percent).² Two hundred and seven grave pits were uncovered. When these figures are applied to the entire square footage of the area (i.e., \( \frac{207 \cdot 5,200}{x} = 77,796 \)), where \( x \) is the total number of expected burials, it is calculated that Area A contains about 3,097 graves. This works out to one burial per 25.1 square feet, or a grave for every four-by-six foot plot in that portion of the study tract.

¹It still was not possible for the grader to penetrate to subsoil in places where fill or erosional deposition was especially thick. However, it was felt that this did not appreciable detract from the efficacy of the sampling design.

²Exposed footage does not include those parts of the trenches where subsoil was unpenetrated by the grader.
Figure 10. Map of grader trenches and exposed features in Area A.
Figure 11. Map of grader trenches and exposed features in Area B.
In Area B (Fig. 11), ninety features were encountered in 2,900 square feet of exposed subsoil. Of 38,736 square feet, 7.5 percent had been graded. Thus, the overall number of graves in Area B approaches 1,202. The density is one burial per 32.2 square feet, or a grave for every four-by-eight foot section of soil.

Area C (Fig. 12) comprises 78,804 square feet, of which 4,700 square feet, or 6.0 percent, were exposed by the grading operation. Ninety-four features were unearthed. These figures yield a total grave count in Area C of 1,576. Again, this number is an exceedingly conservative, perhaps even an unrealistic, estimate. Nonetheless, this works out to one burial per 50.0 square feet, or a grave for every five-by-ten foot plot in this section of the Cemetery.

Summing the frequencies from Area A, B, and C, the grader operation revealed 391 graves in an area of 12,800 square feet. It is estimated that the sampled sections (excluding disturbed zones) contain in excess of 5,967 graves in an area encompassing 195,336 square feet. When these figures are extended to the entire 5.7-acre study tract, the number of graves approximates 7,575. On the average, there is one burial per 32.7 square feet, or a grave in every four-by-eight foot parcel of land in the "potter's field."

All of the exposed grave pits, regardless of their provenience in the study tract, were oriented with their long axis east-west. They were always rectangular in shape with sharp corners, and exhibited remarkable symmetry (Fig. 9). Obviously, they had been dug with considerable care and skill. Grave pits ranged in size from as large as 8.0 feet by 3.0 feet to as small as 2.5 feet by 1.0 foot. It was later learned that the dimensions of each pit were dictated by the size of the coffin to be placed in it, which, in turn, was determined by the size (ultimately the age class) of the individual to be interred.

Further information was obtained from the strip-sampling procedure. Broken and intact artifacts, such as ceramic and glass cups and vases, medicine bottles, oyster shells, and conch shells, were recovered. These objects, in most cases, are thought to have been grave decorations or offerings, products of a common mortuary practice among Black Americans and their African antecedents (Combes 1972; Vlach 1977). Combes (1972:56) reports that the grave pits of nineteenth-century Blacks in coastal South Carolina contained

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3Extrapolation of the burial count to include disturbed zones seems justified since use of these areas for refuse and fill postdate the utilization of the study tract for interments. Furthermore, in the spring of 1979 exploratory excavations seeking a suitable location for a new, underground sewage tank in the dumping ground at the western periphery of the study tract revealed the same pattern of grave outlines, beneath several feet of fill, as was encountered in the penetrated portions of Areas A, B, and C.
Figure 13. Burial pit with fill partly removed. Chamber for the coffin is as yet unexcavated.
Figure 14. Burial pit fully excavated. This was the grave of an infant.
Figure 15. Grave of an adult male. Note the remains of the rectangular coffin draped over the bones.
Figure 16. Upper portion of a burial pit (same as Fig. 15), showing brick border.
cups, saucers, bowls, dishes, tumblers, kerosene lamps, clocks, medicine bottles, pitchers, various cut glass pieces and just about every other household item imaginable... There also may be many pretty sea shells with the conch being the most popular...

In addition, the strip-sampling operation unearthed a few fragmentary grave markers, of both stone and metal. In no instance, however, could it be ascertained whether these markers had been associated with graves in the study area, or had been displaced from adjacent parts of the Cemetery.

In the final phase of the field project, a small number of graves, representing all portions of the study tract, was selected for complete excavation. (Grave pits only partially exposed by the motor grader were excluded from the sample). Graves were chosen partly on the basis of the size of the pits, on the assumption that a range of variation in burial content could thus be obtained. Although only fourteen graves were excavated, significant cultural, as well as biological, information was acquired.

The grave pits were dug with vertical walls to a depth of approximately 3.5 feet, at which point the floor of the pit had been leveled and a smaller excavation made in the exact shape of the coffin (Fig. 13). These smaller chambers were dug to a depth consistent with the depth of the coffin: for adults, about 1.0 foot, and for infants, about 0.7 foot (Fig. 14). Thus the total depth from ground surface to the bottom of the grave was about 4.5 feet for adult interments.

After the coffin had been lowered into the pit, a covering of wooden planks was placed over the coffin and across the dirt ledge. These planks were set at a right angle to the long axis of the grave. An informant, Lester A. Campbell, aged sixty-nine years, from Tennessee, reported that as a child he had observed burials in which boards were placed across the ledge of the grave pit above the casket. The purpose of these slats, he recalled, was to support the weight of the fill dirt used to cover the casket (personal communication: Joe Evans).

The coffins were made of wood, and held together by cut nails. In most instances, however, little of the wood comprising the coffins had survived one hundred years in the ground. Exceptions to this included Feature 12.34 (Area C) in which were discovered remnants of a wooden "trap door" and Feature 3.32 (Area A) in which the remains of the deceased were found "draped" with the wooden top of the coffin (Fig. 15). The upper portion of this feature also had a border of bricks that had been placed around it sometime after interment had taken place (Fig. 16). Combes (1972) has shown that this was a common practice among nineteenth-century Blacks in South Carolina, where the brick border apparently was used en lieu of a stone monument.

Coffins ranged in shape from rectangular (Figs. 17A and 18), to oblong hexagonal (Figs. 17B and 19), to oblong octagonal (Figs. 17C and 20). It has been speculated that these different shapes reflect the disparate
Figure 17. Coffin shapes encountered in the Oakland Cemetery excavations.
Figure 18. Burial in a rectangular coffin. Note the brass handles and oval viewing glass over the head and chest.
Figure 19. Burial in a hexagonal coffin. Note the handles and coffin nails.
Figure 20. Burial in an octagonal coffin. Note the handles, coffin nails, and remains of boards on the ledge over the skeleton.
socioeconomic statuses of the families of the deceased individuals. Perhaps in the case of true pauper burial, the city provided a simple, undorned pine box. In other cases, however, a more expensive container may have been provided by the family of the deceased. (This idea is elaborated upon below.) The amount of casket ornamentation varied widely from nothing, in the case of infants and some adult burials, to elaborate handles and other decorations of brass and/or pewter in some adult burials, to one example (Feature 7.19 in Area B) of a coffin with an oval viewing glass over the head and chest of an adult male (Fig. 18). Combes (1972) reports recovering a coffin in a nineteenth-century Black cemetery in South Carolina that contained a similar "bust window." And, an Atlanta resident Mary C. Campbell, aged sixty-eight years, recalled attending a funeral service at which the coffin had a glass window above the head and chest of the deceased. She pointed out that such coffins were used so that the body could be viewed without opening the lid of the coffin (personal communication: Joe Evans). Presumably, this practice originated when embalming techniques were less sophisticated than today.

These "individualized" casket features, along with the different coffin shapes and varying degrees of casket ornamentation, clearly demonstrate that not all of the interred individuals were derived from Atlanta's pauper population. While paupers undoubtedly constituted a portion, perhaps a sizable portion, of the burial sample, it seems probable that the general burial population represents the moderate-to-low income class of Atlanta's nineteenth-century society. Thus, rather than characterize the study tract at Oakland Cemetery as the "potter's field," it would be more accurate to view it as a segregated burial ground for Black Atlantans from a time period when "Black" and "pauper," with some justification, may have been regarded as synonymous.

