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The Bulletin which follows is easily the longest that the SEAC has put out to date. It dwarfs in size and, of course, cost any of the past issues. Hopefully, the quality of the material is equally greater. The size of the Conference and its yearly program of papers, however, must result in some changes in publication policy. How much of the program can and should we publish? But these questions can be answered best by your response to this issue.

I would like to thank the numerous authors for their cooperation in getting the papers in to me so smoothly and quickly. I hope that they will accept the limited editorial license that I have taken. I did roughly standardize the bibliographic entries (in the very simplest form possible related to the style of American Antiquity), and I did eliminate footnotes whenever possible. I really should not comment on the spelling and punctuation except to say that I tried, but you have heard of the "blind leading the blind." I did not attempt to standardize hypthenation let alone that most inflammatory problem, the spelling of archaeology. Perhaps, in consultation with the officers, I will determine what to do with archeology since we are the Southeastern Archaeological Conference.

Naturally, I take the blame for any typographical errors (particularly, if there are any in the list of participants) and for any problems with the format or reproduction of the illustrations. The printing was done by the Stenographic and Printing Services of Memphis State University.

Drexel A. Peterson, Jr.

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Complicated Stamped Pottery and Platform Mounds: The Origins of South Appalachian Mississippian

Organized by Roy S. Dickens, Jr. and Leland G. Ferguson

South Appalachian Mississippian: A Definition and Introduction

Leland G. Ferguson

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When presented with the term "South Appalachian Mississippian" I think most of us harken to a complex of potsherds, mound structures, house patterns, villages, agriculture, and ceremonial objects. We fit all of these into a generalized set of temporal and spatial boundaries; and, as such, South Appalachian Mississippian is a tool of cultural-historical taxonomy.

As a collection of words, "South Appalachian Mississippian" was coined in 1967 by James B. Griffin in an article that appeared in Science magazine. The article was written for the general scientific reader, yet the phrase fit well into the specialized archeological terminology of the Southeast. Few people had trouble conceptualizing the meaning because the constituent parts were so well known.

The first portion of the term, "South Appalachian," connotes indigenous development within a core area of the extreme southeast. The South Appalachian Province was originally defined by W. H. Holmes in 1903 as that area including Georgia, South Carolina, and the contiguous portions of other states where the predominate surface finish on pottery was effected with a carved wooden paddle. As time depth was developed through archeological research, the term "South Appalachian Tradition" as a continuous sequence of ceramic and cultural development appeared (Caldwell 1968).

For the general audience Griffin explained that the term "Mississippian" included those complexes that had a primary dependence upon agriculture for their basic storable food supply. He also noted that villages were usually located along alluvial floodplains, that there was an increase in population, a specialization of labor, an exchange of goods, and elaborate religious ceremonies related to crop production. To this most of us would agree, especially for the area of primary Mississippian development in the Mississippi River Valley.

The association of the Mississippian idea with "South Appalachian" first came into the picture in 1938 when A. R. Kelly noted that the archeological manifestations near Macon, Georgia, including the Macon Plateau site, the Lamar site, and others, were in some way related to the Mississippi Pattern as it was defined and utilized in the Midwest through the Midwestern Taxonomic System (Cole and Deuel 1937). As a result "South

Appalachian" and "Mississippian," although only recently joined in verbal matrimony, have long been familiar terms. This composite set of words is so well woven into the fabric of Southeastern archeology that South Appalachian Mississippian is easily accepted as pertaining to those sites within the South Appalachian Province and Tradition (complicated stamped pottery) that have some traits similar to those defined for the Mississippi Pattern in the Midwest.

Thus, as a general concept for a cultural complex with time and space boundaries, South Appalachian Mississippian is something we all know and understand. However, the finding of a beginning, an end, or boundaries of such a loosely defined category is a difficult problem. We find ourselves asking the questions: What is a primary dependence on agriculture? How many villages must be located on the floodplain? How much emphasis on territory is emphasis on territory? And so forth. Of course, these problems could be handled if we defined South Appalachian Mississippian attributes in quantitative terms. We could set up definite criteria for the beginning, the end, and the boundaries; and we could then search out those points in the archeological record. However, I think few of us would be interested in such a precise definition. Finding the exact temporal and spatial boundaries of South Appalachian Mississippian would be little more important than finding the "oldest" Clovis point, the "first" fiber tempered bowl, or the last "legitimate" monolithic axe. Beyond idle curiosity, I'm not sure anyone really cares about such arbitrary information.

More than beginnings most of us are interested in the activities of people and the mechanisms that brought about change in the South Appalachian Province from a point in time and culture we know as Middle Woodland or Late Woodland to the fully developed South Appalachian Mississippian. Joseph Caldwell's study of "Trend and Tradition in the Prehistory of the Eastern United States" (1958) was an important treatment of this problem. However, Caldwell's primary data are somewhat out of date today, and his cultural-historical approach has been complemented by other ways of looking at the archeological data.

Consensus today seems to be that we may be more effective in our research if we approach culture considering it to be an adaptive system with special relationships to environmental variables. Technological, organizational, and ideological aspects of culture may then be placed in perspective and studied with priority assigned to the interpretive value of each aspect within our theoretical framework (White 1949; Binford 1962, etc.)

Through such a theoretical approach selected processes may be studied by examining material culture and environmental variables in a manner so that we may view concurrent variation, adequately demonstrate function, define relationships, and isolate causal factors. The stating of such lofty goals is an easy task in the atmosphere of today's archeology. To realize them is another problem. For a number of reasons including academic history, modern cultural developments, and physical geography, the solutions to modern problems are in their infancy in the Southeast when compared to other areas such as the American Southwest. They are beginning; they are in our minds, but we must operationalize them.

Today we shall hear some papers concerning the early appearance or lack of appearance of some traits we think may be the same morphological and functional traits that appear in the complex we conceptually know as South Appalachian Mississippian. The geographical areas discussed include central and northern Georgia by Roy Dickens, the Appalachian Summit Area by Bennie Keel, and the eastern Tennessee River Valley by Charles Faulkner. This last area may well be considered to be out of the classical area of South Appalachian Mississippian; however, the subject matter fits well into the problems of early Mississippian manifestations in the region.

The papers will include discussions of platform mounds, house structures, and ceramics. The authors will place these things into the best temporal and spatial perspective possible. There will be functional interpretations, and there will be hypotheses. However, from a broad research point of view the papers are not coordinated; and they are not aimed at "telling the final story," historical or processual. As such, we will probably not revolutionize South Appalachian Mississippian archeology today.

The goals of this symposium are set much lower than revolution. They have more to do with the generation of inquisitive interaction. Through these papers and the ensuing discussion we would like to develop new ideas and vitality focusing on the most efficient means of understanding the regularities of the past to which we are all drawn.

There is the possibility, I think, that we will eventually take the developing tools of archeology, our literature, our hoarded stockpile of data and better combine them with our anthropological aspirations. But, I think we shall not be very successful at it as individuals. Stuart Struever's comments of several years ago (1968) that the disparity of modern archeology is that our awareness of possibilities demands more than our individual capabilities is especially relevant to South Appalachian Mississippian archeology. The problems of the late prehistory of the Southeast require that we develop a <u>coordinated</u> approach on the regional level, aimed at revealing the best possible understanding of human adaptation and behavior available in our data.

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On South Appalachian Mississippian in the Appalachian Summit Area

Bennie C. Keel

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Ferguson (1971) has defined South Appalachian Mississippian on the basis of the association of two archaeological traits which are easily recognizable--complicated stamped pottery and temple mounds. Certainly there are other "diagnostic" traits of this cultural system, but these may not have the virtual universal distribution across the South Appalachian Province as defined by W. H. Holmes (1903: 3) nor be as readily perceivable as those chosen by Ferguson. I see one possible goal of this symposium as being the identification of other diagnostic criteria, not so much as taxonomic traits, but rather systemic attributes which may lead us into the examination of the dynamics of the South Appalachian Mississippian culture.

Before considering the expression of SAM in the Appalachian Summit Area, I would like to briefly summarize the Woodland and Mississippian cultural complexes (Table 1) which have been defined in recent years by various investigators working under

Table 1

Culture Sequence, Appalachian Summit Area

Date	Phase	Ceramic Tradition
1800		
	Qualla	South Appalachian
1500		
	Pisgah	South Appalachian
1000	?	
600		
	Connestee	South Appalachian and Northern Woodland
A.D. 200		
0	Pigeon	South Appalachian
200 B.C.		
	Swannanoa	Northern Woodland
800		
pre 800	Various Archaic and Paleoindian	

Joffre L. Coe at the University of North Carolina (Holden 1966, Egloff 1967, Dickens 1970, Keel 1972).

The Woodland period is recognized by the appearance of grit tempered cord marked or fabric impressed pottery, small stemmed points, tubular pipes, gorgets, etc. and has been named the Swannanoa phase (Keel 1972). The ceramics of this phase are comparable if not identical to the sand and/or grit tempered Watts Bar series of upper eastern Tennessee, the Dunlap ceramics of northern Georgia, and the Badin series of the Carolina Piedmont. All early cord marked and fabric impressed pottery has been interpreted by numerous workers (Caldwell, Sears, Griffin, etc.) who agree these ceramics minimally represent an intrusion of northern pottery concepts into the South. Towards the end of the Swannanoa period (800-300 B.C.) minor amounts of simple stamped or check stamped pottery (composing 1.3 to approximately 10 per cent of various ceramic assemblages) was made locally. Subsequently, across the mountains, from Murphy to Mitchell County, there is evidence of a cultural complex which we named the Pigeon phase (Keel 1972). This complex is markedly different from the preceding Swannanoa phase in that check stamped and simple stamped pottery constitutes from 60% to 85% of the various ceramic assemblages. The presence of paddle stamped pottery indicates that by 300 B.C. southern ceramic concepts were being added to northern ideas concerning ceramic manufacture.

Within a century or two of the beginning of the Christian Era, a new ceramic ware, the Connestee series, had replaced the Pigeon series over most of the Appalachian Summit Area. In various assemblages that I have examined, including collections from sites which were extensively excavated, Connestee Simple Stamped, Brushed, and Check Stamped types composed from 76.3 per cent (Hw^{o}2), 66.3 per cent (Jk^{v}12), and 49.41 per cent (Bn^{v}29) of the sherds of the series. Complicated stamped pottery (other than the later Pisgah or Qualla series)found at these sites constituted very minor amounts of the collections. At Hw^{o}2, for example, a curvilinear Swift Creek Complicated Stamped-like type was represented by 5 sherds or 0.05 per cent of the total collection and Napier Stamped by 12 sherds or 0.12 per cent of the total collection. At Jk^{v}12 only 68 Woodland period complicated stamped sherds were recovered from a site total of almost 14,000 pottery fragments. At Bn^{v}29 no more than 39 complicated stamped sherds similar to Swift Creek Complicated Stamped or Napier Stamped were noted in a collection of 35,823 fragments. A grand total of 85 Woodland period complicated stamped sherds were observed in a composite collection of 60,560 sherds from the sites I have mentioned (Keel 1972). My purpose in giving these figures is to suggest that at no time during the Woodland period was complicated stamped pottery important in the Appalachian Summit Area.

The latest C^{14} dates obtained from a good Connestee context comes from the Icehouse Bottom site (40Mr23). These dates are A.D. 585 ± 90 (GX2150) and A.D. 605 ± 90 (GX2487) (Gleeson

1970 and Chapman 1971). A later date of A.D. 805 ± 85 (GX593) from Garden Creek Mound 2 has been reported by me (Keel 1972: 112). Although in 1972 I stated that this date was acceptable as a reasonable estimate for the duration of some Connestee types, I did not feel that it accurately represented other material found in Feature 30 (a fragmentary Hopewellian anthropomorphic figurine and two polished stone gorget fragments). A date as early as the 2nd century A.D. for the Connestee phase can be suggested based on ceramic comparisons with, and C^{14} dates from, the Tunacunhee site, Georgia (Jeffries 1974).

The reason I have taken your time to discuss the chronological position of the Connestee phase is that at the Garden Creek locality the Smathers Mound (Garden Creek Mound 2), a product of the Connestee people, was a platform mound on which buildings had been erected. The evidence supporting this interpretation has been offered elsewhere (Keel 1972). Thus at a very early time, i.e., before A.D. 805 ± 85, the southern mountain people were erecting platform mounds. But, they were not manufacturing, nor making any appreciable use of complicated stamped ceramics.

The combination of the Southern Appalachian Mississippian diagnostic duo--platform mounds and complicated stamped pottery--does not occur until the Pisgah phase (Dickens 1970, Ferguson 1971, Keel 1972). Dickens presented the following archaeologically observable traits for this phase:

1. Pisgah series pottery
2. rectangular polished stone celts
3. small straight or concave based triangular projectile points
4. small flake tools (blades, scrapers, borers, saws, gravers)
5. pottery burnishing stones
6. hammerstones, anvil stones, grinding stones, and mortars
7. elbow pipes of stone or pottery
8. pottery zoomorphic figurines
9. small pottery or stone discs
10. mica cutouts
11. bone awls, needles, pins
12. turtle shell rattles
13. marine shell beads, gorgets, ear pins and vessels
14. platform mounds
15. earth lodges
16. single post rectangular houses with round corners and wall trench entrances
17. palisaded villages
18. flexed burials in simple oval pits or in shaft tombs commonly placed within dwellings
19. non-random distributions of grave goods between burials in different houses
20. fronto-occipital cranial deformation
21. corn, beans, squast, and possibly <u>Iva</u> (sumpweed) agriculture
22. great reliance on deer

The date for the beginning of the Pisgah phase has been estimated to be at least as early as A.D. 1000 (Dickens 1974). Radiocarbon dates from Pisgah contexts are A.D. 1070 ± 150 and A.D. 1120 ± 150 from the Chauga Mound, Georgia (Kelly and Neitzel 1961); A.D. 1210 ± 120 from Le-17, Virginia (Holland 1970: 82), and A.D. 1435 ± 70 from Garden Creek Mound No. 1, North Carolina (Dickens 1970: 78). These dates indicate a gap of some 2 to 4 centuries between late Connestee and Pisgah periods insofar as our present chronological knowledge.

The final temporal phase in the Appalachian Summit Area is the Qualla phase and represents the proto-historic and early historic material culture of the Cherokees. This phase represents the latest Appalachian Summit Area development of South Appalachian Mississippian; for, like the Pisgah phase, it contains both complicated stamped pottery and platform mounds.

If we wish to define SAM, as Ferguson and Dickens have done as the association of complicated stamped pottery and temple or platform mounds, then such a pattern is not present in the Appalachian Summit Area until about A.D. 1000. The origin of the Mississippian Pisgah phase is not clearly understood at this time, nor has the culture been identified which occupied the period of time from the termination of the Connestee phase, as I have defined it, until the recognition of the Pisgah phase. Even the origin of the ceramic complex associated with the Pisgah phase cannot be fully explained.

Dickens has suggested that Pisgah ceramics developed when the rectilinear complicated stamping mode of surface finish spreading from the Georgia Piedmont fused with the collared and thickened rim forms and associated decorative motifs which were simultaneously moving from the Midwest along an expanding Mississippian frontier that reached into the Appalachian Summit Area (Dickens 1974: 11-12).

Ferguson, attempting to answer the same question, agreed with Dickens (and I might add with my own observations) that the ancestry of Pisgah series ceramics is complex (Ferguson 1970: 221). As I have noted, Pisgah assemblages have been dated as late as A.D. 1435 ± 70 years at Garden Creek Mound 1 and as early as A.D. 1070 ± 150. Other dates ranging from A.D. 1120 ± 150 at Chauga, Georgia, and A.D. 1210 ± 120 at Le-17, Virginia, and from A.D. 1205 to A.D. 1350 have been obtained from the Frutchey Mound, North Carolina. The Frutchey Mound dates have a bearing on this matter because Pee Dee ceramics were found associated with Pisgah materials at Bn^{v}29 and Garden Creek Mound 1. Ferguson agrees with Dickens that, aside from ceramics, the Dallas phase of eastern Tennessee is quite similar to the Pisgah phase. Ferguson concludes his observations on the Pisgah phase by stating:

> From the mountain investigations we derive conflicting hypotheses. In addition to the geographical isolation of the area, the ceramic evidence tends to indicate that the cultural systems were only distantly related to the cultural systems of the contiguous

> areas. The remainder of the cultural assemblage, however, does show similarity to the cultural assemblage associated with Dallas ceramics in eastern Tennessee; and we have pointed out the similarity between the specialized earth lodge structure at the base of the mound (Hw^{o}1) at the Garden Creek site and the lower levels of the mound at the Irene site. This relationship between cultural traits is further substantiated by the fact that ceramic articles representing Pisgah traits have been found on the coastal plain and that coastal plain ceramic material has been found in association with Pisgah in the mountains. This pattern of similarities brings forth an apparent anomaly in the prehistoric situation in the mountains. While the mountain culture associated with Pisgah ceramics was physically located quite close to the cultures of northern Georgia, most of the associations seem to be with eastern Tennessee and the coastal plain. (Ferguson 1971: 226-227)

By contrasting the settlement pattern data available for the Connestee and Pisgah phases some general view of the environmental exploitations of these cultures can be gained. One of the most obvious contrasts is in terms of settlement (site) density. Pisgah sites, especially east of the Tuckasegee River, are more numerous than Connestee sites. Pisgah sites are also much larger on the average and tend to be located along major rivers on the floodplain or first terrace. To be sure, Connestee sites are present along the major streams, and those in this situation are larger in size than those found along the smaller streams in the coves. Both the size and number of sites of the Pisgah phase suggest an increase in population during the Pisgah period as well as a more settled existence for the people. This change in settlement pattern is most likely related to the adoption of agriculture as an <u>important</u> aspect of subsistence economy equal to, if not exceeding, the importance of collecting. Although no cultigens have been identified from Connestee phase assemblages, the possibility of some form of horticulture should not be totally discounted.

The perceived cultural hiatus between the Connestee and Pisgah phases offers a serious problem since it is during this period that Pisgah developed. We may describe the content and interpreted non-material cultural subsystems of Connestee and contrast them to Pisgah. Further it is possible to suggest what may have occurred to account for the latter if it is a lineal descendant of the former. But, without substantive evidence gathered from archaeological field work which supports our hypotheses we have demonstrated naught. As I have noted, Dickens believes that the Pisgah phase develops out of the local Woodland base. This model (this volume) for interpreting Mississippian origins of the South Appalachian type warrants serious consideration in this case. However, the openers of cultural systems in the east can be traced back into time before the

Hopewell period (Winters 1968). Another hypothesis, one which would call for a migration, seems less rewarding because no culturally identical complex has been isolated in the eastern United States from which to draw the Pisgah folk.

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The Mississippian-Woodland Transition in the Eastern Tennessee Valley

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The term Mississippian was first comprehensively used to identify prehistoric cultures in the eastern Tennessee Valley in 1941 in the preliminary Chickamauga Basin report (Lewis and Kneberg 1941). In this report, Mississippian was used to denote a culture pattern in the Midwestern Taxonomic System (McKern 1938). The Mississippian pattern of the eastern Tennessee Valley was further subdivided into three foci: Hiwassee Island, Dallas, and Mouse Creek (Lewis and Kneberg 1941). The fact that all three foci were identified with different historic tribes suggested that cultural diversity in the eastern Tennessee Valley was either the result of simple culture replacement in which each successive intrusive group wrested control of the valley from former inhabitants or was due to the contemporaneity of diverse groups in this area. Five years later these same manifestations were recognized in _Hiwassee Island_ which was a detailed study of prehistoric culture history in the eastern Tennessee Valley (Lewis and Kneberg 1946). In this classic study which still appears as a basic reference for this southeastern region, the principal cause of culture change continued to be hypothesized as the replacement of one group by another. The "replacement hypothesis" was considered particularly relevant to the appearance of the Hiwassee Island focus which was believed to represent an intrusive group of sedentary horticulturalists who essentially replaced the earlier Late Woodland Hamilton focus (Lewis and Kneberg 1946: 9). At the time, this hypothesis was supported by three factors. These were (1) a continued belief that the Woodland and Mississippian patterns represented entirely different ethnic groups, the latter usually being equated with Muskhogean speakers; (2) the use of the Midwestern Taxonomic System which was not designed to reveal the continuity of culture through gradual culture change, and (3) the lack of evidence for a great time depth for prehistoric cultures in eastern North America at that time.

In light of archaeological work in the eastern Tennessee Valley since the publication of _Hiwassee Island_, the hypothesis of culture replacement to solely explain the appearance of the Mississippian tradition is no longer tenable. The author regards the Mississippian as a cultural tradition which appears in the eastern Tennessee Valley during the Mississippian period. This tradition has been further subdivided into the Martin Farm, Hiwassee Island, Dallas, and Mouse Creek phases, all but the first formerly called foci or cultures (Faulkner 1972). First, it has been recently suggested that the Dallas phase could be the prehistoric remains of the Cherokee in the upper Tennessee drainage and not the prehistoric representative of one of the Muskhogean-speaking tribes (Coe 1961). Although the ethnic identification of this phase has still not been firmly established, there is certainly the implication that the Cherokee may have a long and continuous history in the eastern Tennessee Valley. Secondly, continued fieldwork in the eastern Tennessee Valley during the last decade has revealed two things. One is that the apparent disjunction between Woodland and Mississippian may not exist in this area since there are cultural continuities between them that indicate some sort of acculturative process was operative. In addition, radiocarbon determinations indicate that the Mississippian tradition was established in the eastern Tennessee Valley before the second millennium A.D. which means there was sufficient time for some local Mississippian development out of indigenous Woodland cultures. In light of this data, the author has recently suggested that the origin of the Mississippian cultures in the Middle South can be largely explained by indigenous development out of local Late Woodland cultures although this development was complex with a number of outside influences appearing during this time (Faulkner 1972). (Figure 1).

Although there are a number of culture traits that seem to appear rather suddenly in the earliest Mississippian phase, it is now apparent that several artifacts which were once considered distinctly Mississippian are foreshadowed in the preceding Late Woodland phase. These include such artifacts as shell ornaments, discoidals, elbow pipes, perforated mussel shell "hoes," and sherd discs.