This conclusion is supported, in part, by an examination of the items of personal adornment associated with the physical remains. The individuals appear to have been modestly attired, with only occasional ornamentation. One individual (Feature 7.9 in Area B), however, had a brass ring on the middle finger of her right hand and numerous small, glass beads in the neck region that are assumed to have been decoration on a dress. Another adult female (Feature 12.34 in Area C) had a tortoise shell hair pin, and an elderly male (Feature 10.23 in Area B) had a metal clasp, presumably for a necktie, on his chest. One adult male (Feature 3.32 in Area A) was interred with his head resting on a highly decorated, multiple-layered and tasseled pillow. None of the infant burials yielded ornaments, but glass buttons, ranging in number from two to six, left evidence that they had worn a gown or shroud.

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4A second possibility is that these three shapes have temporal significance.
Figure 21. Typical undorned adult burial. Note the head is to the west and the hands are crossed over the abdomen.
The bodies had been placed in the casket in an extended and supine position and were then buried with the head at the west end of the grave (Fig. 21). This was a common mortuary custom among American Blacks and West Africans (Vlach 1977), which originally was done to permit the deceased to watch (at least spiritually) the rising sun in the East. Typically, the lower arms and hands had been crossed on the chest or abdomen. Occasionally post-mortem earth slumpage and/or the decomposition of the soft tissue displaced these bones. In Feature 7.19 in Area B, for example, the left arm had dropped to the side, but the hand bones remained in the pelvic basin. Water seepage resulted in further displacement of skeletal parts. In one case (Feature 11.48 in Area C), the mandible had been turned upside down and backwards. Preservation of the skeletons ranged from poor to exceptionally good. In two instances (Features 2.3 and 3.32 in Area A), the removal of the skull revealed well-preserved human hair adhering to the occipital bone.

Physical anthropological analyses of the skeletal material confirm that the individuals were, indeed, Black. They ranged in age from neonate to the aged; a breakdown by age and sex shows that the fourteen individuals included four adult males, four adult females, one adolescent female, and five infants. Unfortunately, the small sample size and the possibility that these individuals may not be biologically representative of the burial group as a whole preclude statements concerning the demographic structure of the population from which the sample was drawn.

Among the pathological conditions observed was a massively-boned adult male (Feature 3.32 in Area A) who was found to have successfully recovered from a fractured cheekbone and an ice pick wound to the temple (a part of the metal instrument remained imbedded in the parietal bone). And a young adult female (Feature 2.3 in Area A) had suffered a dislocated hip shortly before her death. Attempts are currently underway to determine the stature of the subjects and, through trace elements analysis, to partially reconstruct their diets. Additional studies of casket fixtures and grave associations are also underway.

**SUMMARY**

The archaeological assessment has been sufficient to provide Oakland Cemetery and HOCI with the necessary information for an adequate cultural resource evaluation and an ultimate ruling by the State Historic Preservation Officer and the President's Advisory Council on Historic Preservation. To say that there are important cultural resources in the study tract is to seriously understate the case. The land contains a prehistoric Indian site from the Middle Archaic "Old Quartz" culture, and there is material evidence of Civil War activities in the area as well as detritus associated with the old mill community. But the overriding historical resources within the study tract are the physical and cultural remains of over 7,500 Atlantans who lie buried in unmarked and, heretofore, unknown graves.
The strip-sampling techniques proved successful as a rapid and effective means for determining the density and distribution of graves within the study tract. From these data it was possible to estimate the number of graves within each sampling area, and then to predict the total number of burials in the entire study tract. Careful monitoring of the grading also provided information on grave decorations.

Excavation of fourteen graves produced valuable information on pit form, coffin types, burial associations, and physical anthropological attributes of the skeletons. These data, still in analysis, should contribute to a better understanding of the mortuary behavior, health conditions, and circumstances surrounding death of late nineteenth-century urban Blacks.

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REFERENCES

Caldwell, Joseph R.

Coe, Joffre L.

Combes, John D.

Dickens, Roy S., Jr.

Garrett, Franklin M.

Moore, Kent

Sherry, Grace T.

Vlach, John
EARLY BRITISH SUBSISTENCE STRATEGY AT MICHILIMACKINAC: A CASE STUDY IN SYSTEMIC PARTICULARISM

Gary Shapiro

The sociable disposition of the commandant enabled us to pass the winter at Michilimackinac in a manner as agreeable as circumstances would permit. The amusements consisted chiefly in shooting, hunting, and fishing. The neighboring woods abounded in partridges and hares, the latter of which is white in winter; and the lake is filled with fish, of which the most celebrated are trout, whitefish, and sturgeon.

(Alexander Henry at Michilimackinac, in 1762; Henry 1809:52)

Introduction and Historical Setting

Strategically located on the southern side of the Straits of Mackinac, a body of water connecting Lakes Michigan and Huron, Fort Michilimackinac served as a major center of the French and British fur trade throughout the eighteenth century. The importance of the Straits area was recognized as early as 1671 by the French Jesuits who in that year established a mission to serve as a focal point for Ottawa, Chippewa, and Huron groups residing west, north, and east of that area. By 1683 the Mission at St. Ignace had begun to serve as a French military post (Miller and Stone 1970:8). The fortified post of Michilimackinac was constructed on the south shore of the Straits about 1715 (Maxwell and Binford 1961:113).

Thus, the geographic location of Fort Michilimackinac was early recognized by the Europeans to be of great import. Because Michilimackinac represented control of the westward expansion of the fur trade, it assumed military significance as well as economic. For the French, there was the constant threat of competition from the British Hudson's Bay company to the north, and military control was imposed in order to protect economic interests. Throughout French hegemony at Michilimackinac, the Fort was usually garrisoned by no more than 35 soldiers. Although the Fort served as a base for some raiding activity by the French, its main purpose was to serve as a trading settlement. During this time Michilimackinac
functioned as a supply depot for traders arriving from the east in spring or autumn to secure provisions for winter trading forays to the north and west. The struggle for control over the western frontier prompted the King George's Wars and the French and Indian War which depressed the fur trade and the general economic system at Michilimackinac between 1744 and 1760.

At the close of the French and Indian War Michilimackinac was ceded to the British, who occupied it from 1761 until 1781. The articles of capitulation, signed at Montreal in 1760, guaranteed religious freedom for the French inhabitants of the newly acquired British territory. In addition, French residents at Michilimackinac were allowed to retain possession of land and property at the Fort, forcing the British garrison to rent housing from their former adversaries.

Documentation of Fort Michilimackinac after 1760 is much more complete than during the French regime. Both fur trade activity and population size increased during this period. Historically and archaeologically it is known that the British period saw an increase in social stratification as well as a shift in orientation of purpose. Whereas Michilimackinac functioned primarily as a trading outpost for the French, the British increased emphasis on the Fort as a military garrison with a secondary emphasis of maintaining British trading interests (Stone 1974:354).

As part of Pontiac's uprising, Fort Michilimackinac was attacked and captured by a group of local Ojibwa on June 2, 1763. The Fort remained virtually abandoned until it was reoccupied by British forces nearly a year later (Henry 1809:155).

In 1781, Fort Michilimackinac was reestablished on Mackinac Island, in the Straits of Mackinac. This move was conducted in order to establish the Fort in a more defensible location for fear of attack by American Revolutionary forces to the east. During the winter of 1780-81 materials and some buildings were carted across the ice to Mackinac Island.

The site and remains of original Fort Michilimackinac on the south side of the Straits soon became covered by windblown beach sands. In 1857 the original site of the Fort and a small parcel of surrounding land was set aside as a local park by the Village of Mackinaw City, and in 1904 was transferred to the State of Michigan to be administered by the Mackinac Island State Park Commission.
Since 1959, the Mackinac Island State Park Commission, in cooperation with the Museum of Michigan State University, has conducted a program of active archaeological and historical research at Michilimackinac. The materials analyzed in this report were recovered during the 1977 excavations at Michilimackinac, conducted by Dr. Donald P. Heldman, staff archaeologist for the Mackinac Island State Park Commission.

The 1977 excavations at Michilimackinac investigated House 1 of the South Southeast rowhouse and its associated garden area. Results of the excavation season are available from the MISPC:


Where Fort Michilimackinac was once considered important for its strategic location, reflecting military and economic concerns, it is today held in esteem by historians and anthropologists as a subject and repository of knowledge. To the historian, Michilimackinac presents the opportunity to elucidate our understanding of the historical processes which so greatly influenced the development of the North American fur trade, including the subsequent expansion of European presence and its effects on the aboriginal population of North America. On the other hand, Fort Michilimackinac represents a laboratory for the anthropologist. Archaeology at Michilimackinac presents the opportunity to test hypotheses concerning a broad range of cultural processes, for here is a site that can yield detailed data relating to the interface between culturally distinct populations of European and aboriginal peoples. The present research is directed toward an anthropological investigation of subsistence adaptations.

The Theoretical Construct

The systemic view of culture is an approach currently popular among anthropologists. This view defines culture as composed of "parts, structurally different from each other, but articulated within the total system" (Struever 1971:10). Understanding of the cultural system then, depends upon an understanding of the relationships between its components. It can be further demonstrated that the components themselves
Map 1. The Upper Great Lakes.

The Upper Great Lakes

Lake Superior

Michigan

Lake Huron

Ontario

Wisconsin

Lake Michigan
are systems, and therefore several levels of interrelationships must be investigated in order to better understand the cultural system(s) as a whole.

This model requires a hierarchy of examination that takes us from the smallest complex of interaction to the greatest. The research strategy "is therefore to isolate each system and study it as a separate variable" (Flannery 1967:120). Such an approach is employed in the study of subsistence strategy at Michilimackinac.

Subsistence strategy is here seen as a system that articulates with other systems as components of the cultural whole. As such, subsistence strategy possesses its own set of components and variables. In order to understand the interrelationships between components at this level of investigation certain systemic components which are normally seen as variables must be held constant. This is an approach I will call "systemic particularism" for we are examining particular aspects (variables) within a system as prerequisite to "reconstruction of the entire pattern of articulation" (Ibid:120).

As with any other system the variables and articulations which compose subsistence strategy are infinitely complex. The selection as to which variables will be held constant are determined by an interplay between research design and the nature and quality of the archaeological data that is recovered. To this formula we might add a consideration of historic documents as a third (and essential) element involved in selection of variables.

Binford (1972:117) is correct when he asserts that the scientific procedure of "observation, hypothesis formulation and testing - is necessarily involved with problems of process and is what constitutes the scientific method". While these are truly the elements involved, the systemic nature of scientific study itself have been insufficiently stressed. This tripartite structure of scientific inquiry is of greatest utility in the initial planning stages of research, but the archaeologist, once in the field, frequently finds reason to restructure hypotheses, redirect observations, and even to alter excavation strategy. This is the systemic side of research method. The alterations in research design are based on the feedback between observation, hypothesis formulation and testing, and are made within the framework of the
preconceived research strategy. The selection of constants and variables (which defines the systemic particularist approach) is no exception to this process of feedback.

Subsistence Strategy and the Limitation of Variables for Analysis

An examination of subsistence strategy was one of the major emphases of the 1977 excavations at Michilimackinac. The faunal analyst was present in the field and either excavated or directly supervised excavation of those features which displayed concentrations of faunal remains. The importance of this arrangement cannot be overemphasized. It allowed for a standardization of recovery techniques and maximized bone recovery, increasing the validity of comparisons between features. All refuse deposits were carefully excavated by hand and matrices were water-screened through fine mesh window screen. Equally important, however, was the ability of the faunal analyst to make observations in the field, which affected hypothesis formulation which in turn affected testing through faunal analysis. The resultant modifications in research design were essentially selective processes allowing for a more focused problem orientation and greater control of variables within the research universe. The sequence of development for the research strategy is briefly described below.

At the outset of the field season, research strategy was based on prior archaeological and historical research, and was designed to complement these studies. Most important of the archaeological contributions concerning subsistence at Michilimackinac, is a study by Cleland (1970) which compared faunal remains from French and British contexts with one another and with faunal remains from the Juntunen site, a prehistoric, Late Woodland occupation located in the Straits of Mackinac. Cleland's study was designed to provide a diachronic perspective on subsistence activities of three culturally distinct occupations of the same geographical area. Differences between the three components were apparent, and Cleland describes these in his conclusion:

Both the French and British subsistence patterns differed from the one at the pre-contact Juntunen site because they were primarily supported by imported foods. The French subsistence scheme differed from the British in the quantity of imported food available. Since the French supply system was relatively small and intermittent, the French exploited a great many more local food sources than the British. (1970:19).
It is important to note that elsewhere in his report Cleland recognizes the importance of variables other than supply logistics in determining subsistence patterns. Nonetheless, in order to compare these three components Cleland employed a normative view of subsistence strategies for each. That is, by combining data from several storage pits, basements, and refuse pits (four French features and five British) it was implied that the sample obtained represented or typified both the British and the French subsistence strategies. The conclusions were based upon a total of 363 identified bone fragments from British features and 317 from French features.

It was early decided that the 1977 investigation of subsistence strategy would not attempt such an undertaking. It was judged doubtful that any sample of faunal remains recovered would be representative of a "typical" subsistence pattern, be it French or British. This decision was made not to belittle Cleland's effort, for the diachronic perspective is important and has always been a mainstay of archaeological contribution to anthropology; rather it was made in recognition of inherent limitations of archaeological data and of the established research goals of the 1977 excavation. Proper investigation of that problem would involve extensive sampling of the entire fort area, whereas the established excavation plans called for excavation of House 1 and its immediate environs.

The only other study of faunal remains from Michilimackinac is an unpublished masters thesis by Elizabeth Butsch currently on file at the Mackinac Island State Park Commission. Butsch compared faunal remains from several types of archaeological features at Michilimackinac (construction features, refuse deposits, fireplaces, etc) to demonstrate that each type of feature showed a different faunal assemblage.

With the information gathered from these two prior studies, a preliminary research strategy was formulated. Whereas Cleland combined data from several features, this study would examine features as single units. Whereas Butsch examined differences between different types of features, this study would examine differences or similarities between like feature types; that is, features whose contents indicate their primary function to have been refuse disposal.

At this stage it was possible to construct hypotheses and observational predictions to account for these differences or similarities. These were derived from both archaeological
and historical data. For instance, historic documents indicate greater social stratification among the Fort's inhabitants during the British period, and that "status differences were recognized between craftsmen, officer's families, traders, and so on" (Miller and Stone 1970:19). If differences were found between features they may be the result of differential access to subsistence resources due to status or wealth. This hypothesis could be tested by examination of the artifacts associated with the faunal remains, and may be supported by a differential representation of preferred food items.

Several other hypotheses and related sets of observational predictions were formulated as well, including systemic variables such as seasonality of deposition, change in supply logistics through time, relationships with native groups, and cultural affiliation. These constructions were, at this state, largely intellectual exercises, for the exact nature of the archaeological data and its associated interpretive limitations or opportunities were not yet known. The value of these preliminary hypotheses lay in their role in organization of data and the establishment of a conceptual framework for a more specific inquiry. We were, and still are, in possession of a repository of possibilities which continues to focus as fieldwork progresses.

Eleven features excavated during the 1977 excavation season have been interpreted as refuse pits (Heldman 1978:94-99). Of these, three showed a sufficiently large sample size as to allow interpretation of subsistence patterns. These are features F561, F636, F641 (see Map 3). In the field it became evident that at least two of these features differed greatly in composition. Feature F636 appeared to be composed primarily of fish and bird remains whereas F641 exhibited a great quantity of large mammal remains and fish bone.

A more important field observation was the ability to identify those features that represented short term-primary as opposed to secondary-long term deposition episodes. These terms are used here to distinguish between refuse deposits created at or shortly after use and those that represent either redeposited material or material which accumulated through a period of time. Two attributes are considered as evidence of short term-primary deposition: the presence of articulated skeletal elements and the lack of stratigraphy within a feature. That is, elements found to be articulated in situ are assumed to have been deposited while still bound by flesh and ligament. The observation of articulated elements,
in conjunction with a lack of stratigraphy within a feature, is taken as evidence of short term-primary deposition. Based on the above criteria, in addition to subsequent analysis of faunal remains, features F56l, F636, and F64l are interpreted as short term-primary deposits.