Shell gorgets and beads have a long history in the eastern Tennessee Valley, being found in the Early Woodland Watts Bar culture of the upper French Broad drainage (Lewis and Kneberg 1957: 15). Shell ornaments continued to be made in the Late Woodland period by the Hamilton people. These include flat disc and cylindrical beads, both of which are also found in the Dallas phase (Lewis and Kneberg 1946: 128-130). Although the use of such cut beads is common in other cultures as well, the use of shell pendants in the Hamilton phase more clearly approaches the type of ornaments characteristic for the Mississippian period. The Hamilton pendants generally do not conform to the round, two-holed engraved gorgets of the Dallas phase, being normally thick, massive triangular artifacts with a single perforation near the apex. Occasionally they are engraved--a particularly interesting specimen being a fragment with parallel engraved lines and small uniform circular depressions, reminiscent of the decorative technique on Dallas gorgets (Lewis and Kneberg 1946: 129). The earliest gorget type recognized in the eastern Tennessee Valley has a simple engraved "square cross" design of parallel lines (Kneberg 1959: 4-5). Gorgets of this type occurred at the Bennett Place site on the Tennessee River (Moore 1915). This is now believed to be a transitional Hiwassee Island-Dallas charnel house mound (see below).

Discoidals occur in both the Hamilton and Dallas phases, but the form is different. The Hamilton phase artifacts are usually thick and barrel-shaped and have been found with burials.

one such barrel-shaped, biconcave discoidal was found with a Hamilton burial in a mound on Hiwassee Island (Harrington 1922: 121-122; Plate LXXXV.). A similar artifact was found in a Hamilton mound in the Sequatchie Valley, and a small barrel-shaped disc was recovered on the Mason site in the upper Elk Valley, the type station for the Late Woodland Mason phase in the Elk and Duck River drainages of Middle Tennessee (Faulkner 1968: 104). Lewis and Kneberg (1946: 122) suggest that these larger, thick discoidals may have had a different function than the finer-made, bi-concave discoidals or "chunky stones" occurring in the Dallas phase since the latter were not believed to occur with burials. Discoidals were also believed to only occur in the late Mississippian Dallas phase (Lewis and Kneberg 1946). However, a polished bi-concave discoidal has since been recovered with a Dallas burial on the Cox site on the Clinch River (Meyers 1961), and the recovery of one of these artifacts at the Bennett Place site (Moore 1915: 351) indicates that such "game stones" may have been continuously used since Late Woodland times.

The elbow pipe is typical for the Hamilton culture although other forms are found as well (Lewis and Kneberg 1946: 117). The elbow pipe is also the predominant type in the Dallas phase (Lewis and Kneberg 1946; Table 35). This pipe form appears to be rare in the Hiwassee Island phase but does occur. One claystone specimen has been recovered at the Hiwassee Island site (Lewis and Kneberg 1946: 119), and another pipe made from the same material was found at Bennett Place (Moore 1915: 343). This would indicate a long tradition for this pipe style in the eastern Tennessee Valley.

The mussel shell with a large, ragged central perforation is a characteristic artifact for both the Hiwassee Island and Dallas phases (Lewis and Kneberg 1946: 129, 131). This artifact may be more typical for early Mississippian phases since it occurs on the Emergent Mississippian Martin Farm site in the Little Tennessee Valley (Salo 1969: 133). These are usually referred to as "hoes" in the literature, but this function has been questioned (Faulkner and Graham 1965: 75-76). Centrally perforated mussel shells have been recovered in what appears to be a Late Woodland context on the Westmoreland-Barber site in the Nickajack Reservoir (Faulkner and Graham 1966: 107-108).

Sherd discs have been recovered in Hiwassee Island context at the Bat Creek site in the Little Tennessee Valley (Gerald Schroedl, personal communication) and are common in the Dallas phase (Lewis and Kneberg 1946: 106-107). Although apparently infrequent, they do occur in Late Woodland context. Two perforated sherd discs were recovered in the Late Woodland horizon at the Westmoreland-Barber site (Faulkner and Graham 1966: 51).

Late Woodland ceramics and projectile points have also been found in what otherwise appears to be Early Mississippian context. Hamilton ceramics are almost exclusively limestone-tempered with cordmarked and plain surfaced jars and bowls being the predominant vessel types. Other surface treatments include brushed, check stamped, simple stamped, and complicated stamped, all occurring in minor amounts. Hamilton projectile points are small, triangular forms, the most distinctive being the Hamilton Triangular type (Lewis 1955; Kneberg 1956).

At the Lea Farm site on the Clinch River in the Norris Basin there was a mixture of limestone-tempered and shell-tempered pottery in what otherwise appeared to be a typical Early Mississippian ceramic assemblage (Griffin 1938: 294-297). Shell-tempered, loop-handled jars and fabric-impressed salt pans made up the majority of the pottery; however, of the jar rims studied from this site, 35 per cent were limestone-tempered (Griffin 1938: 294-295).

What seems to be an even better example of a transitional Late Woodland-Mississippian ceramic assemblage is found at the Martin Farm site (Salo 1969). This multi-component site produced material from two Early Mississippian phases designated Martin Farm and Hiwassee Island (Faulkner 1972: 11). The Developed Mississippian Hiwassee Island phase is characterized by Early Mississippian shell-tempered pottery including flared-rim jars with loop handles, Hiwassee Island Red Filmed bowls, and fabric-marked salt pans. Projectile points include various types of small triangular forms (Salo 1969). The Emergent Mississippian Martin Farm phase exhibits a combination of Woodland and Mississippian ceramic traits and Hamilton Triangular projectile points. The most common pottery is a limestone-tempered series of cordmarked and plain globular jars with flaring rims and occasional loop handles (67% of the total). Shell-tempered plain jars exhibiting the same rim form and appendages constituted approximately 25% of the sherds. Minor but significant types include Hamilton Cord Marked, Woodstock Complicated Stamped, and a limestone-tempered type with wide trailing on the neck and shoulder that seems to be a decorated variant in the plain and cordmarked series. There is a significant absence of red-filmed sherds, and there was only one occurrence of a fabric-marked salt pan sherd (Salo 1969; Table 13).

Although not fully analyzed, the ceramic assemblage from the Emergent Mississippian Banks V site in the upper Duck Valley contains a significant proportion of local Woodland wares in a clearly marked and extremely early Mississippian component. This component features pottery that resembles that found in the Hiwassee Island phase and wall-trench houses (unpublished field data from the Normandy Reservoir, 1974). Radiocarbon dates for this component range from A.D. 880 to A.D. 1040 (see below).

Early Mississippian and Late Woodland radiocarbon determinations and cross-cultural dating in the eastern Tennessee Valley conclusively demonstrate an overlapping of Woodland and Mississippian cultures. Late dates for the Hamilton culture include a determination of 930 ± 150 years B.P. (A.D. 1020) from one of the Alford Mounds in Roane County (Crane and Griffin 1961: 14), and several dates from three mounds on the McDonald site in Rhea County on the Tennessee River suggest that burials continued to be made in the McDonald mounds well after A.D. 1000 (Shroedl 1973: 8). The Late Woodland Mason phase in the upper Elk and Duck valleys of Middle Tennessee has been radiocarbon dated at 1180 ± 85 years B.P. (A.D. 770) and 1060 ± 90 years B.P. (A.D. 890) at the type site where shell-tempered Mississippian pottery was recovered in one of the features (Faulkner 1968: 42-43).

There are no Mississippian radiocarbon dates from the eastern Tennessee Valley proper that are earlier than the 12th century A.D. The earliest dates are from two Hiwassee Island phase sites: Bowman Farm on the Clinch River at 760 ± 150 years B.P. (A.D. 1190)(Crane and Griffin 1961: 114) and the Leuty site adjacent to the McDonald mounds at 830 ± 100 years B.P. (A.D. 1100)(Schroedl 1973: 10). Although two radiocarbon determinations for the Martin phase are obviously in error--A.D. 325 and A.D. 410--the amalgamation of Woodland and Mississippian ceramic traits, the presence of a trade pottery (_Woodstock Complicated Stamped_) from the Georgia Woodstock phase which has been dated at A.D. 928 (Hally 1970), and the absence of such characteristic Hiwassee Island phase pottery types as _Hiwassee Island Red Filmed_ indicate the Emergent Mississippian Martin Farm phase should date between A.D. 900-1000.

Despite the numerous continuities between the Woodland and Mississippian phases and the overlapping of dates for these manifestations in the eastern Tennessee Valley, there are still many striking discontinuities between these two manifestations that suggest rapid culture change that might have resulted from diffusion of new ideas or even migration in this region. These discontinuities are especially marked in subsistence patterns, settlement patterns, and burial practices.

The horticultural base of the Mississippian cultures in the eastern valley has been recognized for some time (Lewis and Kneberg 1946: 44). Maize and/or beans have been documented on at least 20 Hiwassee Island, Dallas, or Mouse Creek sites (Faulkner and Graham 1963; Table 3). In addition to these documented occurrences of cultigens on later sites, maize has also been found but not formally reported at very early Mississippian sites such as Martin Farm and Banks V. The latter site has been dated as early as A.D. 880 (see below).

One traditional explanation for the appearance and expansion of Mississippian cultures in eastern North America is the development of improved agricultural procedures and the appearance of improved strains of maize (Griffin 1964: 248-249). These improved strains of maize would include the so-called "Eastern Complex" which appears on Mississippian sites around A.D. 1000 (Yarnell 1964: 107). Maize recovered at the Hiwassee Island site has been identified as predominantly eight or ten-rowed varieties (Lewis and Kneberg 1946: 45). This has not been specifically identified as "Eastern Complex" maize, but it is assumed that it is of this variety.

Although it still appears that maize horticulture became more intensive during the Mississippian period due to the more numerous occurrences of charred cobs and kernels on habitation sites, there is no longer any question that maize was also cultivated during the Late Woodland period in the eastern Tennessee Valley (there is also the possibility that we are simply dealing with sampling error in that (1) Mississippian habitation sites have been more intensively excavated than Woodland habitation sites, and (2) different preparation techniques of kernels and/or secondary use of cobs during Mississippian period may have been a factor in preservation). Maize kernels have been identified in a Hamilton phase pit on the Westmoreland-Barber site dated at 1325 ± 105 years B.P. (A.D. 625)(Faulkner and Graham 1966: 131), and maize cobs have been recently identified in a Late Woodland Mason phase feature in the upper Duck Valley (unpublished data from the Normandy Archaeological Project). Unfortunately, it is not known if this maize already represents the "Eastern Complex" or the earlier "Basketmaker" variety that was presumably replaced by the former.

There are two features that distinguish the earliest Mississippian settlements from the preceding Hamilton settlements: the more permanent nature of the occupation and attendant architecture. The former is probably the direct result of more reliable horticulture mentioned above. However, it still appears that in the Emergent Mississippian phases the settlements continued to be small with possible pioneer farming hamlets scattered across the alluvial valleys. This is supported by the data from the Martin Farm, Banks V, and Harmons Creek sites, the latter being an apparent transitional Woodland-Mississippian station in the western Tennessee Valley (Faulkner 1972: 7). The settlement pattern of the Hamilton phase has been characterized as dispersed sedentary households whose habitation sites are marked by small shell middens (Lewis and Kneberg 1946: 36-37). However, based on recent excavations on the Doughty site in Loudon County on the Tennessee River, a new hypothetical settlement model has been formulated for the Hamilton phase which includes the small shell middens as seasonal camps (McCollough and Faulkner 1973: 127). It is not entirely clear when the settlement shift from seasonal occupation of sites such as Doughty to the establishment of permanent farming hamlets occurred in the eastern Tennessee Valley, but there is now evidence that some of the small Hamilton shell middens continued to be occupied after the appearance of Mississippian traits in this region. Shell-tempered pottery was recently discovered in the Hamilton shell midden on the Doughty site which is further evidence for Woodland-Mississippian contact or acculturation (McCollough and Faulkner 1973: 128-129).

One significant difference in the internal composition of Woodland and Mississippian settlements is the respective house types; the wall trench house of the latter appears to have no analogs on Late Woodland sites in the eastern Tennessee Valley. Admittedly, this could be due to sampling error since considerably fewer Late Woodland habitation sites have been extensively excavated than Mississippian ones; however, it appears at this time that the Late Woodland architecture was decidely different and perhaps less permanent than that found on early Mississippian sites. At least two types have been recorded--a square to oval structure with individually set large wall posts in the upper Elk Valley (Travis W. Binion, Jr., personal communication) and an oval dwelling with a possible tensioned wall-roof superstructure of individually set poles in the upper Duck Valley (unpublished field data from the Normandy Reservoir, 1974).

The wall-trench house appears on one of the earliest dated Mississippian sites in Tennessee. A dwelling with both open corners and doorway in one side was found on the Banks V site. This is a particularly unusual type of wall-trench structure in Tennessee, and it is noteworthy that a similar structure has been found on the surface of Level 2 or the second major building phase of Mound F at the Angel site in southwestern Indiana (unpublished field data provided by James H. Kellar). Based on one radiocarbon date and ceramic cross-dating, the Angel site is believed to have been first settled prior to A.D. 1300 (Black 1967: 484). The structure on the Banks V site has not been dated, but features around it have been dated at 905 ± 90 B.P. (A.D. 1045), 1000 ± 75 B.P. (A.D. 950), and 1035 ± 170 B.P. (A.D. 915); and two dates on a mass burial (see below) are A.D. 880 (Faulkner and McCollough 1974; and unpublished data from the Normandy Archaeological Project).

Burial patterns in the Late Woodland and Mississippian cultures are believed to differ markedly although comparisons are difficult since few burials have been found in Early Mississippian context in the eastern Tennessee Valley. In fact, no definite Hiwassee Island phase burials have been positively identified which led Lewis and Kneberg (1946: 38-39) to suggest that bodies were interred in a charnel house located at some distance from the village. This conclusion is based primarily on the fact that burials at the Hiwassee Island site were found in the upper portion of the midden and mound and were all assumed to be Dallas inhumations (Lewis and Kneberg 1946: 38). Considering the absence of temporal controls in the midden and the fact that the difference between late Hiwassee Island and early Dallas may be purely academic, it is possible that some of these burials are actually from a late Hiwassee Island phase. However, it is true that other so-called "pure" Hiwassee Island sites in the Little Tennessee, Clinch, and Tennessee Valley proper have produced few or no village inhumations. The burials in a burned charnel house on the late Hiwassee Island Bennett Place mound support this hypothesis. Hamilton burials appear to differ from this pattern although it has been recently hypothesized that Hamilton mounds may have continued to be used by the Hiwassee Island phase people (Schroedl 1973). The late dates for some of the later constructional stages of these mounds support this hypothesis, and a burial with two Hiwassee Island phase pottery vessels was found in the latest constructional stage of a Hamilton mound in the Clinch Valley (Cole n.d.). It might also be argued that it would be a short step from Hamilton burial in an accretional mound to the pattern utilizing a charnel house on a rebuilt platform mound.

Perhaps the most significant Mississippian burials were found at the Banks V site. Fourteen individuals (5 adults and 9 children) were found in a crescentic trench in the habitation area. Typical Mississippian pottery was found in the trench fill. This may have been a communal grave into which bodies were periodically added since there may have been some aboriginal disturbance of previously interred individuals; however, there is no question that several of these individuals were buried at the same time (Berryman n.d.). Two radiocarbon dates have been obtained from this burial trench. They are 1075 ± 100 B.P. (A.D. 875) and 1070 ± 75 B.P. (A.D. 880) (unpublished data from the Normandy Archaeological Project).

If all of these individuals were interred at the same time, it could indicate a catastrophe struck this small community. Since a large number of children were involved, disease or starvation is certainly a possibility. However, no definite pathologies were found to support either cause of death (Berryman n.d.). Although no inflicted projectile points were found and most of the bones were in too poor a condition to assess the possibility of injury, a violent death cannot be ruled out. Considering the date of these burials and the possibility of Mississippian intrusion, it is possible these people were the victims of conflict with the indigenous Woodland populations.

In addition to the burials on the Banks V site, there is another feature that sometimes occurs on sites of this period that suggests all was not tranquil. A shallow ditch about 5-9 feet in width and 1.4 feet deep was found on the Martin Farm site (Salo 1969: 102-105). Although no defensive palisade was associated with this feature, a palisade was found several feet from a similar ditch on the Early Mississippian Hampton Farm site on the Tennessee River in Rhea County (Walker n.d.). A similar shallow (one foot deep) ditch was discovered on the Mason site, but there was no evidence of a palisade in the immediate vicinity (Binion 1968).

Despite these possible evidences of conflict between Woodland and Mississippian groups, there appears to be a general absence of what could be called heavily fortified sites in the Early Mississippian period. Although not enough work has been done on sites of this period to determine the general absence of defensive works, it is noteworthy that Early Mississippian settlements in the Little Tennessee and Clinch Valleys seem to be small, dispersed, and unprotected; and even large Early Mississippian sites such as Hiwassee Island were not palisaded during the earliest part of their existence (Lewis and Kneberg 1946: 38). It now appears that the "population explosion" and attendant pressures only occurred in later Mississippian times with resultant conflicts and defensive measures.

Summary

To summarize the data at hand, which admittedly suffers from the lack of extensively excavated sites of the Woodland-Mississippian transition in the eastern Tennessee Valley, there is now evidence that culture traits which are considered Mississippian do not appear suddenly as a discrete assemblage which would mark the end of the Woodland period and the beginning of the Mississippian period. Such traits as shell gorgets, discoidals, elbow pipes, perforated mussel shell "hoes," sherd discs, small triangular arrow points, and even maize horticulture were found in the preceding Late Woodland Hamilton phase. Typical Mississippian traits like the wall-trench house and shell-tempered pottery appear slightly later, probably between A.D. 850 and A.D. 1000, although such pottery decorative techniques as red filming and negative painting and such vessel forms as water bottles and effigy bowls did not appear until after A.D. 1000. The platform mound, which is also considered a dignostic feature on Tennessee Valley Mississippian villages, may not have appeared until even later, perhaps between A.D. 1100 and A.D. 1200. Platform mounds do not occur on Woodland sites in the eastern Tennessee Valley as they do during the Woodland period in other Southern Appalachian provinces, and these structures do not even occur in the Emergent Martin Farm phase. Perhaps the earliest platform mound construction is represented at such sites as Hiwassee Island, Bowman Farm, and Leuty. At Hiwassee Island, the presence of such pottery types as red filmed and red-on-buff in the village midden below the mound indicates a date perhaps as late as A.D. 1250 for the first construction stage (Lewis and Kneberg 1946: 90-91). At the Bowman Farm site, a Hiwassee Island phase village on the Powell River, a radiocarbon date of 760 $\pm$ 150 years B.P. (A.D. 1190) was obtained from a burned earth covered building (Crane and Griffin 1961: 114). Although a mound covered the structure, there is some indication it was largely formed by a thick earth covering while in use (Webb 1938: 15-25). The earliest site of the three might be the Leuty site substructure mound in which the earliest platform construction was built over a wall-trench house that was burned about A.D. 1100 (Gerald Schroedl, personal communication).

The most reasonable conclusion is that the appearance of the Mississippian tradition in the eastern Tennessee Valley can be explained largely by internal culture change. The radiocarbon dates from the Banks V site are as early as any determinations for Early Mississippian phases in eastern North America. This early and rapid appearance of the Mississippian tradition throughout the Tennessee Valley suggests the Mississippianization of Late Woodland groups rather than migration to explain all of this culture change. Nevertheless, it is difficult to adequately explain the marked changes in subsistence patterns, settlement patterns, and burial practices as resulting solely from internal culture development. This would suggest some intrusions of expanding Mississippian or more likely Mississippianized Woodland populations particularly into marginal areas along smaller tributaries. Although most of the Mississippian sites in the main Tennessee Valley are now denied archaeologists because of reservoir construction, there are tributaries which still hold promise for testing this hypothesis.

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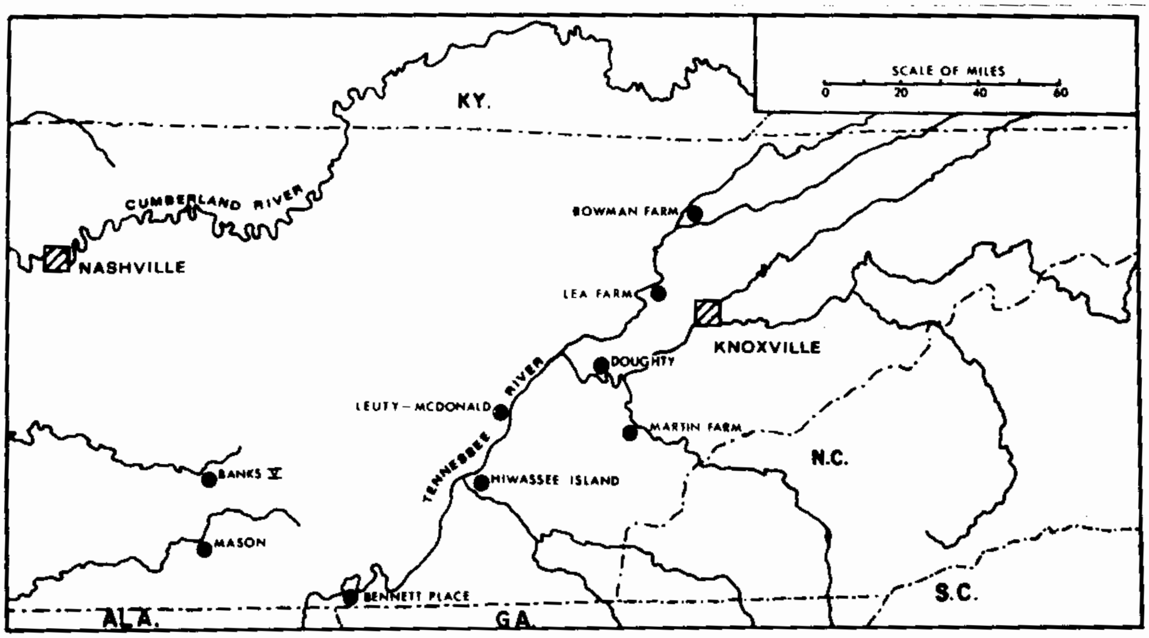

Figure 1. East Tennessee Sites.