The similarities exhibited by these three features in terms of depositional characteristics strengthened any comparison between them, and eliminated the sources of error identified by Butsch (1970). Even more significantly, it became apparent that each represented the material remains of a group of related subsistence activities - a most important consideration, toward further development of research strategy and the focus of problem orientation.

Subsequent to field observation, laboratory analysis of artifact content for F56l, F636, and F64l revealed that each of these three features were constructed during the British period of occupation (1761-1775) and further suggested that all three date between 1761 and 1765 (Heldman 1978:34-35 and 39). The relative contemporaneity of these deposits enabled the control of several systemic variables which proved to be of major importance toward development of a specific research objective. This contemporaneity enabled a synchronic view of subsistence activity, controlling major variables such as supply logistics and relationships with local populations both of which are subject to change through time, and must be treated as variables if a diachronic perspective is employed. At this stage of research, I was able to narrow the research focus to two major hypotheses as potentially explaining differences between the faunal assemblages present in the three features. Status differential, as mentioned previously, remained a consideration, as well as hypotheses relating to seasonal fluctuation in subsistence strategy.

Plotting of the refuse features on the archaeological map (see Map 3) showed that F56l was located within the porch area of House 1 of the south southeast rowhouse, and that both F636 and F64l were located in the garden area associated with House one. This garden area south of the structure was fenced-in, and probably used by the inhabitants of House 1. If we assume that between the years 1761 and 1765 House 1 was inhabited by the same occupants, or if not, that the new inhabitants represented the same social class, then for the purposes of this research the variables of status differential as well as differential cultural affiliation can be held constant. Thus, the researcher is left with the testable hypothesis of seasonal change in subsistence strategy.
The last assumption, however, is the most tenuous of all, and the hypotheses of status and cultural differential were retained as alternative hypotheses. In addition, a third alternative hypothesis was considered: that variation in the faunal assemblage for the different features may result if each feature represents a specific, short-term subsistence related activity, with all the activity sets taking place during the same part of the year. Subsequent analysis of faunal remains however, supported the hypothesis of seasonal variance of subsistence strategy.

The discussion presented above has revealed a procedure for the limitation of systemic variables, which the author has named systemic particularism. It serves as a case study for the systemic approach suggested by Flannery (1967) coupled with a consideration of the systemic nature of the information-gathering process itself.

The Research Orientation

A popular belief is that unlike the French, the British were not willing to accommodate their lifestyle to the demands of the North American environment. That in lieu of adopting the modes of survival practiced by the "savages," the British attempted to import their own traditional means of subsistence, and further, their entire cultural complex to the wilderness of North America. Indeed, the importation of livestock, meat, grain, and other foodstuffs is well documented during the British hegemony. This notion is supported as well by the archaeological data presented by Cleland, who describes the British at Michilimackinac as "transplanted Englishmen," men who must have preferred roast beef, salt pork, biscuits and Bristol beer to spruce beer, moose, sagamity, and corn gruel." Cleland further asserts that "Fortunately, the British logistic system was sophisticated enough to gratify most of these food preferences" (1970:18). Although this concept of British importation of material and ideological aspects of culture continues to be popular, this "Gentlemen on the Frontier" orientation has come under recent criticism by historians as well as anthropologists:

(Cleland, 1971) correctly suggests that the differences between the British dietary pattern and that of the French can be plausibly explained by the former having superior naval power and a more active colonial policy, thus permitting a much better supply system; but the historical generalities in the conclusions read rather like a Rule Britannia interpretation of
Noel Coward Englishmen transporting British culture overseas and establishing some corner of a foreign field that would be forever England. In fact this caricature of British imperialism and its attendant Ryder Haggard and Sanders of the River folklore — from which Cleland seems to have derived his model — is one of the later nineteenth century and has nothing to do with events 100 years earlier at Fort Michilimackinac. (Walker 1972:169).

Indeed, there is ample documentation of utilization of other food sources during the British period. In addition to the raising of livestock and the cultivation of gardens, hunting and fishing are mentioned, and trade with the local Indian groups provided some sustenance at least during the early British occupation. Alexander Henry, a British trader who wintered at Michilimackinac in 1762, states that fish caught through the ice constituted the main food of the Fort's inhabitants. He further states that when the fishery fails the inhabitants have recourse to the purchase of maize and beef,

These high prices of grain and beef led me to be very industrious in fishing. I usually set twenty lines and visited them daily, and often found at every visit enough to feed a hundred men. Whitefish, which exceed the trout as a delicious and nutritive food, are here in astonishing numbers ... those who live on them for months together preserve their relish to the end. This cannot be said of the trout. (Henry 1809:54)

Henry also mentions trade with Indian groups as a food source,

On the second day of April the ice broke up and navigation was resumed; and we immediately began to receive from the Indians around us large supplies of wild fowl. (Ibid:56)

Not only do the historic documents indicate a variety of food procurement strategies, but they indicate that the British supply network was not so efficient as has been assumed. This became especially crucial during the later years of British occupation at Michilimackinac when supply networks were restricted due to naval involvement in the American Revolution. The ensuing food crisis prompted a directive in 1779 from Canada's governor, General Frederick Haldimand, suggesting
that the British make up shortage in provisions by obtaining wild game from the Indians and by fishing the waters of the Straits of Mackinac. Major Arent Schuyler dePeyster, commandant at Michilimackinac, replied that this suggestion was 'impracticable'. Once, he admitted, the Indians of the area had brought considerable wild game to the Fort's residents. ...But by 1779, DePeyster said, the game was not as plentiful and the Indians had grown lazier. (May 1964:7)

The documents presented above are a small sample of those relating to subsistence at Michilimackinac, many of which illustrate the importance of wild animal food resources, especially fish, to the Fort's inhabitants. The question remains, to what degree did the seasonal availability of wild foods affect subsistence strategy at Michilimackinac? In our consideration of this variable it does not matter whether the wild foods were gathered by the Indian or by the British, since the effect on overall subsistence strategy would be the same in either case. If seasonal availability of wild food resources was an important factor for British subsistence strategy, it stands to reason that this factor would have been at least as important in pre-contact times. In this light, a consideration of aboriginal subsistence in the Straits area is most appropriate.

There is ample evidence for three distinct regional adaptations in the Great Lakes region prior to, and during the early period of European contact (Cleland 1966:69). Evidence for these adaptations is apparent in historic documents and is confirmed by zooarchaeological investigation. The first adaptation is represented by large agricultural villages and is restricted to regions conducive to intensive corn agriculture, well south of Michilimackinac.

The second type is based on marginal corn agriculture, fishing and hunting. The northern limits of this adaptation appear to lie at least fifty miles south of Michilimackinac.

The third type of adaptation is represented by peoples who may be best described as fishermen and hunters. This adaptation was widespread in the Canadian biotic province, which includes the area surrounding Michilimackinac and northward until the northern boundaries of Lake Superior. Cleland (1966:23), has demonstrated that there has been little ecological change in this area since prehistoric times. Cleland's (1966:69) characterization of subsistence adaptation in this province follows:
Here, we find people who were strictly hunters and gatherers, except that they would be more accurately described as fisherman and hunters. Population density, and the size and composition of residential units varied greatly with both geographic location and the season of the year. Typically, small patrilineal bands gathered on lake shores in the summer to fish and collect wild plant foods, then with the winter, they scattered over wide areas to hunt moose, woodland caribou, beaver and hare.

The adaptive response to seasonal increases in resource availability is well documented for this region. In the late seventeenth century, La Potherie described the Saulteurs (Ojibwa) at Sault Sainte Marie:

This tribe is divided: part of them have remained at home to live on this delicious fish (whitefish) in autumn, and seek their food in Lake Huron during the winter; the others have gone away to two localities on Lake Superior, in order to live on the game which is very abundant there. (Blair 1911:276-7)

In addition to abundant historical documentation relating the importance of seasonal resource availability, especially with regard to fish, Cleland's analysis of faunal remains from the Juntunen site, a Late Woodland occupation in the Straits of Mackinac, is interpreted as representative of this pattern. This Late Woodland "inland shore fishing complex" is described as follows:

During the early spring when other food was scarce the fish spawning runs concentrated large numbers of fish in shallow water areas where they could be exploited for human consumption. Chief among these was sturgeon...During mild and late summer, fishing continued to be important but more time was spent hunting mammals and birds...When the lake waters began to cool in late November large numbers of lake trout and whitefish moved into shallow waters to spawn. These species were taken with harpoons and gill nets and then stored for winter use. The completion of this fish harvest coincided with the advent of winter and the season of hunting. (1966:209)

Cleland demonstrates further that this adaptation is of considerable antiquity, probably beginning during the Middle
Woodland period which saw the introduction of the use of nets, implying subsequent evolution of social and settlement patterns to best exploit this tremendous food resource (1966:76).

Likewise, ethnohistorical data presented by Jenness (1935) and Hickerson (1962) describe this seasonal economy for Ojibwa groups of Parry Island and Wisconsin.

It should be noted that, as during the British occupation, locally available food resources did not represent the entire subsistence system for the aboriginal occupants of the Straits area. As with the British, trade and importation of non-local foods played an important role in subsistence. Tooker (1964:25) notes that "corn, fishing nets, wampum, and other objects were traded to the Algonquin for fish and for animal skins (Jesuit Relations 13:249; 27:27; 31:209; 33:76)" and that "This trade made Huronia 'the granary of most of the Algonquins' (Jesuit Relations 8:115)."

It has been demonstrated that seasonal availability of animal resources as well as trade for non-local foodstuffs played an important role in the subsistence strategies of aboriginal inhabitants of the Straits area. It should be recalled that subsistence systems do not operate as independent variables, but articulate within the entire cultural system. A change in one component of the cultural system will reflect changes in other components of the same system. Some anthropologists have classified major cultural components into technological, ideological, and social variables. Since an investigation of the impact of seasonal availability of wild food resources during the Early British period at Michilimackinac (1761-1765) invites comparison with aboriginal strategies, this research will in essence examine the similarities between European and Indian subsistence in the same geographical area. For such an analysis, the systemic model is of paramount importance, for not only are the adaptive similarities significant, but the differences as well - because it is the differences in adaptation that reflect the differing technological, ideological, and social variables of the Indian and the European cultural systems.

Thus, the systemic particularist approach is employed to limit variables and focus research design. This process involves the concept of information feedback between research design, field observation, laboratory analysis, and consideration of historic documents. Three contemporaneous features,
F561, F636, and F641, all of primary deposition and associated with a single residence, are compared. The synchronic view is employed to test the hypothesis that during the Early British period, that inhabitants of Fort Michilimackinac did, at least in part, alter their subsistence strategy to conform to the seasonal character of food resources at Michilimackinac.

Analysis

The faunal remains were identified through the use of comparative skeletal collections at the University of Michigan, Michigan State University, and the University of Georgia. Mollusc remains were identified by Fred Thompson at the Florida State Museum.

A total of 6,984 bone fragments was recovered from the three features. Due to the remarkable preservation of faunal remains at Michilimackinac and to the efforts at maximizing recovery on the site, 644 bone fragments could not be assigned to class, and an even greater number (4,771) could be assigned no designation further than class. Mollusc remains appear listed at the end of this research. Mollusca was not represented in sufficient quantity to indicate that it contributed at all to the diet.

Three attributes of the features under consideration are essential toward testing of the seasonality hypothesis: first, that the contents of each feature reflect the activity of refuse disposal; second, that each feature represents short term-primary deposition; third, that the three features are contemporaneous. Evidence for these attributes is discussed by Heldman (1978) and is summarized below.

A lone trash pit (Feature 561) was found and completely excavated within the area enclosed by the ruin of a porch along the north side of House 1. Because it contained a large assemblage of artifacts dating to the early period of British occupation of Michilimackinac, it is our best evidence that the north porch was abandoned when House 1 was razed and completely rebuilt in the 1760's; indeed this large pit contained refuse of the razing of House 1. The pit was ovoid in configuration and measured about 4.1 feet at its widest point and was 2.1 feet in depth (Figures 1 and 3; Map 2). Composed of mixed loamy sand, charcoal, and scattered and mottled clay, the pit contained
Fig 1a

% of Identified Bone per Class: British Period Faunal Remains by Cleland, 1970

Fish: 9.5
Bird: 27.8
Mammal: 62.7
Fig 2

% of Fish Bone Contributed by Major Fish Species

- STURGEON
- LAKE TROUT
- WHITEFISH
- SUCKER

<table>
<thead>
<tr>
<th>Species</th>
<th>F561</th>
<th>F636</th>
<th>F641</th>
</tr>
</thead>
<tbody>
<tr>
<td>STURGEON</td>
<td>53</td>
<td>13.5</td>
<td>48.1</td>
</tr>
<tr>
<td>LAKE TROUT</td>
<td>10</td>
<td>21.5</td>
<td>4.4</td>
</tr>
<tr>
<td>WHITEFISH</td>
<td>2.2</td>
<td>5.5</td>
<td>0</td>
</tr>
<tr>
<td>SUCKER</td>
<td>30.5</td>
<td>61.8</td>
<td>27.4</td>
</tr>
</tbody>
</table>
Fig 3

% of Meat Contributed by
Wild vs Domestic Species

Wild Domestic

F581 70.1
F638 53.6
F841 79.5
plain white salt glaze, scratch blue, Whieldon Type fine earthenware and Chinese export porcelain ceramics, all found in 1976 (Heldman 1977: Appendix 2), and English polychrome delft ceramics recovered in context in 1977 (Appendix 2) (Heldman 1978:34-35).

Heldman notes that because F561 is "stratigraphically (Level VI) and culturally early in the British occupation of House 1, and it was placed where the earlier French porch stood prior to the rebuilding...It is therefore concluded that this large refuse pit was created when House 1 was rebuilt or shortly thereafter, sometime in the early to mid-1760's" (1978:35).

Field notes recorded during the excavation of F561 note the occurrence of articulated skeletal elements throughout the feature. In most instances the elements involved were bird limb elements and fish vertebrae. In addition, one nearly complete red fox (Vulpes fulva) was found close to the top of the feature.

Features 636 and 641 were located immediately south of a garden fence which delimited the garden of House 1 prior to its rebuilding by the British in the early 1760's, and are north of the British garden fence (Heldman 1978:39).

Two of the pits (Features 636 and 641) contained British artifacts...All belong stratigraphically to Level VI and hence date to the British occupation of House 1 (1761-1775). The relatively large samples of artifacts from Features 636 and 641...suggest they were created by their colonial excavators sometime early in the 1760's (Appendix 2).

It is therefore concluded that the lineal arrangement of the British refuse pits north of the garden fence and within the powder magazine entrance itself probably results because the fence uprights...were still standing at the time the pits were dug. If so, the pits probably date no later than 1766, the year Perkins Magra shows in his map that the old fence and palisade had been removed because of the British expansion of the fort...(Heldman 1978:40)

A listing and quantification of artifacts identified from each of the three refuse pits may be found in Appendix 2 of Heldman's 1978 report.
As is the case with F561, field notes indicate that articulated skeletal elements occurred throughout F636. All articulated elements in this feature were bird appendages and fish vertebrae. F641, however, displayed only one instance of skeletal articulation - two thoracic vertebrae of *Sus scrofa*, pig.

Table 1 summarizes the number of identified and unidentified bone from each of the three features. It will be noted that the percentages reflecting the ratio of identified fish, bird, and mammal to unidentified fragments of their respective classes is relatively stable between features. This may reflect a similarity in circumstances of deposition between the three.