A Processual Approach to Mississippian Origins on the Georgia Piedmont[1]

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There have been tendencies in the past to depict the advent of Mississippian culture in the South Appalachian province as a "sudden intrusion" upon or "rude disruption" of the resident Woodland culture. Perhaps when measured against some other comparable episodes of cultural change, the South Appalachian Woodland-to-Mississippian development does seem to have taken place rather rapidly and certainly to have involved the intrusion of some foreign elements. But it is my opinion that at least part of our perception of rapidity and displacement has been founded upon deficiencies in the archaeological record and the lack of a combined synchronic-diachronic, or processual, approach to the problem.

This paper will focus on two traits generally identified with the South Appalachian Mississippian tradition--rectilinear complicated stamped pottery and platform (or substructure) mounds. I recognize both of these traits as material components of an extinct behavioral system, but the mound architecture must be considered of greater value than the pottery styles in evaluating the socio-political distinctiveness of that system. For example, Sears (1968: 140-146) has proposed that ceremonial centers with platform mounds were important in the development of the "priest state" in the Southeast; and Larson (1971: 58-67) has suggested that burial practices related to mortuary temples on platform mounds are evidence for social stratification and hereditary ranking in the Etowah Valley during the Mature Mississippian period. Also, the pottery styles are usually interpreted as having had a more or less local evolutionary development, whereas the mound architecture is envisioned as having been introduced from external sources.

I shall first examine these two traits in their earliest documented contexts on the Georgia Piedmont and at a few selected sites in the Coastal Plain and Blue Ridge provinces. Finally, the patterns perceived in this data will be applied to a simple model which allows for the reconstruction of local Mississippian origins in terms of an ongoing process that began in the Middle Woodland period.

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[1]A preliminary version of this paper was critiqued by Robert Blakely, Leland Ferguson, and James B. Griffin, and although some of their perceptive suggestions were incorporated into this final version, they are not to be held responsible for my persistence on points of disagreement. Mike Bower photographed the pottery in Figure 2.

Rectilinear Complicated Stamped Pottery

In the Piedmont region, the earliest complicated stamped pottery on which some motifs are comprised of purely rectilinear elements is termed Napier. Temporal placement of Napier pottery, since radiocarbon dates were lacking until recently, has been determined on the evidence of its stratigraphic position at several sites and on stylistic grounds (Wauchope 1948, 1966; Sears 1958). Napier, however, is not the earliest complicated stamped pottery, this being represented by the Swift Creek series. The type Swift Creek Complicated Stamped contains some purely curvilinear motifs and (at least in its later forms) some motifs with combined curvilinear and rectilinear elements.

Napier pottery was first identified by Kelly in his report on the Macon explorations (Kelly 1938: 58-59). The earliest published description was in 1940 by Jennings and Fairbanks who saw relationships of Napier to the type Swift Creek Complicated Stamped and thought that the two were "approximately contemporary" (Jennings and Fairbanks 1940: 8).

In 1948, Wauchope discussed the position of Napier in his temporal-spatial framework for nothern Georgia. He classified both Napier and Woodstock (which he felt were roughly contemporaneous) as late Middle Woodland and made Etowah Stamped the earliest pottery of the Temple Mound I (Early Mississippian) period. However, he did perceive a direct descendancy of Etowah styles out of Napier and Woodstock (Wauchope 1948: 204-207). Wauchope seemed disturbed that he found no "predominately Napier sites," although he noted that Napier pottery occurred in varying percentages at about half of his "early" sites (Woodland sites)(1948: 204). He concluded that "Napier Stamped came into the Etowah Drainage as a trade ware"(1948: 207).

In 1952, Fairbanks remarked on Napier pottery in his summary of the central Georgia development. He saw the origins of Etowah styles in Napier, and he felt that the "Napier preoccupation with parallel lines reflected a holdover from simple stamping types"(1952: 290).

By the time Sears wrote his 1958 article on the Wilbanks site, the north Georgia ceramic sequence was coming more clearly into focus. Sears reconstructed "a line of descent starting with Napier Complicated Stamp, a Middle Woodland period type, into Woodstock Complicated Stamp, which is Early Mississippi, and then into the ladder-based triangles of the Early Etowah period"(1958: 167). Although Sears did not say so, I suspect that his reason for moving Woodstock pottery into an Early Mississippian classification was the discovery by Caldwell of this pottery type in association with a stockaded village at the Proctor's Bend site in the Allatoona Reservoir (1950: 13) and in association with a "temple mound" at the Summerour site in the Buford Reservoir (1958: 47). Caldwell, himself, expressed what probably was the prevailing reason for leaving Napier in a Middle Woodland classification: "We know practically nothing about Napier except in the ceramic department, but the continued lack of permanent installations or earthworks suggests the same unspecialized hunting and gathering existence which earlier prevailed"(Caldwell 1958: 44).

In 1966, in his summary report on the 1938-40 survey, Wauchope provided a detailed description of Napier styles and made some important statements about their place in north Georgia ceramic development. He classified Napier as Middle Woodland and followed Sears in moving Woodstock to the "Early Mississippi Period," but he stated that "by the time of the Middle Swift Creek and Napier stages of ceramic development, a design tradition which was to be strong in the subsequent Mississippi stage (Woodstock and Etowah, and Long Swamp Stamped wares) was already well established"(Wauchope 1966: 59-60). Also important was his observation that the pottery in general of the Middle Woodland period exhibited a degree of experimentation and regional specialization "unequaled before or since"(1966: 55, 436-437).

Regarding Sears' and Wauchope's reliance on Napier as an important intermediate style to Middle Woodland and Early Mississippian ceramics, Ferguson has recently (1971: 69) pointed out that Napier sherds from the entire north Georgia survey totaled only 902 and that these were distributed over a large number of sites. He has further stated that "while the distinctiveness of Napier may have been demonstrated in the northern Georgia survey, there is still room for reservation concerning the relative position, general distribution, and associations of this ceramic type"(Ferguson 1971: 69).

In summary, most researchers recognize Napier as the earliest rectilinear complicated stamped pottery in the central and north Georgia areas; they tend to agree that its position stylistically and temporally lies between the curvilinear stamping of Swift Creek (and perhaps the simple stamping of Deptford/Cartersville) and the bolder rectilinear stamping of Woodstock, Etowah, and later types; and they concur that it should be identified with the Middle Woodland rather than the Early Mississippian period. But it also has been pointed out that there are no sites with "pure" Napier ceramic components; rather the type constitutes small to moderate percentages on many sites. And, at least one writer has noted the variability in design motifs in Swift Creek and Napier in comparison with earlier and later ceramics.

Platform Mounds

One of the first indications of the possible association in the Southeast of platform-type mounds with archaeological assemblages earlier than Mature Mississippian came from Kelly's work at the Swift Creek and Stubb's sites in central Georgia. Precise information on the morphology of the Swift Creek mound has never been published, but Caldwell (1958: 44) and Kelly (1938: 26-27) both have referred to it as a habitation "accretion." Kelly (1938: 35-37) described the Stubb's

Mound as a rectangular "house mound," and he at least left open to possibility its association with Swift Creek pottery.

Mound "A" at the Kolomoki site on the lower Chattahoochee drainage has been assumed (Sears 1956: 67, 93-94; Caldwell 1958: 56) to be a "temple mound" and to be associated with Kolomoki ceramics (lower Coastal Plain equivalent of middle-to-late Swift Creek). However, Ferguson (1971: 159) points out that these interpretations have never been verified. The smaller mounds at Kolomoki seem to have been constructed primarily as burial coverings although the upper portion of Mound "D" had a morphology that led Sears to refer to it as "a miniature replica of the temple mound" (Sears 1953: 41). It should be emphasized here that many of the later (Mature Mississippian) platform mounds of the South Appalachians have been found to contain burials, and some of them have been specifically documented as substructures for mortuary houses (e.g. Mound "C" at Etowah). It should also be mentioned that certain mound burials at Kolomoki contained possible Hopewellian-type artifacts such as the bicymbal "earspools" of copper and meteoric iron (Sears 1952: 3; 1953: 20-23). A small amount of Napier Complicated Stamped pottery was found at Kolomoki (Sears 1956: 41).

Mound "A" at the Mandeville site on the lower Chattahoochee River has provided more convincing evidence for the association of platform architecture with early stamped pottery. Here, several superimposed, loaded clay-and-midden constructions (apparently not accretional habitation layers or burial coverings) were clearly defined; and these overlay, in turn, a small "core mound" platform and a complex of premound houses. If this mound was a habitation accretion, it was rather carefully constructed and must have served as the residential area for a limited portion of the site population or an activity area of some specialized function. It seems unlikely that the entire settlement would have been confined to an area of approximately 80 by 140 feet. Although structural floors or definite postmold patterns could not be defined on the surfaces of Mound "A", the platform configuration of the feature has induced Kelly to refer to it as a "domiciliary mound"(1973: 37).

In association with the various stages of Mound "A" at Mandeville were considerable amounts of Swift Creek Complicated Stamped pottery. Next, in order of frequency, were plain, rectilinear complicated stamped (which were either classified as Crooked River Complicated Stamped or were assigned no specific classification), check stamped, simple stamped, roughened, and minor amounts of other finishes. Early mound and pre-mound contexts also contained Hopewellian-related artifacts including prismatic blades (some possibly of imported cherts) and anthropomorphic clay figurines (Kellar, Kelly, and McMichael 1961: 51-58). Radiocarbon dates from Mound "A" are A.D. 530 ± 150 (M1044) for Layer III, A.D. 490 ± 150 (M1045) for Layer II (Kellar, Kelly, and McMichael 1961: 81), and five dates ranging from A.D. 390 ± 70 to A.D. 245 ± 70 (UGA determinations) for Layer I (Betty Smith, personal communication).

Extending our inventory north of the Georgia Piedmont, mention should be made of the recent findings at the Garden Creek site in western North Carolina. At this site, Keel (1972: 93-212) has demonstrated conclusively the association of a platform mound and its rectangular superstructure with local Middle Woodland ceramics. These ceramics, the Connestee series, have a variety of surface finishes including plain, simple stamped, brushed, cord marked, check stamped, and occasioanlly complicated stamped specimens with late Swift Creek and Napier motifs. Also present in the lower mound and pre-mound contexts at Garden Creek was a Hopewellian-related assemblage composed of prismatic blades on imported Ohio chalcedony, anthropomorphic clay figurines, carved animal jaws, copper pins, and rocker-stamped sherds. A single radiocarbon date from an intrusive pit in the second stage of this mound was A.D. 805 ± 85 (GX0593)(Keel 1972: 307). On the basis of data from Connestee and related contexts in eastern Tennessee and Georgia, Keel (this volume) is presently of the opinion that the A.D. 805 determination is at least two centuries too recent.

Back on the Georgia Piedmont, several of the platform mounds excavated in 1938-40 by Wauchope deserve brief mention, even though data on cultural associations are for the most part unclear. The Long Swamp Mound in Cherokee County had a considerable amount of Swift Creek pottery at mound base, but Wauchope (1966: 301-304, 455-458) did not indicate whether he considered the mound and pottery to be associated. At the Stephenson Mound in White County, the core mound layer had associated Swift Creek pottery and a ware that Wauchope described as "Woodstock-like Late Swift Creek Stamped"(Wauchope 1966: 344-345, 460-461). At the Eastwood Mound, also in White County, Middle Woodland and Early Mississippian sherds were found in large numbers in the middle stages of the mound, but at this site the excavators never reached mound base (Wauchope 1966: 347-349, 461-465).

In terms of our discussions here, perhaps the most intriguing of the mounds tested by Wauchope was at the Annewakee Creek site on the Chattachoochee River near Atlanta. Sequential platform stages were apparent to Wauchope in his test trench, but the presence in the central mound of charred wood and numerous Woodland sherds led him to speculate that the mound had been raised over either an "earth lodge" or a "log tomb"(Wauchope 1966: 404-406).

1972 Excavations at the Annewakee Creek Mound

The Annewakee Creek site again came to the attention of archaeology in the winter of 1972 when it was learned that the mound had been almost totally destroyed by the owner who had leveled it for filldirt. A visit to the site in the spring, followed by an aerial reconnaissance, suggested that basal portions of the mound might still be intact and that excavations would be in order.

Investigations by Georgia State University in the summer of 1972 were limited to the southern two thirds of the mound and involved the excavation of ten-foot-wide trenches from the east, west, and south toward the presumed center. These trenches exposed, in plan, the mound margins and at least three major construction stages. Vertically, only a foot to 18 inches of any of the mound remained. Along the mound periphery there were tapering lenses, deposits from several periods of surface erosion and outwash, the latest of which contained Middle Woodland sherds along with a few Lamar sherds and some sherds of early nineteeth century European ceramics. The earlier outwash layers contained predominately Middle Woodland sherds. Internal construction consisted of steep-sided masses of basket-loaded clay with occasional intrusive pits and postmolds. These latter features, along with the mound fill itself, yielded only a small collection of artifacts, but the predominant pottery type was Napier Complicated Stamped.

As our trenches approached the approximate center of the mound, a 30 by 30 foot platform of bright yellow clay was encountered. This "core mound" feature, as with the rest of the mound, had been truncated by the recent grading, but a guess would place its original height at about two feet. This feature had no marginal outwash and thus no indications of long-term use. It was, nevertheless, riddled with intrusive pits and postmolds, these probably having originated from an overlying early mound surface. The yellow clay was completely exposed, and all intrusive features were recorded (Figure 1). One group of postmolds, some of which contained burned sand, suggested a rectangular house pattern. A small pit, in which there was a single large Napier Stamped sherd, was radiocarbon dated at A.D. 755 ± 100 (GX2826).

On the northern edge of the core mound, in fill that formed an extension and possible capping of the yellow clay, there was a large concentration of basket-loaded clay and midden. The midden contained sherds, chipped stone, and a large amount of charred wood and charred food remains. This material gave all appearances of having been "fresh" garbage that was incorporated into mound construction. Sherds from this midden-fill in their order of frequency were plain, Napier Complicated Stamped, Swift Creek Complicated Stamped, red filmed, and check stamped (McKinney n.d.)(Figure 2). Most of these were sand tempered, but a strong minority had limestone temper. Red filmed and limestone tempered sherds are not usually found in this part of the Chattahoochee Basin. In addition to the sherds, there were several small blades and numerous flakes removed in core preparation. The former were not fine prismatic blades of the Hopewellian variety, but they were definitely struck from prepared cores. Most of the flakes and blades were of cherts obtained from Paleozoic formations in northwestern Georgia or from Cenozoic formations in south Georgia. However, some of these were of materials having no known source areas in Georgia, and a few were definitely foreign to the state (Sayer n.d.), and the total collection exhibited considerable variation in color and composition. Charcoal

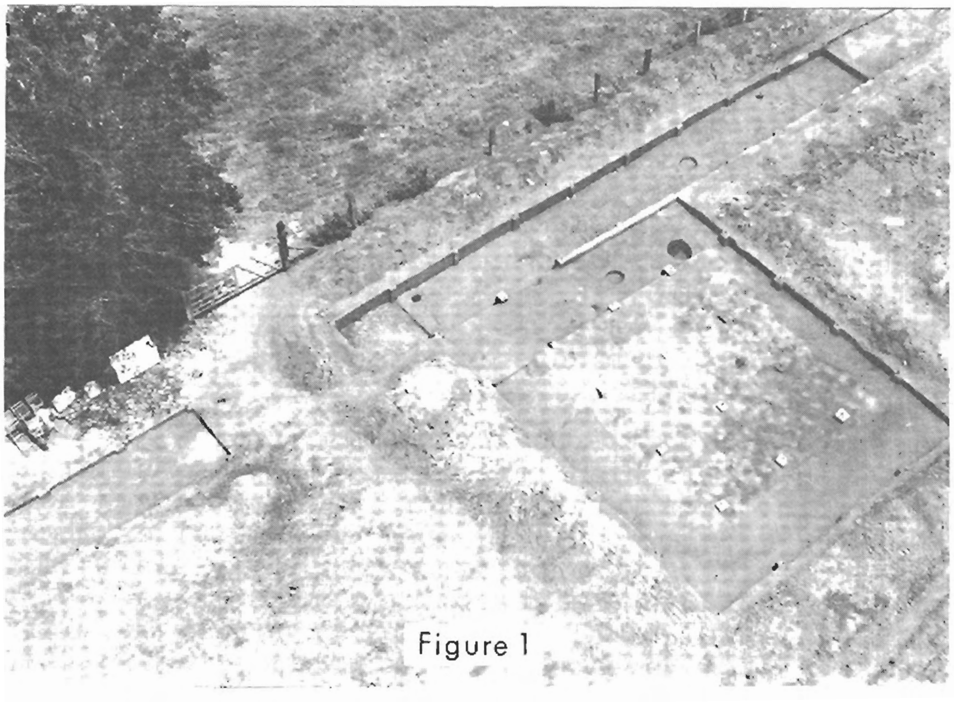

Figure 1

Aerial view of the Annewakee Creek Mound excavations with the yellow clay platform (core mound) exposed.

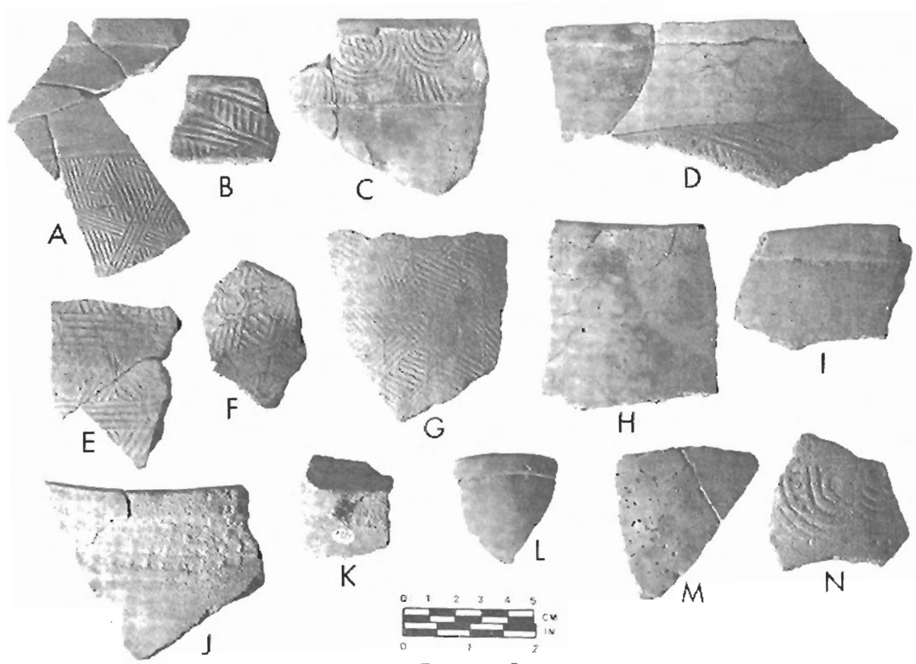

Figure 2

Pottery from the Annewakee Creek Mound. A-G, Napier Complicated Stamped; H-I, plain (sand tempered); J, check stamped; K-L, red filmed; M, plain (limestone tempered); N, Swift Creek Complicated Stamped.

associated with the above described pottery and stone debitage was radiocarbon dated at A.D. 605 ± 85 (GX2825).

Since the yellow clay fill seemed to represent the initial and central mound construction, the final week of the season was spent in excavating a twenty-foot-wide trench through its center to the level of subsoil. The only cultural features encountered on this surface were the scattered remains of two small Late Archaic period hearths. These can be considered to date to around 2000 B.C. and to have no relationship to the mound. No burials were found in the 1972 excavations although the owner had recovered two partial skeletons in his initial grading operations.

Some perceived patterns in the data presented thus far are that South Appalachian rectilinear complicated stamping occurs first in the diversified ceramic assemblages normally referred to as Middle Woodland, that on some sites these same ceramic assemblages are associated with early platform mounds or at least with mounds whose morphology suggests usages not specifically or exclusively as burial coverings, and that some of these same sites have definite Hopewellian relationships in early mound or pre-mound contexts. Finally, these mounds and ceramics can be dated to the early-to-middle centuries of the first millennium A.D.

Processual Model and Interpretation

If we accept these interpretations, our next step might be to pursue some behavioral explanation for the artifactual patterns. And, if we are concerned with the problem of Mississippian origins, then our interest, in part at least, should be directed to the processual meaning of the patterns.

In viewing cultural process through the archaeological record, I have come to rely on a set of concepts and terminology (which are certainly no entirely my own) that may be stated in the form of a simple model. In situations of increased cultural transmission (i.e., increased contact and exchange) between normally detached societies there will be greater potential for diversity in the cultural assemblages (behavioral and material) of these societies. Caldwell, in his classic discourse on "Interaction Spheres in Prehistory," utilized essentially the same proposition by stating that "when different cultural traditions are brought together there becomes available to each a new supply of diverse forms upon which new rearrangements of forms--innovations and inventions--can be built"(Caldwell 1964: 143). These concepts are analogous to the concepts of gene flow and gene pool of population genetics; in fact, we could easily speak of differing rates of culture flow affecting the size and diversification of a culture pool. Thus, one way of exploring cultural stability and change would be through the material (and inferred behavioral) evidence for changing culture flow and changing culture pools. Obviously, this analogy can be carried only so far. Genes are transmitted biologically and are selected through a process of differential reproduction in conjunction with varying social and environmental pressures; cultural traits are transmitted by symbolic behavior and are selected through decisions made in conjunction with varying social and environmental pressures. But, if we recognize these differences, the parallel nature of the concepts can be valuable in defining one set of parameters for investigating culture change through archaeological remains.

Such a construction is on the one hand diachronic--it involves more or less long-term process--and on the other synchronic--it involves more or less short-term mechanisms that stimulate and maintain the process. The ongoing process would not be perceptible to an individual at a given moment in time, but a mechanism within the process would be participated in and, at least in part, perceived by an individual. A mechanism within a cultural process would be expected to have both cognitive and operational components to use Rappaport's dichotomy (1971: 237-267). The cognitive component would represent the way an individual in the society perceived the mechanism to work and his reasons for its existence. The operational component, on the other hand, would represent the way the mechanism actually worked, i.e., its absolute effects on the society and the physical environment.

Now, let us apply this model of mechanism-and-process to the archaeological data of the first millennium A.D. in the Southern Appalachians. It now seems likely that some sites with early platform mounds and stamped pottery participated in the South Appalachian sphere of Hopewellian interaction (Caldwell 1964). The basis of this interaction was an exchange in materials and goods to be used in religious-mortuary activities. Both Griffin (1967: 183-189) and Caldwell (1964: 138) have interpreted this exchange in terms of a well developed procurement network tied together by key sites over much of eastern North America. This network probably developed in the late centuries B.C. and was well established by the early centuries A.D.

In terms of our processual model we may view the Hopewellian procurement system as an initiating mechanism for a process of culture change. There would have been a high potential for culture flow, not just in goods but also in ideas along the routes of this system; and the participating societies, with their different local traditions, would thus have been opened to an enlargement and diversification of their individual culture pools. The diversity in the ceramic assemblages at many South Appalachian Middle Woodland sites, the presence of "exotic" artifacts, and the advent of new types of mound architecture could be interpreted as the material evidence of such a process.

By the middle-to-late centuries of the first millennium A.D. the initial mechanism, or at least its cognitive component, probably had been altered; but the process of culture change continued. An exemplary site of this period would be the Annewakee Creek Mound where there were no specifically

Hopewellian artifacts but where there was still considerable ceramic diversity, some exotic materials and artifacts, and even the residual manifestations of an earlier blade industry. Perhaps, by this time (ca. A.D. 600-800), the basic mechanism--the procurement system--had not changed appreciably in its operational component but had been altered mainly in its cognitive component. For example, we know that certain materials important in Hopewellian trade such as copper, mica, and marine shell continued to be important items of exchange in the Mississippian period. Possibly the shift was from the use of these materials by priests in mortuary rituals to their use by secular functionaries for maintenance and reinforcement of inherited positions. It may be, as Caldwell (1958: 47-48) suggested, that this period also saw a shift in the direction of incoming ideas and materials from a primarily Midwestern source to a primarily Gulf Coastal and ultimately Circum-Caribbean source.

In conclusion, I suggest that one approach to the interpretation of Mississippian origins and development on the Georgia Piedmont, and to some extent in the whole of the Southern Appalachians, is a processual approach. It involves the reconstruction of a process of culture change based on an ongoing transmission of materials and ideas through intra-areal exchange mechanisms. Although the specifics of these mechanisms may have been altered through time, the basic process was maintained. And it was in the expanded material-and-behavioral environments created by this process that new cultural forms were selected--two of which were new pottery styles and a new type of ceremonial architecture, manifestations of a developing Mississippian tradition.

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Complicated Stamped Pottery and Platform Mounds: The Origins of South Appalachian Mississippian. Discussion

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The stated intent of this symposium is the investigation of South Appalachian Mississippian origins. The contributed papers, however, seem to focus upon one aspect of this problem: the historical and developmental relationship between South Appalachian Mississippian and the Woodland cultures that precede it. For the most part, these papers are concerned with the contributions the indigenous Woodland cultures made to South Appalachian Mississippian and with the mechanisms whereby these cultures were transformed into South Appalachian Mississippian. This emphasis is somewhat unique to studies dealing with Mississippian. It comes about, no doubt, in part because of the obvious syncretic nature of South Appalachian Mississippian and in part because of our discipline's current concern with cultural process.

I am in agreement with the general orientation and goals of this symposium. My comments pertain to only two of the contributed papers.

If I understand Dr. Dickens' paper correctly, he is proposing that platform mounds were not simply introduced fully formed into the South Appalachian Province by an expanding Mississippian culture around A.D. 1000. Rather, he is suggesting that through continuing trade contacts and the interchange of ideas that would accompany these contacts, the evolution of ceremonial architecture in the South Appalachian Province paralleled that occurring elsewhere in the East during the 1st millennium A.D.

I find this idea appealing. I do not, however, think there is much evidence to support it at this time. The mere fact that there were platform mounds in the South Appalachian Province during the first 800 years A.D. does not mean they are developmentally related to the later Mississippian platform mounds.

Altogether, there are seven sites in the Southeast with platform mounds that can be identified as pre-Mississippian with some degree of certainty. These sites are Swift Creek, Garden Creek, Annewakee Creek, Kolomoki, Mandeville, Fort Center, and Greenhouse. The last two are not included in Dickens' inventory. The Fort Center site in south central Florida has two platform mounds, which according to Sears (1971) were constructed sometime between A.D. 1-500. One of these was ceremonial in nature, functioning in mortuary rituals, while the other was essentially a raised habitation area. At the Greenhouse site near Marksville, Louisiana, platform mounds were being constructed by early Coles Creek times, roughly A.D. 600-700.

Many of these early platform mounds share distinctive architectural features: the presence of thick deposits of occupation refuse on mound summit (Swift Creek, Mandeville, and Greenhouse); buildings erected on mound summit (Swift Creek, Mandeville, Greenhouse, Garden Creek, and Annewakee Creek)(Sears does not mention archaeological evidence for superstructures at Fort Center, but an artist's reconstruction which accompanies his article shows one on the summit of the mortuary mound); and periodic addition of mound stages (Swift Creek, Mandeville, Greenhouse, Garden Creek and Annewakee Creek). These mounds are similar to the stereotypic Mississippian mound in the latter two features; they differ in the former.

The critical question raised by Dickens' paper is what if any historical relationship exists between these early platform mounds and the mounds of the Mississippi period. Do Mississippian platform mounds in the South Appalachian Province, indeed throughout the Southeast, develop from indigenous Woodland antecedents? This question cannot be answered until we know more about the function of Woodland and Mississippian platform mounds and until we have cultural sequences which provide data on changes in platform mound architecture through time.

Some Woodland period platform mounds (Greenhouse, Kolomoki, and Fort Center) apparently had mortuary functions. Beyond this, little is known about the purpose these early mounds served. The situation is little better for the later period. So-called Mississippian "temple mounds" undoubtedly varied considerably in function from region to region, from site to site, and within sites. Indeed, the available ethnohistorical and archaeological data indicate that Mississippian platform mounds had a variety of functions ranging from repositories for the dead to substructures for charnel houses, "temples," council houses, and the domiciles of high status individuals. With few exceptions, however, archaeologists have avoided dealing with this question. Exceptions to this generalization are to be found in the work of Peebles (1971), Brown (1971), and Fowler (1974).

The Greenhouse site provides the only phase sequence in which changes in platform mound form and function can be demonstrated. Unfortunately, a detailed description of these changes has not been published.

Faulkner summarizes a wealth of recently acquired information that bears on the question of Woodland-Mississippian relationships in the eastern Tennessee Valley. According to Faulkner, this information demonstrates that the appearance of Mississippian culture is not simply the result of population displacement as proposed by Kneberg and Lewis, but rather can be attributed to a combination of factors, including population displacement, acculturation, and indigenous development.

Faulkner is to be commended for offering us alternatives to the long dominant "replacement hypothesis" of Kneberg and Lewis. One wonders, however, whether Faulkner has gone far enough in his assault on established dogma. What is the evidence for intrusive Mississippian populations in the eastern Tennessee Valley? Are the Woodland-Mississippian "discontinuities" as marked as Faulkner believes they are?

Nowhere is it more apparent to me that the established interpretation of Woodland-Mississippian relationships needs rethinking than in the area of subsistence patterns. Faulkner proposes that the Mississippian inhabitants of eastern Tennessee were more intensive maize horticulturalists than their Woodland predecessors. What is the evidence for this belief? According to recently summarized data (Faulkner; this volume; Faulkner and Graham 1967), maize has been found in Tennessee on two Late Woodland sites, two Emergent Mississippian sites, and approximately five sites where association is with Early Mississippian (Hiwassee Island) components. I do not find these figures very convincing as evidence for a marked increase in agricultural dependence coincident with the appearance of Mississippian culture.

Faulkner suggests that biased site sampling may account for the supposedly more common occurrence of maize on Mississippian sites. This point cannot be overemphasized. Most, if not all, maize producing sites listed by Faulkner and Graham (1967) either have mounds or are very large villages. It is evident from published reports of TVA investigations (Webb 1938, 1939; Webb and DeJarnette 1942; Webb and Wilder 1951) conducted in the late 1930's that mound and shell midden sites were heavily favored for excavation, while surface artifact scatters which might have marked the location of small farming communities were ignored. In the Wheeler Basin report (Webb 1938) all sites known to exist within the reservoir are listed. A comparison of this with the list of sites excavated by TVA personnel reveals the extent of bias inherent in the selection of sites for excavation:

	Shelters	Camps and Workshops	Villages	Mounds	Shell Middens
Sites excavated	1	0	2	9	5
Sites not excavated	18	27	131	34	23

Faulkner suggests that Emergent Mississippian settlement pattern in the eastern Tennessee Valley is characterized by small farming hamlets. If similar sites are characteristic of Hamilton, it is obvious that known bias in site sampling would distort our perception of subsistence patterns during this Late Woodland phase. Several Hamilton burial mounds and shell middens have been excavated over the years (Lewis and Kneberg 1946). Maize would probably not be represented in the former. If the shell middens are only seasonally occupied (Magee 1973), maize might not be abundantly represented in them either.

In his introductory remarks, Ferguson cautions us not to expect this symposium to have a revolutionary impact on South

Appalachian Mississippian archaeology. Whether it will generate "inquisitive interaction" among archaeologists as he hopes remains to be seen. In my opinion this symposium has performed its greatest service by focusing attention specifically on the problem of Woodland-Mississippian relationships in the South Appalachian Province.

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Archaeology of the King Site, An Early Historic Indian Town in Northwest Georgia

Organized by David J. Hally

Introduction to the Symposium: The King Site and its Investigation

David J. Hally

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The King site is an early historic Indian town located in northwest Georgia approximately twenty-five miles west of the city of Rome (Figure 1). The site is situated in the alluvial floodplain of the Coosa River at a point where the river has formed a large meander loop known as Foster Bend. Lake Weiss begins approximately two miles downstream.

The earliest published reference to the King site occurs in Battey's History of Rome and Floyd County (1922) where artifacts scoured from the site by floods in the late 19th Century are illustrated. Margaret C. Ashley visited the site for Warren K. Moorehead in February, 1928, and during her single day's excavation uncovered hearths and charred posts associated with a burned structure. Asheley concluded from her brief investigation that the "culture of the site was like that of Etowah" (Moorehead 1932: 157). The site was not visited by WPA survey crews working in north Georgia during the 1930's; in his Archaeological Survey of North Georgia, Wauchope merely paraphrases Ashley's account (1966: 219-220).

The scientific investigation of the King site began in the spring of 1971 when Mr. Patrick Garrow, then Instructor of Anthropology at Shorter College, commenced weekend excavations with a volunteer crew. Excavations were continued intermittently by Garrow until the summer of 1973 when a formal ten-week field season was undertaken with financial support from Shorter College and the University of Georgia. In December, 1973, the author received a grant from the National Geographic Society for research at the site. These funds, along with generous contributions from local citizens and assistance from the University of Georgia, supported full time excavation by a small crew under Garrow's direction until June, 1974. At that time a research grant was received from the National Endowment for the Humanities, and the crew was augmented by a University of Georgia summer field school class under the direction of the author. Large scale field work was terminated on September 1.

The King site covers an area which is probably in excess of four acres; 124,000 square feet or approximately two-thirds of the site have been excavated (Figure 2). The remainder of the site is in pasture and has not been available for excavation.

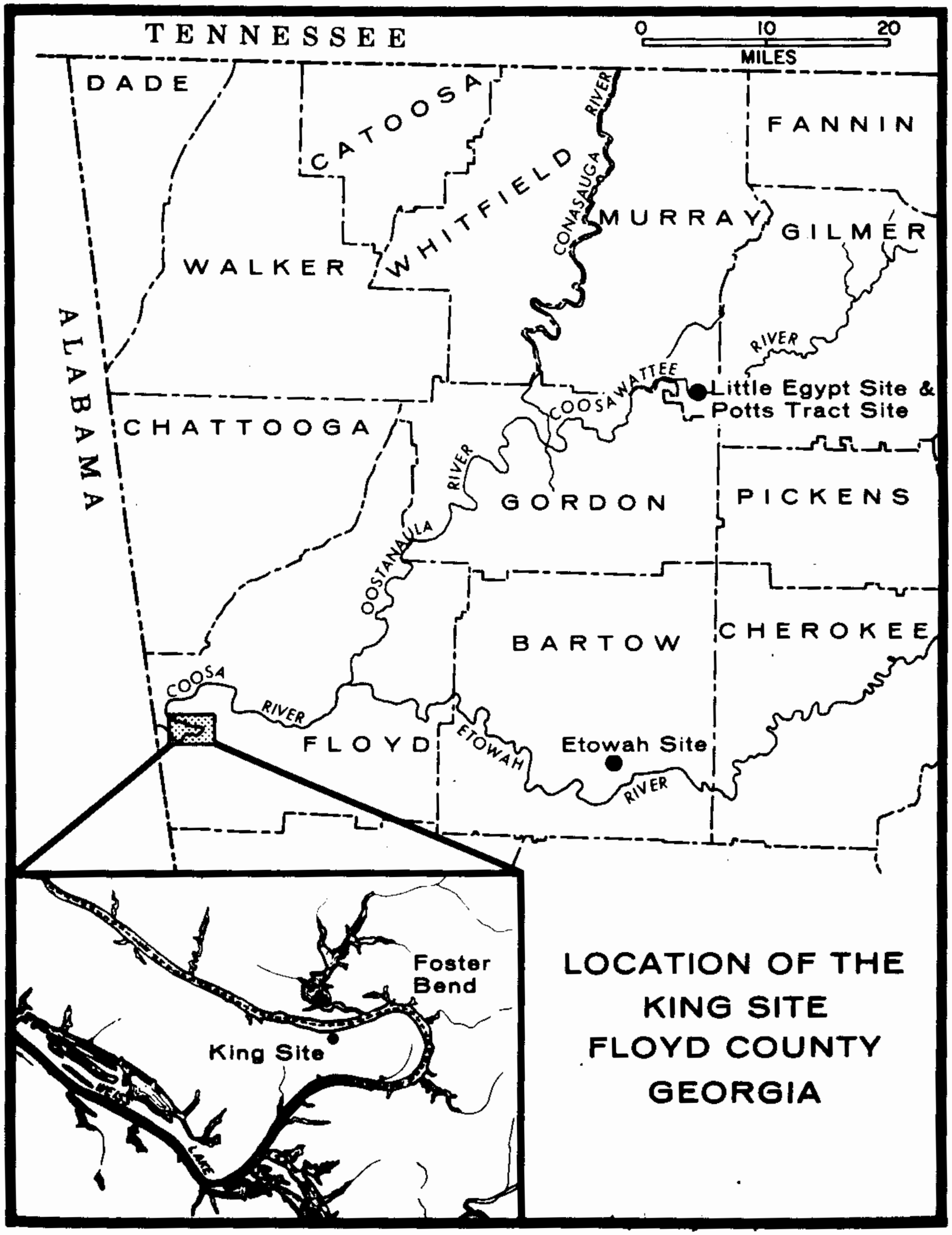
TENNESSEE
0 10 20
MILES
DADE
CATOOSA
FANNIN
WHITFIELD
CONASAUGA RIVER
MURRAY
GILMER
WALKER
ALABAMA
RIVER
COOSAWATTEE
Little Egypt Site &
Potts Tract Site
CHATTOOGA
RIVER
GORDON
PICKENS
OOSTANAULA
BARTOW
CHEROKEE
COOSA
RIVER
FLOYD
ETOWAH
Etowah Site
RIVER
Foster
Bend
King Site
LAKE
LOCATION OF THE
KING SITE
FLOYD COUNTY
GEORGIA

Figure 1.


KING SITE (9FL-5)
FLOYD COUNTY, GEORGIA
POST
HEARTH
BURIAL PIT
ENTRANCE TRENCHES
DITCH
COOSA
RIVER
SCALE AND CONTOURS IN FEET
N
600
700
800
100
200
300
400
500
98.0
98.5
97.0

Figure 2.

Stratigraphically, the site consists of a light colored sandy loam subsoil and overlying plowzone. Occupation refuse and virtually all the aboriginal occupation surface have been destroyed by erosion and cultivation. Features such as burials and postholes, however, are abundant in the subsoil and are easily detected.

Excavation of the King site entailed first and foremost the removal of plowzone and exposure of subsoil surface. This was accomplished by means of selfloading drag pan, tractor mounted scraper blade, shovel shaving, and trowelling. Features appearing on the exposed subsoil surface were mapped with plane table and alidade and, with the exception of postholes, were subsequently excavated by hand. Altogether, 210 burials, seven intact house floors,[1] and a small number of miscellaneous features were excavated.

A large number of postholes, numbering in the thousands, were recorded during site investigations. The original research plan called for cross sectioning of a representative sample of these, but due to time and money limitations this goal was not achieved. Since postholes were identified solely on the basis of their surface appearance, it is possible that some recorded "postholes" are actually animal burrows and tree root canals. The number of such misidentifications is probably small, however, since subsoil features produced by these natural agencies did have distinctive and recognized characteristics.

The major shortcoming of the King site is readily seen in the contours of the subsoil surface (Figure 2). Since at least the late 19th Century, the site has been periodically scoured by the flooding Coosa River. Greatest damage has been done in the southwest corner of the excavated site where subsoil is as much as two feet lower than it is farther north and east. All structures with intact floors are located along the eastern edge of the site. All but one are located in the area circumscribed by the 98.5 foot contour. Palisade and wall posts here extend to a depth of at least 1.5 feet while burials average two to three feet in depth. Feature preservation decreases as one moves across the excavated site from northeast to southwest. Hearths and the interior support posts of structures are the first features to go. Ultimately palisade and wall posts as well as burials disappear. All burials encountered in the southwest sector of the excavated site were plow disturbed.

The King site, for all practical purposes, has only a single, early historic component. Four radiocarbon determinations have been obtained for this component: A.D. 1410 $\pm$ 55; A.D. 1670 $\pm$ 70; A.D. 1830 $\pm$ 65, and modern (Geochronology Laboratory, University of Georgia). Inasmuch as all assays

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[1]Excavation of Structure 7 was not completed until November 1974. As a result, the structure's posthole pattern is not portrayed on the site map, Figure 2.

were made on charcoal derived from burned structures, it is difficult to explain the wide discrepancy between them. In lieu of reliable radiocarbon dates, site antiquity is best determined by means of artifact cross dating. The assemblage of European artifacts obtained from the site and described in Marvin Smith's paper indicate an occupancy date sometime in the 16th or 17th centuries. Ceramic similarities to the Potts' Tract and Little Egypt sites (Hally 1970, n.d.) at Carters Dam, Georgia, suggest that the King site dates somewhere between A.D. 1550 and A.D. 1725. It would seem then that of the four radiocarbon dates, the A.D. 1670 determination is probably closest to reality.

Site occupancy seems to have been of rather brief duration--probably less than fifty years. This estimate is based primarily upon the fact that there is only one palisade line and that it seems to have received only limited repair. Ethnohistorical documentation for the life span of aboriginal palisades in the Southeast is unfortunately lacking. In a recent experiment with fence posts conducted in Athens, Georgia (Vick, et al. 1967), however, it was found that none of the six species of pine and hardwood tested had an average life span in excess of 6.5 years. Even considering differences in soil acidity, season of cutting, and replacement of decayed posts it seems unlikely that a single palisade line would last more than fifty years.

Also indicative of brief occupancy is the fact that there is little crowding of architectural features within the habitation zone. The majority of domestic structures have been rebuilt at least one time, but there is no evidence of overlapping structures such as one finds on some large village sites in the eastern U. S.

The King site ceramic complex contains Lamar and Dallas-Mouse Creek pottery types in approximately equal proportions. The numerically dominant types in order of frequency are Lamar Plain, Dallas Plain, Lamar Complicated Stamped, Lamar Incised, and Dallas Incised (Hally 1970: 13). Dallas Modeled and Dallas Filleted occur as minority types. With the exception of Lamar Complicated Stamped, all types are found with both grit and shell tempered paste.

The King site ceramic complex closely matches that found by the author at the Potts' Tract and Little Egypt sites (Hally 1970) located some fifty miles to the northeast at Carters Dam. Similarities are also to be seen with Mouse Creek and Dallas (Kneberg 1952), but there are major differences mainly in the areas of tempering and complicated stamping. Important similarities and differences can also be noted with the early historic occupations of Weiss (DeJarnette et al. 1973) and Guntersville (Heimlich 1952) reservoirs in Alabama. The most striking differences involve the almost complete replacement of complicated stamping with cordmarking and brushing in the Alabama site collections.

It is unlikely that the historic ethnic or tribal affiliation of the King site inhabitants will ever be determined with certainty. To begin with, historical documentation of the site, so far as is known, is lacking. Secondly, site location is geographically intermediate to the known 18th Century location of Cherokee and Creek towns (Swanton 1922; Plate 1). Finally, the King site ceramics show an almost equal degree of resemblances to all pottery complexes that have been defined in the tri-state area including those that are generally equated with Cherokee and Creek.

According to the United States DeSoto Commission report (1939), the DeSoto expedition passed within fifty miles of Foster Bend in 1540. Given the distinct possibility that the King site was occupied as early as the second half of the 16th Century, it is probably most meanigful to seek cultural affiliations with one of the towns or provinces--Chiaha, Coste, Tali, Tasqui, Coca--encountered by DeSoto in the tri-state area.