Features F561 and F636 have been designated as primary deposits by virtue of their lack of stratigraphy and occurrence of articulated skeletal elements throughout. Although F641 displayed no stratigraphy, only one instance of skeletal articulation was apparent. However, the ratio of identified fishbone to unidentified fishbone is remarkably consistent between the three features. Fishbone is the most fragile class of osteological remains. If F641, in contrast to F561 and F636, was not a primary deposit, that is, if its contents were subject to more cultural modification (redeposited or swept around) we might expect to see a greater disparity in the ratio mentioned above. It is concluded from the above evidence, in conjunction with the peculiarities of its faunal assemblage, that F641 is, like F561 and F636, of primary deposition.

A total of 1,549 bone fragments was identified to the species or family level. In addition, each feature yielded large quantities of fish scales which have not yet been analyzed. F561 showed the greatest variety of species, (20), while F636 and F641 showed 15 and 16 species, respectively. A summary of species identified for each feature is shown in Table 2. In addition, three other categories of information are presented:

1. the number of bones identified for each species
2. the minimum number of individuals (MNI) represented by each species
3. the percentage of bone contributed by each species to the total number of identified bones per feature

The minimum number of individuals is based on the
<table>
<thead>
<tr>
<th></th>
<th>F561</th>
<th>F636</th>
<th>F641</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unidentified fish</td>
<td>971</td>
<td>1,750</td>
<td>902</td>
</tr>
<tr>
<td>Identified fish</td>
<td>201</td>
<td>272</td>
<td>135</td>
</tr>
<tr>
<td>% of fish identified</td>
<td>17</td>
<td>13.5</td>
<td>13</td>
</tr>
<tr>
<td>Unidentified bird</td>
<td>282</td>
<td>359</td>
<td>30</td>
</tr>
<tr>
<td>Identified bird</td>
<td>343</td>
<td>293</td>
<td>47</td>
</tr>
<tr>
<td>% of bird identified</td>
<td>55.5</td>
<td>45</td>
<td>61</td>
</tr>
<tr>
<td>Unidentified mammal</td>
<td>189</td>
<td>42</td>
<td>246</td>
</tr>
<tr>
<td>Identified mammal</td>
<td>160</td>
<td>20</td>
<td>78</td>
</tr>
<tr>
<td>% of mammal identified</td>
<td>54</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>Unidentified bone</td>
<td>386</td>
<td>154</td>
<td>104</td>
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<tr>
<td>Identified bone</td>
<td>704</td>
<td>585</td>
<td>260</td>
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Table 2. Species Identified from Features F561, F636, and F641

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<th>Species</th>
<th>F561</th>
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<th>F641</th>
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<tr>
<td>Lake Sturgeon (Acipenser fulvescens)</td>
<td>106</td>
<td>6</td>
<td>37</td>
</tr>
<tr>
<td>Lake Trout (Salvelinus namaycush)</td>
<td>27</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Chub (Coregonus Leucichthys sp.)</td>
<td>1</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Lake Whitefish (Coregonus clupeaformis)</td>
<td>42</td>
<td>83</td>
<td>65</td>
</tr>
<tr>
<td>Round Whitefish (Prosopium cylindraceum)</td>
<td>21</td>
<td>168</td>
<td>6</td>
</tr>
<tr>
<td>White Sucker (Catostomus commersonii)</td>
<td>21</td>
<td>168</td>
<td>6</td>
</tr>
<tr>
<td>Northern Pike (Esox lucius)</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Largemouth Bass (Micropterus salmoides)</td>
<td>12</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Walleye (Stizostedion vitreum)</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total Fish</td>
<td>201</td>
<td>272</td>
<td>135</td>
</tr>
<tr>
<td>Canada Goose (Branta canadensis)</td>
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<td>46</td>
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<td>Mallard (Anas platyrhynchos)</td>
<td>33</td>
<td>83</td>
<td>46</td>
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<tr>
<td>Passenger Pigeon (Ectopistes migratorius)</td>
<td>178</td>
<td>171</td>
<td>46</td>
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<tr>
<td>Cooper's Hawk (Accipiter cooperii)</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Red-Tailed Hawk (Buteo jamaicensis)</td>
<td>11</td>
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<td>1</td>
</tr>
<tr>
<td>Ruffed Grouse (Bonasa umbellus)</td>
<td>15</td>
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<td>1</td>
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<tr>
<td>Chicken (Gallus gallus)</td>
<td>94</td>
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<td>1</td>
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<tr>
<td>Turkey (Meleagris gallopavo)</td>
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<td>1</td>
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<tr>
<td>Snipe or Woodcock (Scolopacidae)</td>
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<td>1</td>
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<tr>
<td>Blue-Winged Teal (Anas discors)</td>
<td>8</td>
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<td>1</td>
</tr>
<tr>
<td>Flicker (Colaptes auratus)</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total Bird</td>
<td>343</td>
<td>293</td>
<td>47</td>
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</table>

(continued)
Table 2. Species Identified from Features F561, F636, F641

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<tr>
<th>Species</th>
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<th></th>
<th></th>
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<td># of</td>
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<td>% of</td>
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<td></td>
<td>bones</td>
<td>bone per</td>
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<td>Short-tailed Shrew (Blarina brevicauda)</td>
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<td>1</td>
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<td>Marten (Martes americana)</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mink (Mustela vison)</td>
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<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Otter (Lutra canadensis)</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Fox (Vulpes fulva)</td>
<td>111*</td>
<td>15.8</td>
<td></td>
<td>8</td>
<td>1</td>
<td>1.4</td>
<td>4</td>
<td>1</td>
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<td>Beaver (Castor canadensis)</td>
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<td></td>
<td>1</td>
<td>1</td>
<td>2.7</td>
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<tr>
<td>Mouse (Peromyscus sp.)</td>
<td></td>
<td>1.4</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
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<td>Muskrat (Ondatra zibethica)</td>
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<td></td>
<td>1</td>
<td>1</td>
<td>4.0</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Snowshoe Hare (Lepus americanus)</td>
<td>18</td>
<td>2.5</td>
<td></td>
<td>5</td>
<td>1</td>
<td>0.8</td>
<td></td>
<td></td>
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<tr>
<td>Cow (Bos taurus)</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>3.5</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Pig (Sus scrofa)</td>
<td>20</td>
<td>2.8</td>
<td></td>
<td>6</td>
<td>1</td>
<td>1.1</td>
<td>51</td>
<td>2</td>
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<tr>
<td>Total Mammal</td>
<td>160</td>
<td>22.6</td>
<td></td>
<td>20</td>
<td>4</td>
<td>3.4</td>
<td>78</td>
<td>9</td>
</tr>
</tbody>
</table>

*Note that the high bone count for red fox results from the burial of one nearly intact individual in F561.
number of the most frequently occurring element that occurs only once in the skeleton of any individual. For example, if we have identified the following elements from the lake trout (*Salvelinus namaycush*):

1 right coracoid
2 basisphenoid
1 left basipterygium
1 right basipterygium
3 right opercular

then the eight identified elements represent at least three individuals, based on the occurrence of three right operculars. The MNI value will be a most important figure in assessing the relative importance of food sources.

Figure 1 shows the relative bone frequencies per class for Features 561, 636, and 641. Figure 1a shows the same relationship for Cleland's (1970) composite sample. Comparison of Figures 1 and 1a serves to illustrate the success of our efforts at maximum recovery of faunal remains. Where Cleland found that only 9.5% of the 353 bones he identified from British features were fish bone, Features 561, 636, and 641 show 28.5%, 46.5% and 51.9% fish bone respectively.

Examination of Table 2 reveals some immediate differences between the three features. The relative representation of each class varies greatly. Figure 1 graphically illustrates the low representation of mammal bones identified from F636, as opposed to the relatively high representation from F641.

In addition to the differences reflected by the relative representation of vertebrate classes, examination of Table 2 shows apparent differences reflected by the presence, absence, and relative representation of particular species. This aspect of the data is most important to the examination of seasonal differences in subsistence strategy. A brief discussion of the major fish species represented will render the data more meaningful.

Of the nine species of fish identified, four will be shown to be the most important food species; they are sturgeon, trout, whitefish, and sucker.