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Preliminary Analysis of the King Site Settlement Plan

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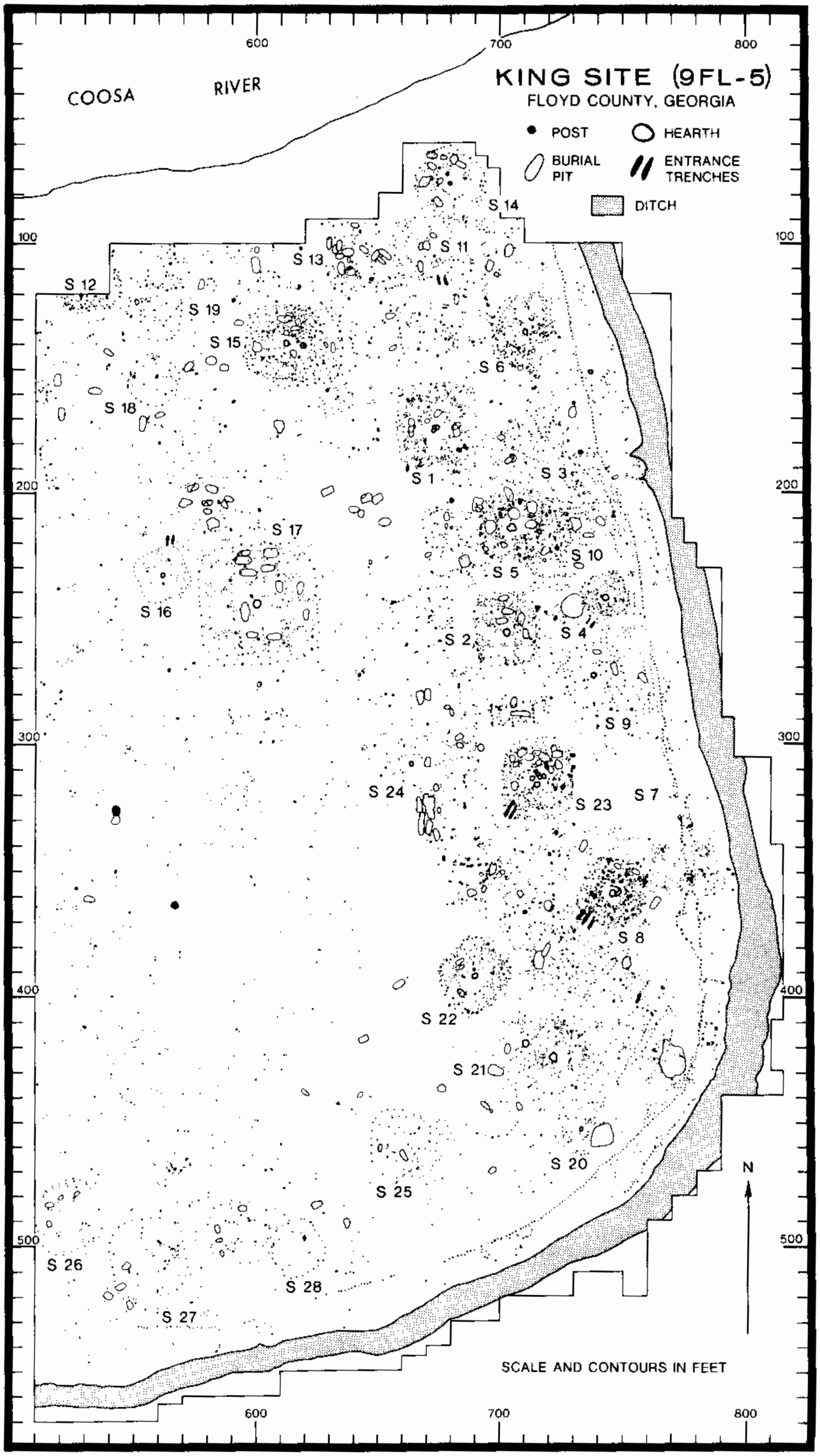
As revealed through archaeological investigations, the basic elements of the King site settlement plan are: 1) a defensive perimeter consisting of ditch and palisade, 2) an inner zone of domestic structures, and 3) a large centrally located plaza containing buildings and other architectural features of a presumably public and ceremonial nature (Figure 1).

The full areal extent of the King site, that is, the area enclosed by the ditch and palisade, is not known with certainty at the present time. Resistivity and magnetometer surveys and limited test trenching in the field west of the excavated site will be conducted in the near future. These will probably yield reliable information on the location of the ditch and the distribution of the habitation zone.

Nevertheless, it is possible at this time to make what is probably a reasonably accurate estimate of total site size. One hundred feet beyond the western edge of the excavations there is a large gully which extends from the river bank southward for a distance of approximately 100 feet. This feature has been modified by erosion, but its width and depth dimensions certainly do not rule out the possibility that it was originally the defensive ditch. If we assume that the two plaza structures, Numbers 16 and 17, are centrally located along the east/west axis of the site, the projected location of the western ditch falls exactly where the gully is today. If this is the location of the ditch, and the site is symmetrical in shape, then total site area will be approximately 196,000 square feet or 4.5 acres.

The ditch which encircles the entire excavated potion of the King site is somewhat variable in cross section but tends to have a flat bottom and steeply sloping sides. At the time of construction it would have had a depth of at least 4-5 feet and a bottom width of 8-11 feet. These dimensions are approximately half those reported by Larson (1972: 386) for Etowah. At no place in the exposed length of the ditch has evidence of an elevated crossing been encountered.

Ditch elevation is well above that of mean river level. Preliminary results of a sedimentary analysis of ditch fill suggest that initial fill strata were not deposited under


KING SITE (9FL-5)
FLOYD COUNTY, GEORGIA
POST
HEARTH
BURIAL PIT
ENTRANCE TRENCHES
DITCH
COOSA
RIVER
600
700
800
100
200
300
400
500
S 1
S 2
S 3
S 4
S 5
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S 7
S 8
S 9
S 10
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S 19
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S 23
S 24
S 25
S 26
S 27
S 28
N
SCALE AND CONTOURS IN FEET

Figure 1.

standing water conditions. It seems unlikely, therefore, that the ditch held water permanently. There seems also to have been no intentional deposition of occupation refuse in the ditch.

Throughout most of its exposed length, the palisade is represented by a single line of posts spaced an average of 1.5 feet apart. Distance between palisade and ditch varies between 10 and 20 feet. Architectural features such as bastions and entrances are difficult to recognize and may be absent at least in the area excavated. What may be a screened entrance and associated bastion are located east of Structure 21 (S390-420, E780-790). Small semicircular posthole arrangements measuring 7 feet by 4 feet occur at two points (S280, E770 and S495, E710) along the palisade and may represent bastions. These features approach in size and shape bastions associated with one of the palisade lines at the Jonathan Creek site in Kentucky (Webb 1952; Fig. 10).

In two locations (S220, E760 and S460, E770) posthole lines extending in excess of 30 feet occur between and parallel to the ditch and palisade. These may be remnants of an earlier palisade line destroyed as a result of ditch construction. Finally, there are in several locations lines of posts that may be attributed to palisade repair.

Within the palisade, twenty-seven structures have been indentified on the basis of posthole alignments and related architectural features (structures 5 and 10 are counted as a single structure with two building stages). Most of these occur in a relatively narrow zone adjacent to the palisade and are probably domestic in nature. This identification is based on the large number of these structures, at least twenty-two, and on the occurrence of presumably domestic debris in those buildings with intact floors.

The general characteristics of these structures include: 1) single post wall construction, 2) wall trench entry passages located at building corners, 3) floor plans that are rectangular with rounded corners, 4) four interior support posts, and 5) central hearths (Figure 2). Structures range in size between 19 and 31 feet and are frequently exactly square. The spacing of interior support posts varies with total structure size, the distance between them amounting to between 35 and 45 per cent of total structure size. Postholes from walls and interior supports average 0.65 feet in diameter. Preserved wall posts, however, are frequently split timbers and considerably smaller than the hole they occupy. Wall post spacing averages just under three feet.

Three structures (Numbers 4, 7, and 8) were definitely erected within shallow basins. Floor elevation in the deepest, Structure 8, is 1.2 feet below adjacent subsoil surface. Altogether, seven structures had partially or wholly intact floors. Since aboriginal ground surface has been destroyed over the entire site, it is likely that all of these had depressed floors.

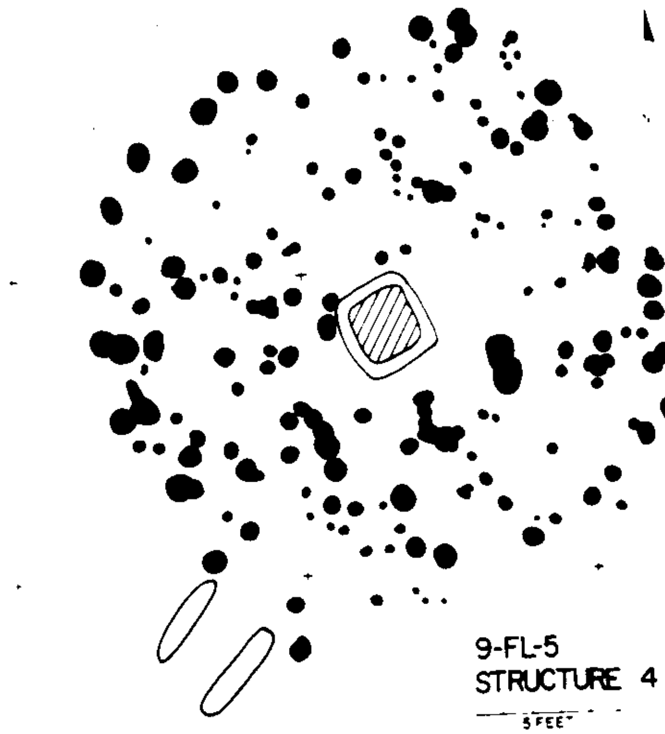

Figure 3.

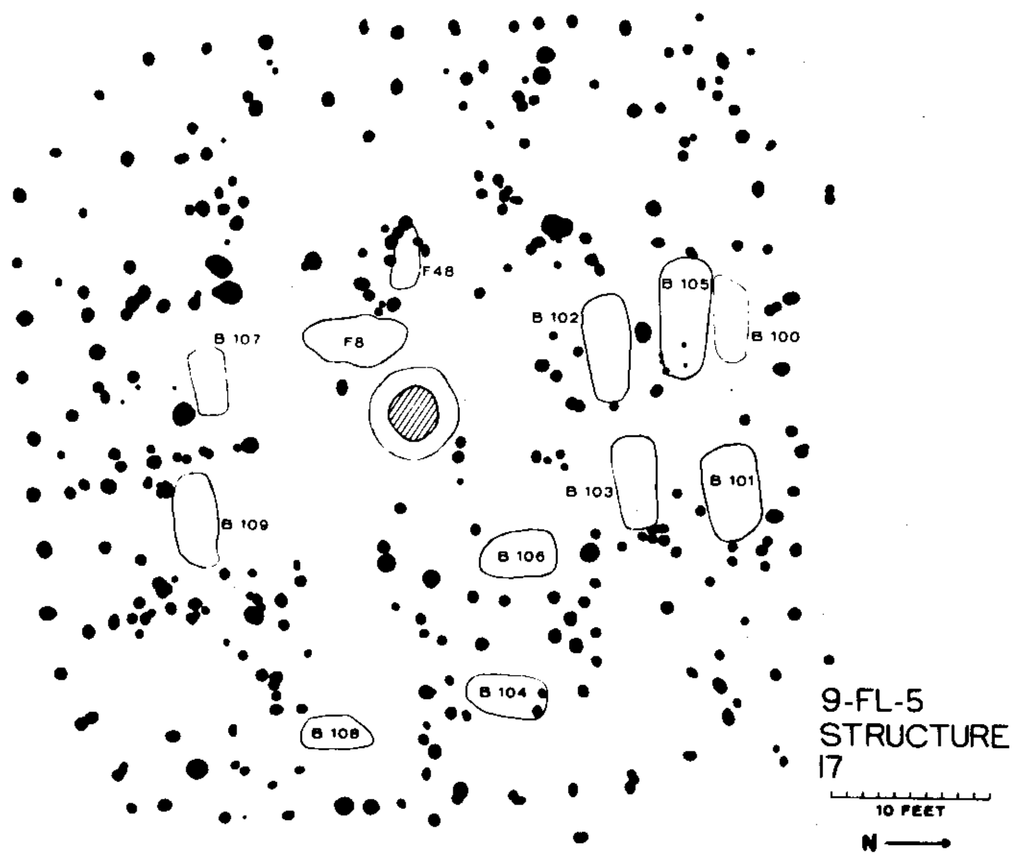

Figure 4.

Interior postholes other than the four support posts are quite common in domestic structures. For the most part they occur outside the central floor area defined by the major support posts. They probably served at least two functions--bench or bed supports and partition walls. Raised benches, placed against exterior walls, were a common feature of aboriginal houses throughout the Southeast in the historic period (Swanton 1946: 422). Evidence for the second identification, that of partitions, is provided by preserved basal remnants of clay and post walls in Structures 4 and 7.

Laboratory analysis of the occupation debris occurring on intact house floors has hardly begun. At least one probable activity area, however, can be identified at this time. Lithic debris invariably occurs over a several square foot area adjacent to the southwest or southeast wall.

The majority of the domestic structures have been dismantled and rebuilt at least one time. Six structures evidence only one construction stage; an equal number evidence two stages, while in the case of three structures rebuilding may have occurred three or more times. Typically, the entire structure is shifted 1 or 2 feet from its original position. In three cases (Structures 3, 5-10, and 15), however, spatial displacement exceeds 7 feet. In several instances, the number of hearths exceeds the number of wall building stages indicating perhaps an intermediate step in the life cycle of domestic structures.

The compass orientation of domestic structures in general coincides rather well with the orientation of the adjacent section of palisade. The greatest deviation from this pattern is seen in Structures 8 and 25. Orientation of entrance trenches appears to be quite variable, but four of the seven extant entraces (Structures 4, 7, 8, and 23) cluster between S31°W and S45°W. That this orientation is intentional is indicated by the fact that these same structures vary in orientation by as much as 60°.

As is apparent in the preceding discussion, domestic structures at the King site exhibit a rather marked degree of architectural uniformity. Variation is also evident in a number of features, however, including presence or absence of wall trench entrances, fired wall daub, and burials; orientation of entrances; forms of central hearths; and number of construction stages. It seems unlikely that such variability is entirely random and unintended. Rather, at least some must reflect the different uses to which these structures were put by their occupants.

Functional variability in domestic structures is clearly documented in the ethnohistorical literature for the Southeast. To begin with, most tribes seem to have utlized separate buildings for winter and summer occupancy (Swanton 1946: 386-388). Beyond this we have Bartram's statements that Creek households consisted of between one and four functionally distinct structures--the number depending upon the wealth of the occupants. These structures, according to the same source, were arranged around the sides of a small square courtyard (Swanton 1946: 392-394).

The spacing and orientation of several of the King site domestic structures are suggestive of Bartram's household complexes. In three instances, three or four buildings, all similarly oriented, are arranged around a relatively large open area: Structures 1, 6, 11, and 15; Structures 2, 9, and 23; and Structures 8, 21, and 22. In each cluster, at least one single and one multiple stage building are represented, and there is at least one building with a wall trench entrance.

It should be noted that there is evidence which tends to counter these cluster identifications. For one thing, structures in two of the clusters have wall trench entrances which face away from the associated courtyard. In addition, other differently constituted clusters can be identified on the site map with little difficulty--for example, Structures 6 and 11, and Structures 1 and 5-10. These problems would seem, however, to reflect the preliminary state of settlement plan analysis rather than the absence of patterning in the data.

The large area in the center of the King site which is characterized by a low density of postholes is identified as plaza. This area, as presently known, measures 150 feet east/west and 300 feet north/south. It is difficult to determine the southern boundary of the plaza with certainty as erosion may have completely obliterated some domestic structures at the south end of the site. Notable features within the plaza are two clusters of burials at the north end, the two structures immediately to the south, and the two large postholes, Feature 11 (S363, E570) and Feature 45 (S325, E540) farther to the south. Of the latter, Feature 45 is the largest and most distinctive. It measures over 3.5 feet in diameter and probably exceeded five feet in depth at the time of construction. Several large limestone slabs occurred in pit fill, and pit bottom was covered with a neatly arranged layer of similar slabs. Feature 11 is a narrower (1.5 feet in diameter) but equally deep circular pit.

Both Features 11 and 45 are unique on the site and, no doubt, are postholes. Given their size and location, it is possible that the posts they held can be identified with the "chunky" and "slave" posts that have been described for late 18th Century Creek towns (Swanton 1928: 188-190). According to Bartram, both kinds of post stood in the town plaza or "chunky yard." "Chunky poles" were 30 to 40 feet tall, measured 2 to 3 feet across at the base, and were used in a ball game played between men and women. "Slave posts" stood about 12 feet high and were used for the display of scalps and the torture of war captives (Swanton 1928: 188-190).

Measuring 48 feet square, Structure 17 is by far the largest building encountered at the King site (Figure 3). The central floor area of the structure, bounded by eight interior posts, contains a hearth, two shallow pits, and a small number of postholes. Burials and numerous postholes fill the area between interior supports and exterior walls. The majority of postholes in this latter area form alignments that divide each side of the structure into three or four compartments. The only indications of an entrance for Structure 17 are two paired wall posts at the southeast corner of the structure and the near absence of interior postholes in the same corner.

It is probable that Structure 17 had public and ceremonial functions and that it can be equated with the Cherokee town-house or Creek hot house. These structures were usually round, but Taitt describes the hot house at Tuckabahchee as a square building with rounded corners. He further observes that the entrances to Creek hot houses generally face to the southeast (Swanton 1928: 170). The interior posthole alignments in Structure 17 probably represent supports for platforms which are a common feature of Creek and Cherokee community structures.

There is no mention of human burial occurring within historic Creek and Cherokee community structures. Ten burials were placed within the walls of Structure 17 however. In all cases where bone preservation was adequate for sex and age identifications, these interments were found to be adults (9 individuals) and male (4 individuals).

Immediately adjacent to Structure 17 on the west is a building which in nearly all respects is similar to the domestic structures described above. It differs only in location, the absence of burials, and the occurrence of a small pit containing a pottery vessel immediately south of the hearth. The function of this structure is not known. Given its location, however, we can infer that it played a role in community affairs.

The general settlement plan for the King site--consisting of defensive perimeter, habitation zone, and central plaza with associated public buildings--is consistent with what is known archaeologically and ethnohistorically for the interior Southeast during the 15th to 18th centuries. The Mouse Creek site near Chattanooga appears to have an almost identical layout (Kneberg 1952). On the historic level, rather close parallels are to be seen in Bartram's illustration of a "typical" Creek town and ceremonial ground (Swanton 1928: 178). The major differences are the obviously greater compactness of the King site habitation area and the absence of a square ground. Sufficient area exists at the southern end of the King site plaza for a square ground, but there are no posthole alignments that are suggestive of one. Given the heavy erosion that has occurred in this portion of the site, it is entirely possible that the evidence for such a structure has been destroyed.

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European Materials from the King Site

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The King site shows evidence of very early European contact or influence. This paper describes the European artifacts found in the course of site excavation and suggests possible origins for them. It is hoped that these descriptions will be useful in identifying other sites of the early contact period.

All European materials found during the excavation of the King site were manufactured from iron. No artifacts of brass, silver, or glass were discovered. The absence of these artifacts, so common in later historic sites in this area, may be a significant clue to the dating of the site. The King site is considered to be quite early, certainly pre-1670 and possibly 16th Century. The scarcity of European materials also suggests an early date for the King site. Out of 210 burials excavated, only 5 contained European artifacts. No European artifacts were discovered on preserved house floors although there are a few possible examples from the plowzone. Due to the uncertainty of their origin, these latter artifacts are not considered in this paper.

The burials that contained European artifacts had several things in common. All were located around the edge of the plaza, an area which Garcilaso de la Vega states is reserved for the "noblest and most important personages" (Varner and Varner 1951: 171). If this statement is accepted, then it may be inferred that European goods were scarce and were reserved for the "nobility." All burials containing European goods were in a flexed or semiflexed position, while other burials on the site were flexed, semiflexed, extended, and bundle types. Four of the burials containing European artifacts also contained numerous aboriginal grave goods, while the remaining burial contained only a single iron artifact. These burials were found both inside and outside of domestic structures. Perhaps surprisingly, no European artifacts were found with burials in the "council house."

The eight iron artifacts from the King site can be divided into three groups: celts, knife blades, and other (Figure 1). Three rectangular iron celts were found, two in one burial and one in another. All of these iron celts are approximately 10 cm long. Widths range from 2.8 cm to 3.9 cm. All celts show evidence of wooden hafts. As a group, the celts were well preserved, but unfortunately this was not true of the two artifacts interpreted as knife blades. These objects were badly corroded, and identification was made from X-ray photography by Pat Garrow. One blade was 13.6 cm long, and the other was 11 cm long. One object was originally interpreted as an iron spike. This object is 9.3 cm long, irregular in cross section, and split at one end. This object was very badly corroded,

Figure 1

European Artifacts from the King Site

Top row, left to right: celt, Burial 92; celt, Burial 92; wedge or tapered celt, Burial 117; celt, Burial 15.

Bottom row: Rod with rounded, chisel-like end, Burial 92.

and as a result its function is not known. Two other miscellaneous objects were found. One is a thick tapered celt or wedge, 8.5 cm long, with maximum thickness of 1.9 centimeters at the poll end. There is a rectangular socket in the poll end. This object had been hafted and functioned as a celt. The final object is an iron rod 18.6 cm long with a rounded, flattened, chisel-like end. This rod is 1.1 cm in diameter and had been hafted parallel to its long axis. More complete measurements for all artifacts are given in Table 1.

It is the opinion of this writer that there are only two plausible explanations for the origin of this European material. It was obtained either through direct European contact, probably with early Spanish explorers, or through aboriginal trade from coastal areas where there was early European contact. The material dealt with in this paper is both quantitatively and typologically different from materials found at other later historic sites in the immediate area. Thus English and French trade of the post-1670 period can be largely discounted. On the other hand, the material is typologically similar to

Table 1

Iron Artifacts from the King Site[1]

Burial No.	Description	Length	Width	Thickness
Bu 15	Celt	8.0 cm.	3.9 cm.	1.0 cm.
Bu 19	Knife Blade (?)	13.6 cm.	*	*
Bu 40	Knife Blade (?)	11.0 cm.	*	0.4 cm.
Bu 92	Celt	9.8 cm.	3.2 cm.	0.8 cm.
	Celt	10.2 cm.	2.8 cm.	0.6 cm.
	Rod with rounded, flattened, chisel-like end	18.6 cm.	1.1 cm. diameter	
Bu 117	Unidentified fragment	9.3 cm.	1.1 cm.	0.5 cm.
	Wedge or tapered celt	8.5 cm.	4.7 cm. maximum at blade 1.9 cm. minimum at poll	1.9 cm. at poll

[1]Due to the corroded condition of these iron artifacts, all measurements are somewhat approximate. The knife blades from burial 19 and 40 were in extremely poor condition, thus not all measurements were practical.