The lake sturgeon (*Acipenser fulvescens*) is a shallow water, bottom feeding fish in the Great Lakes and their
tributaries. It reaches maximum availability in the spring and early summer when it spawns in tributary streams and shallow waters of the Great Lakes (Hubbs and Lagler 1958:38). Sturgeon is represented in greatest quantity in F56l and is not found in F64l.

The lake trout (Salvelinus namaycush) is a deep water inhabitant of the Great Lakes. Historic documents indicate that this fish was a major component of the diet at Michilimackinac (Henry 1809:54). Although the lake trout was taken by ice fishing during winter at Michilimackinac, this fish reaches its maximum availability in late October or early November when it surfaces to spawn on rocky reefs (Hubbs and Lagler 1958:48). Historic documents relate that the fall harvest of fish was dried and frozen for use during the long winter months. Alexander Henry states that this method of preservation rendered the fish suitable for consumption even until April (op. cit.:63).

Like lake trout, the lake whitefish (Coregonus clupeaformis) inhabits the deep waters of the Great Lakes. It too is a fall spawner, found in shoal areas in late November. This fish was most often taken in gill nets at the Straits of Mackinac. Although the whitefish was netted under the ice during winter, it was available in greatest quantity during the spawning season. Along with the lake trout, the whitefish made up the fall harvest of fish to be stored as rations for winter.

The white sucker (Catostomus commersonnii) is another bottom dwelling fish in the ponds, lakes, and streams of this area. Although this fish is available throughout most of the year, tremendous quantities become available when it ascends small streams to spawn in late May or early June.

Our brief overview of the seasonal increase in availability of the major fish species may be summarized as follows:

- Sturgeon: late spring, early summer
- Lake Trout: late October, early November
- Whitefish: late November
- Sucker: late May, early June

With this framework in mind, we are prepared to examine the relative frequencies of the major fish species in relation to total fish bone. The relationships are indicated in Figure 2.
The data presented in Figure 2 allow further examination of the differences between the three features. It is readily apparent that the majority of fish bones identified from F64l are those of lake trout and whitefish, both of which reach maximum availability in the fall, are stored for winter, and are exploited to some degree throughout the winter. This observation, in conjunction with data that will follow from analysis of other classes, supports the interpretation that F64l represents a deposit of faunal remains resulting from winter refuse.

By contrast, the preponderance of fish bone from F56l are identified as sturgeon, a spring spawner. Likewise, the majority of fish bone from F63l is represented by sucker, another spring spawner.

With regard to the large quantity of sucker bones found in F63l, it is worth noting that no skeletal elements found anterior to the webbarrian apparatus of Catostomus were recovered. It is apparent, then, that the heads of these fish were removed prior to deposition. A glance at Table 2 will show that 16 individual suckers were represented in F63l. The absence of skull bones from these fish may be interpreted as a result of collecting large quantities such as are available during the spawning season (late May, early June), and processing them at the site of collection. Processing may include removal of the heads and gutting the fish before return to the Fort. In any case it is certain that the heads were removed prior to deposition. This evidence, in conjunction with data from other classes, supports the interpretation of F63l as a late spring deposit.

With regard to the identified bone representing the class Aves, it should be noted that of the eight wild species identified, only one, the ruffed grouse (Bonasa umbellus) is a year-round resident. The remainder are characterized by southward migration in fall and a return northward in early spring.

Six of the species that occur from March to October are present in F56l, five are present in F63l, and only one species of wild fowl, the passenger pigeon (Ectopistes migratorius) is represented in F64l. The passenger pigeon arrived from the south usually in March, and remained in the area until the first snowfall (Bent 1963:392). Descriptions of the passenger pigeon nesting and migration rarely fail
to stress the fantastic abundance of these creatures prior to events which led to their becoming extinct. Several writers have claimed that from a billion to a billion and a half assembled at one place to nest (Barrows 1912:245). This abundance in part explains the occurrence of passenger pigeon bones in F641. As stated by Barrows, "The Indians of Northern Michigan, as well as many of the white residents in the neighborhood of the roosts, collected immense numbers of adults and squabs and preserved them for winter use by salting or smoking and drying" (Ibid.:245). Thus, the evidence presented by the avian fauna is consistent with the seasonal inferences provided by examination of the fish component of the faunal assemblages.

Of the nine species of non-domestic mammal identified, six are the bearers of pelts that were of great import to the eighteenth century fur trade. They are as follows, marten (Martes americana), mink (Mustela vison), otter (Lutra canadensis), red fox (Vulpes fulva), beaver (Castor canadensis), and muskrat (Ondatra zibethica). Because their pelts were generally more valuable when taken in the winter, we might expect to see a greater representation of these animals in feature F641, if indeed that feature represents a winter deposit. This is exactly the case. Table 2 shows that of the six fur-bearing mammals represented in the three features, two species are represented in F561, one in F636, and five in F641.

At this point in the analysis another, more enlightening view of the data is introduced. That is, an assessment of the relative importance of each species to the diet as represented in the refuse features.

This variable is measured by comparing the amount of meat contributed by each species to the total estimated meat per feature. The method is essentially simple, and has been a major basis for interpretation of faunal remains since its introduction by Theodore White (1953). It consists of arriving at an estimation of average meat yield per species. This is done through application of a conversion factor that is applied to the total live weight of the species to correct for that portion of the animal that does not contribute to the diet (bone, skin, viscera, etc.). For example, the average live weight of the red-tailed hawk for this region is 2.5 lbs. Only 70% of that figure represents edible material, so we multiply 2.5 x .70 to arrive at an average meat yield of 1.75 lbs. for this species. This figure in turn, is multiplied by the minimum number of individuals of that species
to arrive at the total meat contributed per feature. This method is generally regarded as a better estimate of relative importance of species because it eliminates certain biases introduced by simple bone count. For example, the 46 passenger pigeon bones found in F641 represent less than 1/20 of the meat represented by the 37 lake trout bones identified from that feature.

Table 3 shows the results of this kind of analysis. Average weights and conversion factors for each species were taken from Cleland (1966 and 1970) to facilitate comparison between this analysis and Cleland's 1970 analysis of faunal remains from Michilimackinac.

Two categories of animal are not included in the dietary estimates because they were not identified to the species level, chub (Leucichthys sp.), and the snipe/woodcock family (Scolopacidae). Two more species are excluded because their presence is assumed to be incidental to construction of the features. The remains of the short-tailed shrew (Blarina brevicauda) and the deer mouse (Peromyscus sp.) are assumed to be intrusive, the result of burrowing activity.

The data presented in Table 3 is most enlightening when species are grouped as to allow comparison of the relative contributions of wild, as opposed to domestic meat sources (chicken, turkey, cow, and pig). A graphic representation of this comparison appears in Figure 3.

Differences between the features in terms of reliance upon wild vs. domestic meat sources are readily apparent. Observe that only in F636 does the contribution of wild meat sources exceed that of domestic animals. Also note that the lowest representation of wild meat occurs in F641.

It is suggested that the differences between features F641 and F636 represent a response to variation in available wild resources at different seasons of the year. That is, as available biomass of fish and migratory fowl increased with the coming of spring, dependance on domestic resources diminished. This process is represented in F636, which, based upon its faunal assemblage, has been interpreted as a late spring deposit. Note that 43.6% of the total meat represented in F636 is from fish, while 48.1% is from mammal.