European goods found in the early historic period (1500-1600) in Florida. Hale Smith (1956: 35) states that the celtiform axe, hunting knife blade, hafted axe, chisel, spike, fish spear, adze, pointed rod, and hoe are found in early contact period sites in Florida. Sites producing iron artifacts of the types found at the King site include Mound near Fort Mason, Thursby Mound, Raulerson's Mound (Smith 1956), the Philip Mound (Benson 1967), and the Goodnow Mound (Griffin and Smith 1948).

There is some indirect evidence that the materials found at the King site may have come from Spanish exploratory expeditions. In the U. S. DeSoto Expedition Commission Report, Swanton prepared a list of European articles given to the Indians or found already in their possession by the DeSoto Expedition (1939: 55). This list includes iron axes and iron "implements."

Thus we know that materials like those found at King site were brought in by DeSoto in 1540 and no doubt by subsequent explorers such as Pardo in 1568.

The other possible origin for the material is by aboriginal trade from coastal areas visited by early Europeans, either in Florida or perhaps the Atlantic coast of the Carolinas or Georgia. Presumably this European iron could have easily been carried along the same trade network that carried marine shell into the interior. Hale Smith states that during the Early Historic Period in Florida, "trade relations with the northern parts of Georgia and Alabama were still functioning, and new aboriginal culture traits were introduced from this area"(1956: 109). It is thus logical to assume that this aboriginal trade was a two-way affair and that iron could easily have travelled north. Furthermore, it is supposed that direct contact sites would show more ornamental articles such as glass beads and brass bells (See Brain 1974, Smith 1974).

Finally, it should be mentioned that the European artifact assemblage at the King site is not unique in this area. Other similar sites are known from the Coosawattee, Etowah, and Coosa drainages of North Georgia as well as the Tennessee River in eastern Tennessee (Smith 1974).

In conclusion, the early historic nature of the King site is indicated by eight iron artifacts. The scarcity as well as the nature of these artifacts certainly indicates an early historic chronological position for the King site. The iron goods may represent gift materials from early explorers, but it seems more likely that they represent materials brought in via aboriginal trade.

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Preliminary Report on the Social Dimensions of the King Site Mortuary Practices

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Two hundred and ten burials were excavated at the King site during the total period of fieldwork. This paper will describe (1) some of the variability in the burial population, (2) some specific analyses already performed, and (3) summarize future research with this data.

The underlying assumption of this paper is that the different forms of burial viewed in this extinct society are related to the status of the deceased individuals (Ucko 1969: 270). The definition of status used in this paper is that formulated by Linton, the sum total of all status positions occupied by the individual, i.e., "his position with relation to the total society"(1936: 113).

Description

At this site a number of "dry holes" were excavated. These are features which resemble burial pits from the surface, but contain no bone or artifacts. At the present stage of analysis two explanations can be offered for these features. The Fatherland site and Natchez ethnohistorical data supply an hypothesis that these dry holes may well be burial pits of exhumed individuals (Neitzel 1965: 44). Alternatively these features may be burials of fetal and infant children which have decayed beyond recognition.

The King site burials are positioned in a variety of ways. The most common position is semiflexed accounting for 36% of all burials. Flexed is second in popularity comprising 16%. Ten per cent of the burials are extended, and only 2% are secondary bundles. As the data now stand, 37% could not be identified as to position due to poor preservation. Several of these burials were classified as multiple burials. Multiple burials are defined as more than one individual in a single pit.

Approximately 9% of the burials showed evidence of mutilation. The mutilations range from missing finger and foot bones, which may be due to poor preservation, to disarticulation and apparent cuts on bone. These mutilations and multiple burials suggest several hypotheses. Are we here dealing with warfare, European introduced disease, delayed burial (Adair 1930: 189), or criminal justice in this society? The occasional harshness of the latter is clearly shown in DeBry's engravings (Lorant 1965: 99). These questions are presently under study and are not dealt with in this paper.

The differential distribution of European trade goods, discussed by Marvin Smith (this volume), is of interest. Trade goods in the form of iron objects are found only with five burials or 2.4% of the total. Assuming that as value increases quantity decreases, these items, probably of Spanish manufacture, were surely very valuable and were destroyed by burying them only with those whose status position in life allowed or dictated such extravagance.

Special treatment was also given in the form of log or plank tombs which occur in 6% of the burials. Special treatment was given to a Cherokee chief in this manner in the Eighteenth Century (Adair 1930: 189). Most of these are in the so-called "Public Area" of the site to be explained later.

Preliminary Analyses

Much of the analysis done for this paper was inspired by James Hatch's M.A. thesis, Dallas Mortuary Practices (1974). Because of the cultural similarity and geographical proximity of the King site to Dallas Culture, his analysis is felt to be applicable to this study.

To order the King site burial data, the values from the variables of orientation, presence or absence of artifacts, sex, age, and site area were coded onto IBM cards. This was done in a format applicable to Crosstabs, a program of SPSS, the Statistical Package for the Social Sciences, which allows two-way to n-way table display of variable value lists. Useful statistics given by the program are Chi Square, Phi, and Cramer's V--all measures of association (Nie, Bent, and Hull 1971). Samples of various sizes were run to control somewhat for sample error. The final runs which serve as the testing resource for this paper consisted of 65, 156, and 189 cases or burials. The smaller sample utilized only those burials for which data were complete; the second contained 91 cases for which sex and/or age class were missing or undeterminate, and the largest consisted of all cases which had complete artifact and area data. It should here be made clear that none of these samples were drawn using probability sampling. The second run was made in an attempt to include subadults in the analysis since none of these were sexable. The last run, which still excludes 10% of the population, excludes the variable of orientation, for reasons explained below.

Confidence limits were placed at the .10 level for acceptance, a procedure which has been criticized on statistical grounds (Christopher Peebles, personal communication). However, all levels of significance are listed in the tables--N.S. signifying cell values too low for computation.

A basic assumption was made about the nature of the site for this preliminary analysis. The site has been divided into two distinct functional areas, a private sector and a public sector. The private area includes hypothesized domestic structures and environs, and the public includes the hypothesized public or ceremonial structures, the plaza, and environs of these areas. There are implications of this spatial separation in the ethnographic literature (Hawkins 1948: 68-72; Smith 1968: 239). Finer definition of these areas awaits the completed study of settlement pattern and structure variability.

Table 1. Run 1, N=65

Crosstab	Phi* or Cramer's V	Significance
Sex/Area	.27*	.05
Artifact/Area	.34*	.01
Artifact/Age	All adult	N.S.
Artifact/Sex	.32*	.02
Area/Age	All adult	N.S.
Orientation/Age	All adult	N.S.
Orientation/Area	.28	.63
Orientation/Sex	.39	.18
Orientation/Artifact	.28	.66

Table 2. Run 2, N=156

Crosstab	Phi* or Cramer's V	Significance
Sex/Area	.18	.09
Artifact/Area	.23*	.01
Artifact/Age	.13	.65
Artifact/Sex	.20	.04
Area/Age	.21	.13
Orientation/Age	.21	.55
Orientation/Area	.27	.12
Orientation/Sex	.26	.08
Orientation/Artifact	.19	.60

Table 3. Run 3, N=189

Crosstab	Cramer's V	Significance
Artifact/Sex Adults in Public	.38	.07
Artifact/Sex Adults in Private	.29	.07

First and Second Sample Results

Utilizing the first and second samples, the distribution of age between the two functional areas of the site was examined. It was hypothesized that inclusion in the public areas of the site was an achieved status; therefore, the public area would contain more adults than subadults. Generally speaking this hypothesis is supported. However, since subadults were split into different age classes, the association was low (.21) with a correspondingly low level of significance (.13). In later analyses, these subadult age classes will be lumped, and this association should be stronger, and the level of significance should also be higher.

Still, however, 32% of this group are subadults which leads us to the following possibilities:

(a) Status positions were not restricted to adults, i.e., elements of an ascribed status system are evident. Most recent studies of status in Southeastern Indians point to ascribed status positions as a real possibility (Larson 1971) with great time depth (Winters 1968: 204).

(b) The areas are not well defined, i.e., there is overlap between the defined areas through the analyst's error.

(c) There was a diffuse boundary separating the public and private areas during occupancy of the site.

Most likely aspects of all these possibilities have some merit.

It was also hypothesized that males were preeminent in the politico-religious sphere; therefore a significantly larger number of males would be in the public area. Results of this analysis yielded almost a 2:1 ratio of males against females. The level of significance fell well within the range of acceptance (.05). The presence of females in this public area still must be explained however. Twenty-five per cent of all females in the site sample are located here. To explain this we must rely on possibility (b) and/or (c) from hypothesis I or accept female participation in the politico-religious sphere.

Another hypothesis was formulated dealing with presence of artifacts against sex across the site. It was hypothesized that artifacts reflect status and that males had higher status; therefore more males should have artifacts than females. This crosstabulation resulted in one of the stronger associations (however, still low statistically) of all the pairs of variables (.32) with a correspondingly high level of significance (.02). This resulted in a 2:1 ratio of males against females. It is suspected that a finer scale analysis made on artifact types rather than simple presence will strengthen this association. In this finer scale analysis males and females with artifacts should show a strong negative association in terms of specific artifact types.

<u>Final Sample Results</u>

In the first two runs orientation was tested against other variables without respect to the orientation of structures, clearly an error (Ucko 1969: 271-272). It now appears that the burials at the King site which are inside structures are oriented with the nearest wall in that structure (Swanton 1928: 395). In final analyses, variables will be included to study this observation such as orientation of structure, position of burial with respect to the nearest wall, relationship to functional areas inside the structure, and others.

Orientation must be considered because it has been shown to be significant in different ways. Bendann found status differences determined orientation in two Indonesian societies.

She also found that in one society, the Wotjo of Melanesia, orientation was determined by clan membership (Bendann 1930: 201, 208). Nonrandom orientation has also been observed in archaeological studies (Gruber 1971, Lopez 1970, Saxe 1971).

The only crosstabulation of orientation which fell within the designated level of significance was that with sex (.08). This variable pair resulted in an association of .26 which would suggest that perhaps males and females, while having the same general pit orientation, would be "pointed" in different directions. The inclusion of structure data should clarify this situation.

Dropping orientation from the analysis and utilizing only the largest run further refined the data to allow a more complex crosstabulation to be run utilizing a four-way table. The first such crosstab was on adults in the public area considering artifacts against sex. This resulted in a relatively high association (.38) with an acceptable level of significance (.07). Simply put, more males have artifacts than females. The actual numbers involved show that less than 60% of the adults have artifacts. If our initial assumption about the spatial and ideological separation of the two areas, public and private, is correct, then the hypothesis that several different dimensions of status positions were present at the King site and were reflected in the mortuary procedure is advanced. Once again these status dimensions probably included ascribed as well as achieved positions. This inference stems from the number of infant, subadult, and female burials in the public area with artifacts. Again a finer scale artifact analysis will undoubtedly modify or clarify this situation.

The last crosstabulation performed also deals with adults, this time in the private area. The association was lower than in the public area, however; and only 39% of adults have artifacts. This distribution conforms to predictions. Males still maintain an edge in the presence-of-artifacts category. This could reflect a cross-society acknowledgement of the difference between men and women and not simply a difference between those in high status positions in the public area.

Summary and Future Research

This paper is intended only as a preliminary report to illustrate some of the variability evident in the mortuary practices at the King site. This variability has been shown to include differential distribution of wealth, female participation in the public arena, ascribed status for subadults, and orientation to other entities than the sun (Ucko 1969: 271-272). A much more complete and finer scale analysis will be formulated and implemented. Below is a list of problems to be considered in this future research:

> An examination will be made of the hypothesis on societal participation set forth by Binford.

An attempt will be made to elucidate the kinship pattern, i.e., does the King site pattern conform to a ramage organization as explained by Sahlins (1958), Peebles (1971), and Hatch (1974).

Do the public and private sectors stand up with respect to burials (Saxe 1970)? In other words, are high status individuals localized on the site?

A final consideration will be a comparison to determine in what respects the King site mortuary pattern differs from that of Dallas (Hatch 1974), Moundville (Peebles 1971), Natchez (Neitzel 1965), and other southeastern groups.

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Preliminary Demographic Analysis of the King Site Burial Population

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The King site is a protohistoric village site in northwest Georgia. The number of individuals excavated here was 210. These skeletal remains vary in preservation from complete skeletons to tooth caps and bone stain. Twenty-seven per cent of these burials are in very poor condition. Bone preservation seems to vary with composition of the pit fill soil. A dark humus fill, mottled with ash and sand, seems to be best for preservation. The worst preservation conditions occur in clay pit fill.

The site is in a field which has been plowed for one hundred years. Plowing and erosion have affected a large portion of the southern and western sections of the excavation. In these areas plow damage was extensive, and burials consisting only of fragmentary bone were quite common. Heavy equipment (drag pan and tractor scraper) may have also compacted burials in place. There was no loss in burial numbers through use of this equipment however.

Since burial analysis has not been completed on all burials recovered during excavation, I have chosen for discussion an area where plow damage was minimal and preservation optimal. This is a ridge of high ground from 600E to 740E and 430S to 60S. This area excludes the plaza and encompasses only domestic structure area. The area of the ridge is 33,500 square feet or 24% of the calculated domestic structure area of the whole village. There are 109 burials on the ridge or slightly over one-half the total number of burials excavated.

Except in a few cases, only those individuals 18 years old and older were sexed. Sexing was based on pelvic morphology, femur head, mastoid process, supraorbital ridge, nuchal lines, and long bone robusticity. Age categories were defined as: 1-6, 7-12, 13-17, 18-30, 31-40, and 40+. Aging of adults was based on suture closure, the pubic symphysis, and dental wear planes (differential helicoidal wear).

Using this segment of the population, I calculated the per cent dying from each age group and also the per cent surviving. This worked quite well until the 18-30 category was reached. Twenty-four per cent of the children died before age 7, 14% died before age 13, 11% died before age 18, and 52% died before the age of 31. This figure is abnormally high for the 18-30 age category. When this was checked against the total number of people analyzed, the percentage was higher. It yielded a 54% mortality rate for the 18-30 category as opposed to the 52% for the ridge sample. A breakdown of this category from the ridge sample shows 41% are males and 59% are females. A large portion of the females can be accounted for by death in childbirth, for this is the age of maximum productivity. Even so, a 52% mortality rate seems unusually high. Another explanation for the death of both males and females that seems plausible for this time period is the advent of European diseases. Since this age range would probably be most active in trade or other associations with Europeans, they would be exposed to such short-term diseases as smallpox, measles, or mumps.

It should be mentioned that males dying away from the village and infants not buried could affect the population picture that is preserved. This is especially true of infants. Only two children could be aged at two years and none below that age. This may be due to poor preservation or to burial practices.

Burials from five domestic structures (Numbers 11, 13, 14, 15, and 23) were selected for further demographic analysis. These structures were chosen because they contained a large number of burials within their walls and because plow damage to burials was minimal. The burials themselves seem to represent a cross section of the population for all age ranges and for sex (Table 1).

Table 1. Sex and Age Identification for Burials in Structures 11, 13, 14, 15, and 23.

	1-6	7-12	13-17	18-30	31-40	40+	Adult
Structure 11	2		1 ---		1 male		
Structure 13	2		1 male	2 male 1 female	1 male	3 female	
Structure 14	1	2	1 ---	1 male		2 female	
Structure 15	4			3 female	2 female	2 male	
Structure 23	3		1 ---	2 female 1 ---	1 male	1 male	1 ---

Since these houses have burials from all age ranges and both sexes, it would seem probable that the individuals represented are a partial sample of the people living in these structures. Dental and cranial characterisitics were checked for each house group. Structure 15 yielded several instances of Carabelli's cusp. This was the only evidence of genetic similarities that was discovered. It seems impossible to prove family relationships yet quite tempting to discuss them.

The Mouse Creek "Focus": A Reevaluation

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Mouse Creek, Dallas, and the King Site: The Comparative Base

Mouse Creek was initially described by Lewis and Kneberg (1941: 7-12) in their preliminary report on the Chickamauga Basin excavations. At that time they labeled it the "Mouse Creek Focus" and presented a generalized and informal trait list to justify that distinction. Somewhat more generalized summaries of Mouse Creek subsequently were included in the Hiwassee Island report (Lewis and Kneberg 1946); an article titled "The Tennessee Area" which appeared in Griffin's Archeology of the Eastern United States (1952: 190-198); and the popularized work, Tribes that Slumber (Lewis and Kneberg 1958). All of those treatments suffered from the same basic flaw which was a lack of solid data concerning Mouse Creek. The final report on the Chickamauga Basin was not completed, and the data from those excavations have remained in rough form.

Lewis and Kneberg (1941: 7) described the distribution of Mouse Creek sites in the following manner:

> [Mouse Creek] is exceptionally well represented on both banks of the Hiwassee River where the two streams known as North Mouse Creek and South Mouse Creek flow into the Hiwassee. This river is the main eastern tributary of the Tennessee in the Chickamauga Basin. The distribution of the Mouse Creeks culture is almost entirely along the Hiwassee River. So far only one Mouse Creeks community has been identified on the main Tennessee River. This is the Hampton site in the Watts Bar Basin....

They felt that this distribution meant that the Mouse Creek villages represented a rather small group of people who occupied an enclave within the larger Dallas region (Kneberg 1952: 198).

Temporally, Lewis and Kneberg (1941: 7) felt that Mouse Creek belonged to the early contact period since European items were found with burials on the Hampton site. Furthermore, they felt that Mouse Creek had a rather brief occupation span since they said that Mouse Creek probably arrived in the Hiwassee River area in the late Fifteenth Century (Kneberg 1952: 198).

Recent excavation and research conducted on the King site (9Fl-5) appears to indicate that Mouse Creek as proposed by Lewis and Kneberg had a greater geographical distribution than originally assumed. It is not possible to state this with absolute certainty because of the generalized nature of the available Mouse Creek data, but it now appears highly probable that the King site was a component of Mouse Creek. Also, it is now apparent that in order to maintain consistency with the terminology proposed by Willey and Phillips (1963: 22) that the Mouse Creek "Focus" should be renamed Mouse Creek "Phase."

A major problem when dealing with Mouse Creek is differentiating it from the larger, more well defined Dallas Culture. Lewis and Kneberg (1941: 12) felt that the two could most easily be differentiated on the basis of settlement pattern, architecture, mortuary practices, and ceramics. In view of the limited data concerning Mouse Creek, the comparison presented in this paper will be restricted to those four categories. This paper will endeavor to compare the Mouse Creek sites of Tennessee and the King site of Georgia on the basis of those four categories as well as delineate other potential Mouse Creek components. Hopefully, this will result in both a general definition of the Mouse Creek Phase and an idea of the geographical limits of its occurrence.

Settlement Pattern

Lewis and Kneberg (1941: 7) characterized the Mouse Creek settlement pattern by saying:

> The community plan showed closely grouped habitations frequently within a stockade. The dwellings were placed in an orderly arrangement, occasionally around a central open court. There were no elevated foundations for the community buildings, and such structures, if their function may be inferred from their unusually large size in contrast to that of dwellings, did not show any special features.

Kneberg (1952: 198) has also stated that the towns were fortified with "deep ditches" in addition to palisades. The "Mouse Creek community plan" illustrated in Archeology of the Eastern United States depicts the open court type described by Lewis and Kneberg and shows the houses arranged in rows parallel to the palisade. The council house and presumably function-linked structures are located in the large court or plaza (Kneberg 1952; Figure 110).

The Dallas and Mouse Creek settlement pattern types appear to be somewhat different. Lewis and Kneberg (1941: 12) said the Dallas "community plan was of the compact stockaded village type with the houses adjacent to a prominently located community center." The open court village type was apparently absent in the Dallas Culture. Lewis and Kneberg (1941: 12) felt that the absence of mounds in Mouse Creek and their presence in Dallas was also a differentiating factor, but that contrast no longer seems valid. It is more likely that the lack of mounds in the Mouse Creek communities reflected the frontier position of those villages and did not indicate a definitive trait of the Mouse Creek Phase as a whole.

The King site settlement pattern conforms to the open court type described by Lewis and Kneberg (1941: 7) and illustrated by Kneberg (1952; Figure 110). The King site is roughly "horseshoe" shaped and aligned perpendicular to the Coosa River.

A single post palisade protects the village on at least three sides with the river on the fourth. A ditch runs parallel to and outside of the palisade and appears to have been the source of clay for the village structures. The houses are grouped in two rows that run parallel to the palisade and the river and enclose a large central court or plaza. The council house and appurtenant structures are located in the north central section of the plaza. All but a small section on the western edge and a smaller strip to the north bordering the river has been excavated, and the excavated area represents considerably more than the site segment illustrated in <u>Archeology of the Eastern United States</u>. However, from the written descriptions and the illustration of Mouse Creek, the two patterns appear to be virtually identical. The King site does not contain a mound, but it also seems to occupy a frontier position in the Mouse Creek Phase.

Architecture

The architecture of Mouse Creek structures is one of the most distinctive traits of this phase. Lewis and Kneberg (1941: 7-8) described Mouse Creek architecture by saying:

> Both the dwelling and the community buildings showed the distinctive feature of a subsurface floor. The floor level was excavated into the ground to depths averaging one and a half feet. In this rectangular pit the large logs of the walls were set close to the sides of the pit. These logs varied from six to nine inches in diameter and formed a rigid framework which supported the roof beams, possibly by crotches at the top.... There were well marked entraces of the exterior vestibule type. The floor of the vestibule was on a level with the land surface. Although the exact construction of the entrance could not be determined, the walls were evidenced by narrow trenches. It seems probable that either small saplings or canes were set contiguously in the trenches and plastered on the outside.

Additionally, the structures were wattle and daub types with basin-shaped hearths lined with puddled clay and fitted with well defined clay rims.

The Mouse Creek architectural type offers a sharp contrast with the prevalent architectural type described for the Dallas Culture. Lewis and Kneberg (1941:13) said that Dallas structures lacked the semisubterranean house floor and, with the exception of a single council house, lacked exterior vestibule entrances.

The King site architecture is best typified by Structure 4, excavated in 1973 and described by Smith and Garrow (1973). Structure 4 was a small (18' by 18') domestic structure located adjacent to the eastern palisade. The wall posts averaged .2' to .3' in diameter and were set two and one-half to three feet apart. The actual depth of the house floor was difficult to determine because of plow interruption but was in excess of .5 feet. The floor was saucer shaped and reached its greatest depth at the hearth. The hearth was square with rounded corners and contained a well developed rim that was .25' high. A pair of exterior wall trenches, reflective of Lewis and Kneberg's "exterior vestibule type," were located on the southwest corner of the structure. The similarities between Structure 4 and the Mouse Creek structures led Smith and Gorrow (1973: 17) to conclude: "Structure 4 apparently represents an Eastern Tennessee Mouse Creek type structure." Subsequent excavation and research on the King site has indicated that the Structure 4 architectural description typifies the King site architecture.

Mortuary Practices

Lewis and Kneberg (1941: 8) said the Mouse Creek burial pits were "generally well made oblong pits with vertical sides and flat bottoms." Log tomb forms were present as well as rare stone lined forms. Infants were occasionally found "covered with fragments of large pottery vessels"(Lewis and Kneberg 1941: 8). "Characteristically" the bodies were extended, and often pits contained two individuals apparently buried at the same time. Lewis and Kneberg did not indicate whether or not flexed burials also occurred but left the impression that they probably did. Also, they stressed that relatively few grave foods were found with the Mouse Creek burials and that the ones found did not include much more than vessels, celts, or objects of personal adornment. Cranial deformation, apparently intentional, was noted for the Mouse Creek sample, and the deformation was so extreme that it resulted in "many of the skulls having a breadth considerably in excess to the length"(Lewis and Kneberg 1941: 10).

Dallas and Mouse Creek mortuary practices were differentiated by Kneberg (1952: 198) on the basis of the prevalence of extended burials in Mouse Creek as well as the presence of numerous multiple interments. Also, more and finer grave goods seemed to occur with Dallas burials.

The mortuary practices observed on the King site appear to parallel those described for Mouse Creek in most respects. Burials were found clustered outside the houses in some areas of the village, but many subfloor graves were found. The illustration of the "Mouse Creek community plan" pictured in Griffin (1952; Figure 110) seems to reflect the type of burial arrangement found on the King site and does indicate that subfloor interments existed on Mouse Creek sites. Also, log tombs, but not stone lined graves, had a fairly common occurrence on the King site. In one instance (Bu 80) an infant was found with a fragment of a large pottery vessel covering the skull. Numerous instances of extended burials were found on the King site, but the majority of the burials were flexed. Many multiple burials, with individuals obviously buried at the same time, were uncovered. The number and quality of grave goods varied widely from area to area on the site and reflected the relative status arrangement present in the village. Artificial cranial deformation was quite common on the King site.

The Mouse Creek mortuary practices seem to offer a poor area of contrast with Dallas. The large occurrence of extended burials along the Hiwassee River and on the King site may provide one meaningful contrast, but the presence of multiple burials in both areas and the scarcity of grave goods noted for the Hiwassee River sites probably do not. The number of multiple burials present at northern and southern Mouse Creek sites may reflect the intrusion of European diseases and merely reinforce the late date for this phase. The scarcity of grave goods noted for the northern Mouse Creek sites probably reflects the village nature of those sites and the relatively small amount of area excavated.

Ceramics

It is very difficult to make definitive statements about Mouse Creek ceramics since Lewis and Kneberg did not quantify the ceramic sample from any of their sites. The ceramic description in the Chickamauga Basin report (Lewis and Kneberg 1941: 8-9) represents the most complete delineation of ceramics from Mouse Creek sites, but no attempt was made to present the relative frequencies of the various types. It is apparent, however, that the majority of the ceramic sample was made up of Dallas-derived types. Shell tempered jars and bowls predominated; and the major decorative elements included fillet strips, strap handles, lugs, incising, and various types of modeling. Minor decorative types included fabric impressed (exclusively on salt pans, but the majority of the salt pans were plain), spouts, cord marking, and punctations. Two types of water bottles, including a "blank faced effigy" type and a simple open necked type, were also present. The only ceramic type found on the Hiwassee River sites that was not related to Dallas was a sand or grit tempered complicated stamped variety which Lewis and Kneberg (1941: 9) said "resembled a stamped ware which is characteristic of eighteenth century Cherokee pottery." The Mouse Creek ceramic inventory on the whole seems to be less elaborate than that found on sites of undeniable Dallas affiliation, but the two inventories were remarkably similar. Lewis and Kneberg (1941: 14) noted the similarities between the two and differentiated them mainly on the basis of the greater frequency of cord marking in Dallas as well as the presence of fabric marking on all Dallas salt pan forms.

The King site whole ceramic sample is different from the Mouse Creek ceramics descibed by Lewis and Kneberg, but the two samples do have comparable elements. The ceramic sample on the King site represents a mixture of Dallas and Lamar types designated "Dallamar" by Kelly (1965) and "Barnett Phase" by Hally (1970: 13-21). The Dallas segment of the sample is predominantly plain, and those are mainly body sherds. Decorations are largely restricted to the rims of the vessels and consist of fillet strips, strap handles, and occasionally incising, modeling, or punctations. Modeling and punctation are rare on the King site ceramics, and modeling is represented by crudely done from effigy vessels. Spouted vessels also occasionally occur, but other traits mentioned by Lewis and Kneberg--namely blank faced effigy bottles, cord marking, and plain and fabric marked salt pans--do not occur. The predominant Lamar surface treatment is coarse plain with lesser amounts of complicated stamping and incising. Handles are rare in the Lamar sample as are lugs, but both are present. Occasionally Lamar type incising was found on vessels with Dallas paste as well as Dallas incising on vessels with Lamar paste. The Lamar vessels characteristically exhibited some type of decoration over their entire exterior surfaces.

Lamar and Dallas ceramics occur in nearly equal amounts on the King site. The Dallas forms found on the King site appear to be comparable with northern Mouse Creek ceramics; but, with the exception of apparently small amounts of Lamar complicated stamped, the Lamar sample does not have a counterpart on the northern sites. This is not really surprising since the Mouse Creek sites on the Hiwassee River were in close proximity to the territory of the people of the Dallas Culture. The ceramic samples from the Hiwassee River Mouse Creek sites are probably much less typical of the Mouse Creek Phase ceramic assemblage than is the sample from the King site.

Mouse Creek: Geographical Distribution

The King site would mean little in terms of the Mouse Creek Phase if it existed in isolation. However, the King site seems to be typical, in terms of ceramics (and architecture where excavation data exist), of a number of other sites in the Ridge and Valley physiographic region of Georgia. The Mohman site located near Coosa, Georgia has been the subject of limited (and unpublished) research by Victor P. Hood (1973) of the University of Tennessee, Knoxville. A test excavation on that site yielded the characteristic blend of Dallas and Lamar ceramics in association with each other. The Mohman site is located on the Coosa River and is a few miles east of the King site. The Johnstone site located near the Coosa River Lock and Dam and east of the Mohman site is the third known Coosa River village that has yielded the distinct blend of Dallas and Lamar ceramics that appears to typify Mouse Creek in that area. Unfortunately, the Johnstone site has not been systematically tested and has been largely destroyed by relic hunters. The Mouse Creek Phase is represented in the interior of the Ridge and Valley region of Georgia by the sites in the Carter's Dam project area. The Carter's Dam area is in Murray County, Georgia and is approximately fifty miles northeast of the King site and an equal distance south of the Hiwassee River. Four excavated sites within that project area have yielded the same basic ceramic assemblage as found on the King site (Hally 1970: 17-18).

The Carter's Dam sites including Sixtoe Field (9Mu 100) (Hally 1970: 17), Pott's Tract (9Mu 103)(Hally 1970), Bell Field (9Mu 101)(Kelly 1965, n.d.), and Little Egypt (9Mu 102) (Hally 1974) may be more characteristic of the Mouse Creek Phase than the sites on the Hiwassee or the King site. Bell Field and Little Egypt probably formed a single ceremonial center and perhaps the single most important such site within Mouse Creek. The sites are located adjacent to each other and are separated by Talking Rock Creek. Talking Rock Creek is a narrow, relatively shallow stream and in no way inhibits contact between the two sites. Significantly, both sites contain mounds, and multiple mounds in the case of Little Egypt. Also, those mounds were in use and were expanded during the Mouse Creek occupation (Hally 1974). This would perhaps reinforce the importance of this site complex. Sixtoe Field and Pott's Tract were probably satellite towns of the combined Bell Field-Little Egypt complex.

If the Carter's Dam sites are as similar to the King site as they appear to be (Hally 1974), then it is evident that the Mouse Creek Phase occupied the Ridge and Valley physiographic region in Georgia as well as a section of that region in Tennessee as far north as the Hiwassee River. There is little doubt from the data provided by Lewis and Kneberg (1941: 7) that the Hiwassee River formed the northern boundary of this phase. Limited survey data (see Wauchope 1966 and DeJarnette _et al_. 1973 for examples) indicate that the King site was positioned on the southwestern border. The Etowah site may have been on or very near the southeastern margin.

Mouse Creek: A Definition

It may be premature at this time to offer a definition of the Mouse Creek Phase, but at least a few definitive traits seem to be present. The settlement pattern of Mouse Creek is known only in terms of frontier village sites, but at least some of those sites exhibit a distinct palisaded, open court village type. The frontier villages do not appear to contain mounds but do have well defined community buildings or council houses. The interior towns are not well known but at least in one case appear to consist of a center of ritual and population with smaller and less elaborate satellite towns. Too little research has been done to indicate the internal patterning of those towns.

Mouse Creek architecture seems to be consistent at all sites of this phase. The typical Mouse Creek structure has a semisubterranean floor and an exterior wall trench entranceway. The walls consist of individually set posts covered with wattle and daub and roofed with thatched grasses or reed mats.

It is somewhat difficult to typify Mouse Creek ceramics since the ceramic assemblages were apparently affected by rapid change through the short Mouse Creek span. Also, the ceramic inventory of the northern Mouse Creek sites does not conform to the development of Mouse Creek types in general due to their proximity to the Dallas territory. Ceramics from the southern and central segments of the Mouse Creek territory appear to exhibit a trend towards greater representation of Lamar and less of Dallas types as time goes on. Also, design frequencies of some of the Lamar decorative motifs appear to change through time. As an example, Lamar plain was a relatively rare surface treatment on the King site and yet represented 26 per cent of the Mouse Creek sample (called "Barnett Phase" by Hally) at Pott's Tract (Hally 1970: 21). This may have been just a regional variation, but it seems more likly that it was temporal. The replacement in the case of the Pott's Tract took the form of plain or smoothed surfaces partially replacing the coarse plain or complicated stamped motifs on the same vessel forms. That increase in Lamar plain was partially balanced by an overall decline in the Dallas sample.

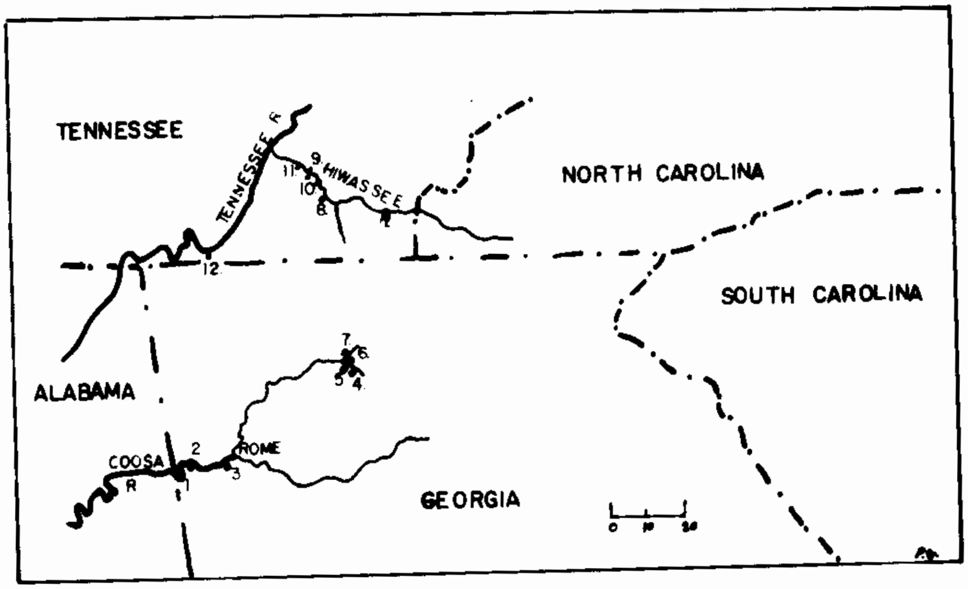
The presence of numerous extended burials appears to be one somewhat definitive Mouse Creek mortuary trait. Complete analysis of the King site and Little Egypt burials should provide further traits in that area however.

Temporally, the main span of Mouse Creek occupation in the Ridge and Valley region appears to be largely restricted to the Sixteenth Century A.D. Occasional items of European origin have been found on Mouse Creek sites, but the few items appear to reflect early contact stage. The King site yielded five iron celt form axes, two possible knife blades, and two spikes. Hally (1970: Appendum) reported a crbon date of A.D. 1664 ± 45 (UGA56) from the Pott's Tract site, and that seems much too late to be credible. Carbon dates were processed from the King site by the University of Georgia Geochronology Laboratory, but the results were very inconsistent and do not merit attention. It is possible that a few Mouse Creek villages survived into the first quarter of the Seventeenth Century in the Ridge and Valley region, but the main occupation seems to have been terminated by around A.D. 1600. There appears to be a significant break in the archaeological record in the Georgia segment of the Ridge and Valley region from early in the Seventeenth to the early Eighteenth Century. That break appears to reflect abandonment of the region by the bearers of the Mouse Creek Phase with a resulting occupational vacuum.

Conclusions

A great deal more will be understood about the Mouse Creek Phase when the analysis of the Little Egypt, Bell Field, and King sites is completed. It is premature to explore the cultural roots of the Mouse Creek Phase at this time although Kelly's work (n.d.) at Bell Field has indicated that the Mouse Creek architectural type developed in the Ridge and Valley region of Georgia over a long time span. Also, few clues now exist concerning the ultimate fate of the people reflected by the Mouse Creek Phase.

What is now evident is that the Ridge and Valley region of Georgia and Tennessee north to the Hiwassee River was occupied by Mouse Creek villages during the early phases of European contact. These villages may have been components of a single political entity, but that question and many others awaits the answers to be derived from the analysis of previously excavated sites in that area.



1. King
2. Mohman
3. Johnstone
4. Pott's Tract
5. Little Egypt
6. Bell Field
7. Sixtoe Field
8. Ocoee
9. Mouse Creek
10. Rymer
11. Ledford Island
12. Hampton

Figure 1. Geographical Distribution of Mouse Creek.

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Photographic Innovations from the King Site

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The King site excavation (Garrow and Smith 1973) project has yielded a great deal of data that should provide insights into the Southeast during the Protohistoric period. It is not the purpose of this paper to document the contributions made by this project in that respect but instead to describe the new methodological techniques that have been developed during that work. The King site was a relatively simple site to excavate. It consisted of subsoil features and postholes and contained almost no intact midden. The few intact saucer shaped house floors were the most complex excavation features of the research project. The fact that the site was both single component and a short term occupation eliminated most of the complexities usually attendant to the excavation phase.

Lack of funding and the resulting lack of adequate equipment presented a major problem at the site. The first research grant at the King site was received in January 1974. This was seven months into the full time excavation phase and over two and one-half years after the initial research began.

At the advent of the funded phase of the excavation, the most critical need was in the area of photo-recordation. A twelve-foot photographic tower made of aluminum was soon constructed; but, although this did make the photography more efficient, it did not come close to solving all of the site photography problems. Equipment money was still sorely limited, and it was necessary to proceed with inadequate cameras and little specialized equipment.

The coauthor of this paper, Gordon L. Hight, joined the site staff as a volunteer in April 1974 and brought with him extensive camera equipment and a sophisticated knowledge of photography. He immediately devoted himself to trying to overcome the deficiencies in burial-recordation. Within a week he had designed and constructed a piece of equipment intended to solve some of those problems.

The device constructed by Hight filled the three basic criteria for archaeological field equipment: it was effective, portable, and inexpensive. The basic component of the "Hight Photographic Scaffold" is a six-foot high aluminum scaffold with a four by eight foot box (Figure 1). The scaffold for the prototype was borrowed from a local contractor. A similar one could probably be purchased for less than $150. An aluminum scaffold was used because of the weight factor, but almost any

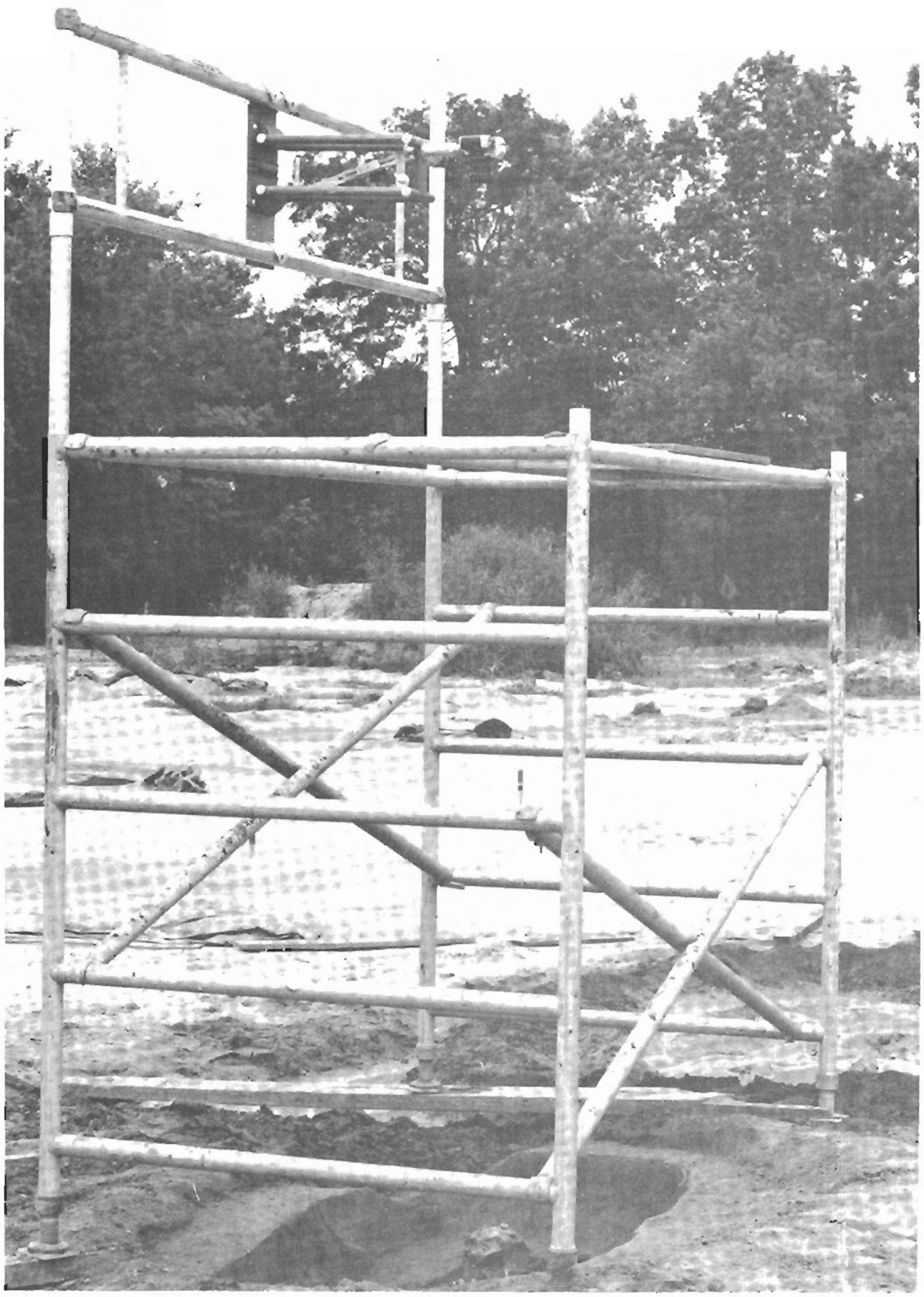

Figure 1. The Hight Photographic Scaffold.

type could be adapted for the same purpose. It became evident during field testing that it was necessary to add vertical extender arms to the scaffold to raise the maximum potential camera height. This was done by machining two pieces of aluminum pipe so that they would fit in the vertical pipes on the scaffold frame. The two pipes raised the maximum potential camera height to almost eleven feet, and this made it possible to photograph large burial pits without resorting to a wide angle lens. Casters were removed from the leveling feet of the scaffold and replaced with aluminum plates retaining the leveling feature.

The plaque containing the camera mount was secured to a reinforced crosspiece originally designed to receive the scaffold boards. This crosspiece was turned on its side and secured to the pipes with screw clamps. No problems with vertical slippage were encountered while using this arrangement. The camera mount consisted of an aluminum plate equipped with three strap hooks and a latch to hold the apparatus in place. This plate was fitted with parallel arms acquired from surplus sales which, in turn, contained a tripod head. The parallel arms allowed vertical movement of the camera assembly without moving the entire crosspiece. The tripod head made it possible for the camera assembly to be easily leveled. A small wooden platform was added to one of the scaffold board frames to provide a stable work space for the photographer.

The "Hight Photographic Scaffold" is utilized by setting up the scaffold over the subject and centering the camera over the item to be photographed. The camera is set up to shoot inside the scaffold,and the camera is precisely centered over the subject in order to minimize distortion. The camera is then leveled, and the light conditions determined. At this point, if the sky is overcast and there are no shadows, the camera is focused, and the shots are made. If there are shadows, the camera is focused, and then the pit is shaded with a tarpaulin to produce even lighting throughout the area to be photographed. The light factor is then determined, and the photographs made. Experience has shown that the reduction in light in the pit produced by the shading is not a problem since the camera is mounted on a very steady base, and the shutter speed can be dropped to compensate without greatly affecting the f-stop setting. The addition of a scale bar, placed at the bottom of the pit, results in scale photographs accurate enough to produce precise scale drawings. Of course, the photographs are made from different heights, and it is necessary to establish the scale of each photograph with calipers before the drawing can be made.