In contrast F641 which has been interpreted as a winter deposit, shows 15.7% of its meat is contributed by fish, and 83.2% by mammal. It is assumed that in winter the ice would
Table 3. Pounds of Meat Contributed by Each Species - Michilimackinac, 1977

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<tr>
<th>Species</th>
<th>Live weight (lbs.)</th>
<th>% conversion</th>
<th>usable meat/ indiv. (lbs.)</th>
<th>F561 MNI</th>
<th>lbs. of meat</th>
<th>% of meat/ feature</th>
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(continued)
Table 3. Pounds of Meat Contributed by Each Species - Michilimackinac, 1977

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<th>Species</th>
<th>Live weight (lbs.)</th>
<th>% conversion</th>
<th>usable meat/ indiv. (lbs.)</th>
<th>MNI</th>
<th>F561 lbs. of meat</th>
<th>% of meat</th>
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decrease the fish harvest, and it is certain that migratory fowl were not available for exploitation during this season. Accordingly, reliance upon domestic food sources was increased during the winter months, supplemented by preserved portions of the fall harvest (smoked and dried whitefish, lake trout, and passenger pigeon). Figure 3 shows the relationship between domestic and wild meat sources for F561 as lying somewhere between that of F636 (late spring) and F641 (winter). This would seem to contradict the expectation that if F561 were a spring deposit, as its faunal composition seems to indicate, that the ratio of wild to domestic meat sources would more closely approximate that displayed by F636. However, this deviation from the expected pattern is more apparent than real. A glance at Table 2 will show that Cow (Bos taurus) is represented by only two bone fragments from F561 whereas nine elements represent Cow in F641. Adherence to White's method of calculating meat yield requires that one individual, whether represented by one bone or by twenty, be counted as an entire carcass in calculation of dietary percentages. Although this method is one currently favored by most osteoarchaeologists, it too has its built-in biases. Therefore, the ratio of domestic to wild meat sources in F561 is probably lower than Figure 3 indicates, and does not alter the conclusion that as availability of wild resources increases, reliance on domestic resources decreases.

It is significant that this model of British subsistence adaptation is remarkably similar to the reconstruction of aboriginal exploitation strategy in the straits area presented by Cleland in 1966 (as mentioned previously in this report). To identify the resemblances between the two models we need only to replace the category of meat contributed by large game (prehistorically) with that contributed by domestic mammals (historically).

In his characterization of Late Woodland subsistence strategy Cleland presents the assumption that "winter ice would decrease the total fish harvest and therefore either absolutely or relatively increase the number of mammals taken during the winter period" (1966:191). This is surely the case in F641 which displays the greatest variety of mammalian species, and in which 83.2% of the total meat represented in the feature is attributed to mammals (Fig. 4).

The replacement of large game by domestic mammals in the British diet may be seen to reflect several technological, ideological, and social variables affecting the subsistence system. First and foremost is the ability of the British
Fig. 4

% pounds of Meat Contributed for Each Class

- **FISH**
- **BIRD**
- **MAMMALS**

<table>
<thead>
<tr>
<th>Class</th>
<th>F681</th>
<th>F636</th>
<th>F641</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td>211</td>
<td>4.4</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Legend:
- F561
- F636
- F641
to import domestic foods. This variable itself has a seasonal character since importation of goods was limited to seasons of ice-free routes of supply on the Great Lakes. This meant that a winter supply of domestic foodstuffs (salt pork, grain, lard, and others) had to be cached generally by November. As stored resources diminished during the six-month winter it became necessary to tap the livestock resources kept at the fort. This seasonal importation of non-local foodstuffs may be important toward interpretation of the high representation of large domestics from F641.

Another important consideration is that during the winter season traders would accompany Indian groups to their various hunting grounds and return to Michilimackinac with their pelts in spring. Those remaining at Michilimackinac during the winter were probably involved in the maintenance and support of the fort as a military garrison. These individuals then, would not have the freedom to remove themselves from the fort for the extended travel which exploitation of large game would require. Hence another factor toward understanding an increased representation of domestic animals in a winter deposit such as F641.

A third consideration applies equally well toward understanding all three features, and that is a cultural preference for and a scarcity of domestic foods. As noted earlier by Alexander Henry, the difficulty of obtaining domestic meat resulted in high prices which in turn resulted in an increased effort on the part of Michilimackinac's inhabitants to exploit available natural resources.

The data presented in the preceding discussion favors the seasonal model of subsistence adaptation. The alternative hypothesis, that each feature represents a specific short-term subsistence activity taking place during the same part of the year, is not supported by features 561 and 636, since both show a wide variety of vertebrate classes and species. In addition, species which reach their greatest availability in the spring, as well as some that are not available during the winter months, are well represented in both features. This hypothesis is difficult to test as concerns a winter deposit since there are no species which could serve as reliable indices of winter deposition. However, the very fact that fish as well as both domestic and wild mammals are present in F641 should indicate that a variety of subsistence activities are represented. This alternative hypothesis should remain under consideration for future studies, but the data presented in this study tend to support the seasonal hypothesis.
### Table 4
Mollusca Identified from the 1977 Excavation Season

<table>
<thead>
<tr>
<th></th>
<th>F561</th>
<th>F636</th>
<th>F641</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gastropods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lymnaea humilis</em></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Physa sp.</em></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Goniobasis liveaeacea</em></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Pelecypods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Unionidae</em></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Musculium sp.</em></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anidontoides sp.</em></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Lampsilis siliquoides</em></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Summary and Conclusions

Through application of the systemic particularist approach the anthropological problem of subsistence adaptations has been isolated and examined. Historic archaeology presents an ideal opportunity for this approach by virtue of its tight chronological controls and the availability of contemporary documents, both of which enable the reduction of variables necessary for the study of complex systems.

By comparison of three refuse features located near House 1 of the south southeast rowhouse, we have demonstrated something of a seasonal round of subsistence strategy as practiced during the early British period at Michilimackinac.

It is suggested that in some ways the adaptation of the British settlers resembles that practiced by aboriginal inhabitants of the same area. These similarities are seen as adjustments reflecting seasonal availability of natural food resources in the area, and the differences are those introduced by the differing cultural and technological factors which distinguish the British and the Indian. That is, the availability of domestic and imported foodstuffs to the British, their culturally determined food preferences, and the sophistication of food-getting technology.

These factors account for the observable differences in what is basically a similar adaptation.

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The following are the members of my thesis committee. My special thanks to all of them for their concern and for the advice each has provided.

Dr. Donald P. Heldman conducted the 1977 excavations at Michilimackinac. Without his constant encouragement and cooperation this study could not have been conducted. The professional standards he has always exhibited in our working relationship, and which are reflected in his fieldwork, will remain always as a source of inspiration.
I credit Dr. Bruce D. Smith with my introduction to the realm of scientific method. His criticism of the original manuscript and the insights he provided were invaluable.

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The following individuals graciously allowed access to comparative collections, their cooperation is gratefully acknowledged. At the University of Michigan they are: Dr. Richard I. Ford, Dr. Gerald Smith, and Mr. Richard Redding, and at Michigan State University; Dr. Charles E. Cleland. Dr. Fred Thompson and Mr. Irvy Quitmyer identified the mollusc remains at the Florida State Museum.

Maps 2 and 3, as well as Figures 1-4, were drafted by Mr. John A. Shimmin of Archaeographic, Inc. All Maps and Figures appear through the courtesy of the Mackinac Island State Park Commission.

Sometimes sources of help and inspiration derive from areas other than the academic sphere, sometimes in the form of moral support. In this regard my greatest debt is to my parents, for they provided the key. Without their unfailing love and support - I couldn't even find the door.
REFERENCES

Barrows, Walter Bradford

Bent, Arthur Cleveland

Binford, Lewis R.


Blair, Emma Helen
1911 The Indian Tribes of the Upper Mississippi Valley and Region of the Great Lakes as Described by Nicholas Perrot, Bacqueville de la Potherie, Morrell Marston, and Thomas Forsyth. 2 Vols. Clark, Cleveland.

Burt, William H.

Butsch, Elizabeth
1970 "The Ethnozoology of Fort Michilimackinac."

Cleland, Charles E.

REFERENCES (Continued)

Flannery, Kent V.

Heldman, Donald P.


Henry, Alexander
1809 Travels and Adventures in Canada and the Indian Territories Between the Years 1760 and 1776. I Riley, New York.

Hickerson, H.

Hubbs, Carl & Lagler, Karl F.

Jenness, D.

Maxwell, Moreau S., and Lewis H. Binford

May, George S.
REFERENCES (Continued)

Miller, J. Jefferson, II, and Lyle M. Stone  

Stone, Lyle M.  

Struever, S.  

Tooker, Elisabeth  

Walker, Iain C.  

White, Theodore E.  