A second photographic device, the "Hight Photographic Platform," was developed by Hight in order to take scale photographs of pit cross sections as well as close-ups of pit contents (Figure 2). The photographic platform well fills the three criteria previously cited for archaeological field equipment and, in fact, is less expensive to produce than the photographic scaffold. The basic components of the photographic

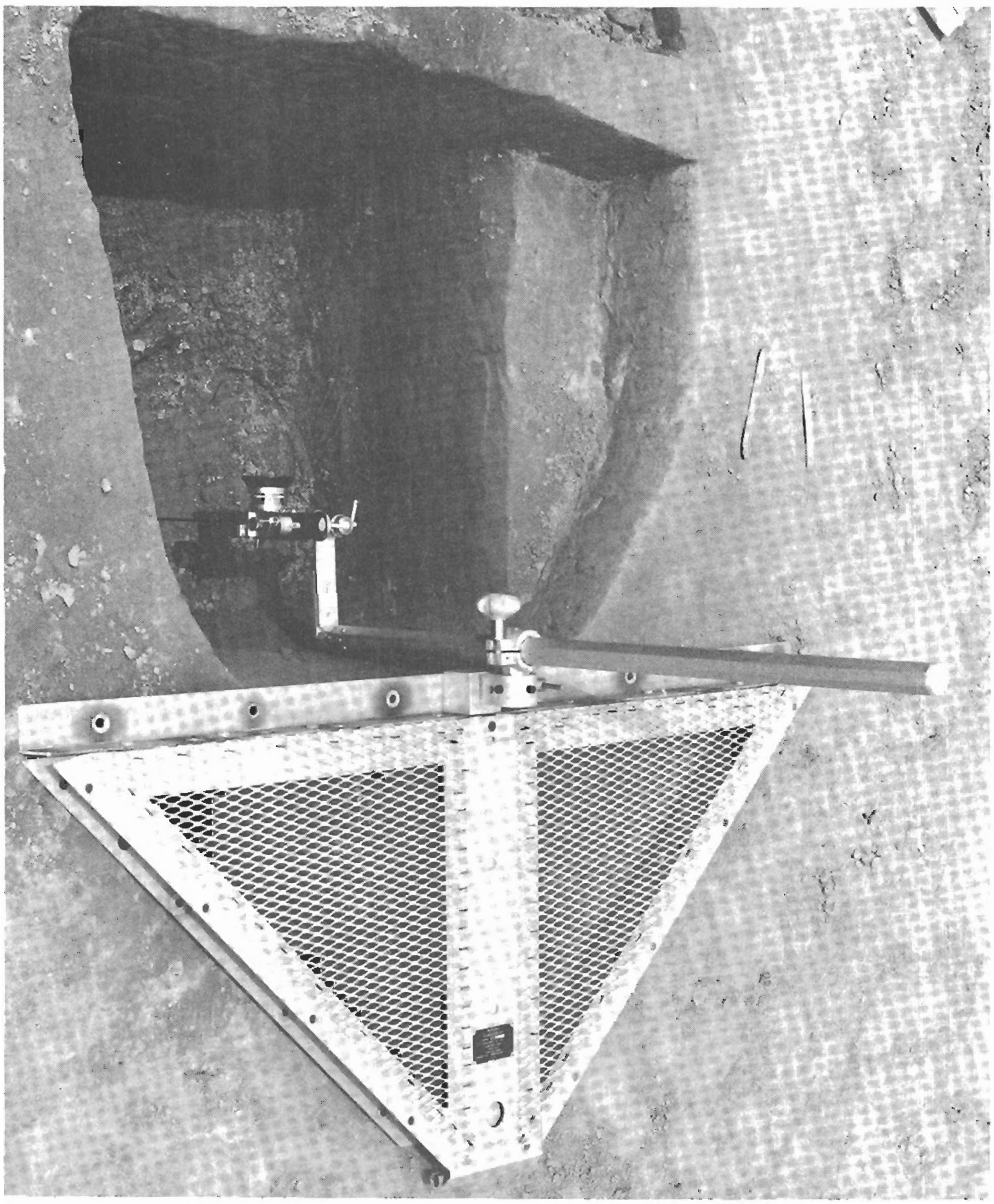

Figure 2. The Hight Photographic Platform.

platform can easily be acquired or improvised from government surplus equipment. The base of the platform is made from an aluminum component of a corner reflecting radio antenna. A triangular section (at the end of the antenna) was cut off, and a clamp mount was added to receive an extender arm. The extender arm was made from part of a surplus hospital bed traction frame and, like the platform base, was made of aluminum. Two attachments were then made to perform cross-section and close-up tasks. The close-up attachment was simply a bracket with a mounted tripod head. The second attachment was a piece of aluminum bar stock attached directly to the extender tube and fitted with a tripod head. The advantage of the platform in close-up work is that lighting is not a factor in the production of the final shot. The platform provides a stable base whcih can hold a camera in virtually any position above or in front of the photographic subject. The cross-section adapter allows the production of precise scale cross-section photographs that can be studied and drawn at leisure in the laboratory. The uniform light and camera placement makes it possible to produce a photograph that can show more detail than the researcher can observe in the field. It is necessary to use a wide angle lens with this apparatus.

The "Hight Photographic Scaffold" and the "Hight Photographic Platform" have undergone extensive field testing on the King site, and each has performed its designated task. Photographs taken from the "Hight Photographic Scaffold" were converted into drawings by Robert Plank, a Berry College student, during the 1974 field season. He found that it was necessary to establish the scale and make up a grid for each photograph before the final drawing could be made. His average time per drawing was about three hours, but he believed that the drawing time could be reduced with increased experience using the technique. Plank also recommended that experiments be conducted with an opaque projector to see if that could speed up the drawing procedure.

Experiments on the King site have indicated that the "Hight Photographic Scaffold" could be made more effective through a few design changes. One change which would make the device more efficient would be to increase the scaffold box from four feet by eight feet to eight feet square. This would allow the equipment to be used over larger pits and features. Also, if this arrangement was coupled with a modified camera mount, it would be possible to use the device to photograph five-foot squares and ultimately produce a photo-montage of the site under research. Both design changes would, however, result in increased equipment costs.

<u>Summary</u>

The "Hight Photographic Scaffold" and the "Hight Photographic Platform" offer precise, relatively inexpensive means of taking burial and feature photographs. Both techniques result in scale photographs which can be converted into precise drawings in the laboratory. Neither technique is meant to replace field drawings although this might become practical as both equipment and procedures are refined.

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Technical Notes: Camera Equipment

The Leicaflex SL 35 mm camera fitted with a 50 mm Summicron f2 lens was used on the "Hight Photographic Scaffold." This is is a most dependable camera that can withstand the trying conditions encountered in the field. The light metering system is selective through-the-lens measurement. The area covered by the meter coincides with the central focusing field, a circle 7 mm in diameter appearing in the center of the focusing screen. This system has definite advantages over the more common average metering system especially when photographing grave goods or other small objects. Another advantage of the system is that light that may enter the eyepiece does not affect meter readings due to placement of the metering cell at the bottom of the camera instead of in the pintaprism as is the usual case. Two cameras were used--one loaded with color slide film and the other with black and white film.

A 21 mm lens fitted to Leicaflex bodies was used in recording pit profiles. Care must be taken when photographing both cross sections and whole pits to omit the scale bar when determining light factors. Also, cable releases are used with both techniques to reduce the chance of camera movement during the shot.

It is strongly recommended that, while in the field, all cameras, lenses, and film be stored in an insulated picnic cooler to protect them from extreme heat and dust. Also, all lenses should be equipped with a UVA filter for protection.

Film and Processing

The best results in color slides were achieved by using Kodachrome II exposed at the recommended ASA 25 rating. All color slides produced on the site were processed by Eastman Kodak.

Panatomic X, exposed at ASA 64 which is double the recommended rating of 32, was used for all black and white prints. The film was developed in AGFA Rodinal diluted 1 to 50 for nine minutes at 70 degrees. Enlargments from resulting negatives were made on Kodak Medalist F 3 single weight and processed with Dektol following the manufacturer's instructions.

Site Survey and Test Excavations in the Upper Central Tombigbee Valley: 1974 Season

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The primary goals of the 1974 Mississippi State University fieldwork in the Tennessee-Tombigbee Waterway construction area were 1) completion of the surface survey in the Aliceville and Columbus Lock and Dam impoundment areas and 2) initiation of test excavations at some sites located in the 1973 survey which were felt to be of primary significance <u>and</u> which were in imminent danger of destruction by the construction of the waterway. This paper is intended to be a brief research report on the manner in which these two goals were approached. It should be emphasized at the outset that the preliminary analysis of all the materials recovered is not yet completed, and any definitive statements concerning the significance of either the survey or the excavation results would be premature. However, I do feel that it is important that the members of the profession be made aware of the progress being made in the Tombigbee area. The waterway construction represents one of the largest projects being undertaken by the Corps of Engineers at the present time, and our survey has shown the banks and floodplain of the Tombigbee are rich in both prehistoric and historic occupation sites.

Physiographic Setting

The Tombigbee River has its headwaters in extreme northeastern Mississippi where the drainages of the Tombigbee and the Tennessee River are separated only by a narrow band of low hills. Included among these hills is Woodall Mountain--at 806' the highest point in Mississippi. The Tennessee drainage on the north side of this low, narrow divide is to the north and ultimately into the Mississippi River via the Ohio. The Tombigbee drains to the south ultimately joining the Alabama River just above Mobile Bay on the Gulf of Mexico. The route of the Tombigbee parallels the present eastern boundary of the state of Mississippi from its headwaters to a point approximately 15 air miles below Columbus, Mississippi where the river crosses into Alabama. This is a distance of approximately 100 air miles from the Tombigbee headwaters to its crossing into Alabama.

The magnitude of the project, stretching approximately 253 statute miles from the Pickwick Basin of the Tennessee River to Demopolis, Alabama has dictated some division of the archeological labors. Therefore, the initial breaking point used was the Aliceville Lock and Dam near where the Tombigbee crosses into Alabama. Above this point Mississippi State has carried out archeological work over the past two years while downstream crews from the University of Alabama have exerted their efforts.

The 1973 and 1974 work conducted by Mississippi State has been focused on that section of the river between Pickensville, Alabama and Aberdeen, Mississippi--a distance of about 50 air miles. The river in this section of the state runs through two ecosystems. The southern half of the area, i.e., below Columbus, Mississippi is in the Prairie ecosystem (Miller _et al_. 1973). The Prairie uplands are characterized by gently rolling, subdued terrain with somewhat poorly drained clay soils derived from marls and chalks. Acid clays may top some of the narrow ridges on interstream divides. Broad meanders and large oxbow lakes are characteristic of the river in this section, and cypress and tupelo gum are often associated with the bottomland lakes and swamps. The river's width increases as one moves southward.

Starting about 10 miles north of Columbus is the Tombigbee Sand Hills ecosystem which extends northward to Amory, Mississippi, north of the boundary of the Mississippi State activities. This ecosystem was formed by the cutting of the river into the Tombigbee Sand member of the Eutaw Formation resulting in a broad terrace on the east side of the river and steep bluffs on the west. A well developed dendritic pattern is found on the west side of the river, but there is only a weakly developed dendritic pattern on the acid terraces to the east.

In terms of present land usage, it should be noted that much of the land on both sides of the river in the Prairie ecosystem is in timber, largely pulpwood forest. In the Tombigbee Sand Hills ecosystem much of the eastern terrace is in crop, primarily soybeans or cotton, while the rugged west bank remains to a great extent in timber or pasture.

History of Archeological Work in the Area

The history of archeological work in the Tombigbee Valley in Mississippi has generally been a record of neglect. Unlike many of the major rivers in the Southeast, until recently the Tombigbee has rarely interested archeologists. In 1901, C. B. Moore published a volume on work along the Tombigbee; and in 1941 and 1944 Jennings published data dealing with northeast Mississippi. However, it has only been with the coming of the Tennessee-Tombigbee Waterway that intensive and extended efforts to deal with the archeology of the region have come into being. In 1972, Shelia Lewis and J. D. Caldwell carried out a relatively rapid and cursory assessment survey of that portion of the waterway route in Mississippi. Even within the framework of a preliminary assessment survey they located 106 sites. In 1973, Marc Rucker, at that time an Assistant Professor in Anthropology at Mississippi State University, was granted a contract by the National Park Service to carry out a more extensive survey of the area between the proposed Aliceville and Aberdeen Locks and Dams. In addition, during the 1973 season Rucker initiated test excavations at the Vaughn Mound (22Lo538) a multi-component occupation mound with a stratum of Archaic burials below the first occupation zone. Rucker's survey extended from Pickensville, Alabama to a point about 8 miles north of Columbus, i.e., approximately 35 miles in a straight line. Sixty-one new sites were added to the list of known sites by this survey.

With this background, the program of investigations for the summer of 1974 was drawn up. This work, like the 1973 season's work, was also supported by the National Park Service. The 1974 work will be discussed in two parts--the survey and the excavations.

1974 Survey in the Upper Central Tombigbee Valley

Survey efforts for 1974 were begun essentially where Rucker had left off the year before with the goal being to extend the surveyed area to Aberdeen before the end of the field season. This was a distance of about 16 miles by air and perhaps twice that far by river. The 1974 survey area was entirely within the Tombigbee Sand Hills ecosystem and, therefore, was characterized by the broad floodplain on the eastern side and the steep, maturely dissected bluffs on the western side. Also, as noted above, much of the eastern side was in crops and most of the western side was in timber. Although it was recognized that in order to complete a comprehensive site survey of the area all ecological zones must ultimately be at least sampled for the identification of sites, it was felt that this first intensive effort in the area should be focused on those parcels of land which held the greatest promise of yielding information on site locations. Therefore, the survey efforts were almost wholly limited to lands which are at present in cultivation. The biases introduced into the site distribution by this approach are relatively obvious. First, since the modern farmer is not likely to cultivate lands which are permanently wet, poorly drained, or in the prime flood areas, site distributions in these types of microenvironments were not going to be found. Furthermore, since the high western bank is primarily in timber, most of the located sites are along the eastern side of the river. Although these biases introduced by the survey method are of considerable importance, there were equally strong reasons for conducting the survey in the manner in which it was done. First, by surveying the large open areas offered by the cultivated fields, it has been possible to locate a large number of sites which will allow us to develop a settlement model which can at least deal with the factors affecting site distribution in these prime agricultural areas. Second, the problems of conducting a survey in the timbered sections of the area are obvious. Even if some sites are found, the ground cover is such that there can be little or no assurance that the site distribution identified is representative of the actual site distribution <u>even in the exact area which was surveyed</u>. Therefore, survey of the timbered areas might, in essence, be counterproductive in that there would still be no reasonable possibility of depending upon the accuracy of the results obtained from such efforts. In contrast, while survey of only the cultivated lands obviously introduces biases into the areas in which sites will be located, it can be argued with much greater assurance that for the area surveyed the site distribution identified is representative. Furthermore, it should not be concluded that the cultivated lands are non-variable. There is certainly variation in local elevations, in location relative to the river itself and to tributary streams, and in soil types. These factors, in turn, could affect drainage, potential productivity, probability of flooding, availability of water, relationship to major ecotones, etc. Therefore, it is reasonable to suggest that the surveys of 1972-74 have laid the foundation for the development of a settlement pattern model for the upper central Tombigbee which can take into account differences in both diachronic and synchronic variability in the prehistoric occupations of the region.

In the 1974 survey, 97 new sites were located; and samples of surface materials were collected. Although the analysis of these collections has not been completed some preliminary comments can be made. First, there is at least some representation in the collections of all major periods of occupation in the Southeast except for the Paleo-Indian. Second, there are a number of single component sites, at least as far as the surface collections indicate, which will enable us to examine the occupational and activity patterns of each period somewhat free of the midden mixing problems so prominent in the multi-component sites in the area. Third, the late prehistoric occupation physically adjacent to the river appears to be extremely limited. At no site located in 1974 was Mississippian pottery the predominant type. The survey results would indicate that if there were a large Mississippian occupation of the area it was probably along the tributaries of the river rather than along the main stream itself. Finally, there appears to be a definite association of sites with old meander scars of the river which might provide an opportunity for the interchange of ideas on site distributions between geologists, ecologists, and anthropologists interested in the Tombigbee and its environs.

1974 Test Excavations

Test excavations were made in 1974 at four sites located in 1973. Three of these were small, accretional mounds similar to the Vaughn Mound which was tested in 1973; and the fourth was a linear site along a bluff overlooking a small dead-end finger of the river. Two of the sites--one of the mounds (Barnes Mound, 22Lo564) and the bluff site (North Nashville Ferry Cutoff site, 22Lo553)--were on the east bank of the river; and the other two mounds (Kellogg Village site, 22Cl527; Kellogg Mound, 22Cl528) were on the west side.

At each of the tested sites a metric grid was established, and a plane table contour map was made. Units for excavation were then chosen by a stratified random sampling procedure based upon sampling strata which were defined by the contours. The area within the top 25 cm contour at each site was treated as the first stratum, and all other strata were defined on the basis of 50 cm contours. Sampling strata could not be based on any type of controlled surface collection due to ground cover. It was felt that the contour sampling method would be the best way to obtain a representative sample of the occupation of each of the sites. The basic unit of horizontal control was the 2-meter square, and arbitrary vertical control was maintained primarily by 10 cm arbitrary units. The arbitrary vertical control was dictated by the relative uniformity of the subplowzone midden, and the size of these strata was governed by both the depth of the sites and by the time factor.

The North Nashville Ferry site (22Lo553) differed from the other three tested sites in that it was a linear bluff site. Like the other three it was a multi-component site and provided us with the only good Wheeler series ceramics which we obtained this summer. Observations made during the excavations seemed to indicate that we might have horizontal segregation of our Wheeler and later components at this site. It should also be noted that the site was wholely a ceramic occupation and was much shallower than the other three sites, the midden extending only to about 50 cm below the present surface.

The limited nature of these excavations in terms of both time and personnel available made it impossible to expose large horizontal areas of any site. Furthermore, the midden at all of the sites was extremely mixed, and identification of occupational strata will be dependent upon an analysis of the frequency of ceramic and other artifact types in the vertical zones rather than in any strict stratigraphic separations which might be made on the basis of visual differences in the midden deposits. While a number of pits and probable postmolds were found, no structures or occupation floors were identified at any of the sites. This can be attributed partially to the mixture of the midden and partially to the limitations of the horizontal extent of the excavations.

The full value of the summer's excavations can not be assessed until the analysis is completed. However, we have obtained further data on the ceramic sequence in the area which will permit testing of the validity of Rucker's (1974) tentative definition of a Miller IV Period based primarily upon the distinction made between Tishomingo fine sand/clay tempered ceramics and Mulberry Creek clay tempered ceramics. We also now have a good idea of the time depth of the occupation along the Tombigbee. In addition, the analysis of the flotation samples obtained from this summer's excavations should provide us with a picture of the exploitation of the floral resources of the region at various points in time.

The most immediate future concerns for the archeologists in this region of the Tombigbee Valley will now be the extension of the survey in those ecological zones thusfar inadequately sampled and the conducting of excavations at single-component sites where the efforts can focus more upon horizontal exposure with the expectation that data on structures, site layout, and activity areas may be obtained. Excavation of the deep multi-component sites was a necessary first step in the process of extending the archeological knowledge of the Tombigbee; but it is now time, I feel, to emphasize work aimed at obtaining more extensive data on the occupations identified in the excavations and surveys carried out to date.

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The Cache River Archeological Project: Survey Methods and Contract Archeology

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The Cache River Basin is located within the Mississippi Alluvial Valley in northeast Arkansas. The basin is 143 miles long, averages about 12 miles in width, and is 2,018 square miles in area. A proposed Corps of Engineers drainage project for flood control in the basin would involve 230 miles of channel enlargement and realignment on the Cache River and its major tributary, Bayou De View.

For about 15 months now, the Arkansas Archeological Survey has been doing research in the Cache Basin under contract with the Corps of Engineers providing them with archeological information adequate for inclusion in an Environmental Impact Statement for this project. This research, directed by Michael B. Schiffer, involved several months of survey and testing in the basin and extensive analysis of the resulting data. The final report is almost complete at the time of this meeting. It is assembled by Michael Schiffer and myself, includes contributions by 14 persons, and is entitled, "The Cache River Archeological Project: An Experiment in Contract Archeology." It is scheduled for publication by the Arkansas Archeological Survey in their Research Series in 1975.

As implied by the title, we tried some new things when we carried out this research. Our contract with the Corps of Engineers basically required (1) an estimation of the direct and indirect impacts of the 230 miles of proposed channelization and (2) an inventory and evaluation of the total archeological resource base in the basin. In general, we were guided by the assumption that the division between "contract archeology" and problem-oriented archeological research is artificial and unnecessary. We believe that, with the adequate time and funding now becoming available, there is no longer any valid excuse for contract archeology to fail in using modern research methods and in producing important research results. We contend that problem-oriented research designs can and should be operationalized at every stage of contract research from the preliminary survey to the multi-disciplinary mitigation project. Accordingly, we believe that the evaluation of the information potential and significance of archeological resources must involve viewing the resources in a broad framework by asking a wide variety of questions in the course of contract research. The Cache Project was an attempt to apply this research orientation, both in the inventory and evaluation of archeological resources and in the proposal of mitigation measures.

To accomplish these goals we operationalized a number of research designs during the survey and testing program. These were related to:

1. Construction of a provisional typology for lithic artifacts and the use of factor analysis to compare functional variability in surface collections.
2. Experiments in replication of fire-cracked rock.
3. Investigation of prehistoric lithic resource procurement.
4. Testing of Morse's Dalton settlement pattern hypothesis (Morse 1971, 1973).
5. Investigation of patterns of site location.
6. Investigation of patterns of modern site utilization and site destruction by agricultural practices.

In addition we solicited and received cooperation from a number of persons with specialized interests in both substantive and technical questions relevant to the archeological resources of the Cache Basin. These interests include: (1) palynology, (2) dendrochronology, (3) prehistoric ceramic technology, and (4) the Dalton Culture. Also, Dan F. Morse, the Arkansas Archeological Survey archeologist for northeast Arkansas, provided ideas for research and was available for advice throughout the project.

The testing program involved a number of research designs including feasibility of palynology in the basin and the feasibility of recovery of charred floral remains. Another research design involved investigation of regularities in surface/subsurface relationships at sites. In the latter research design we were attempting to test the principles which we had been using to infer the subsurface nature and extent of sites from observable data. We hoped in this way to extend the reliability of our estimates of the information potential of the resource base and to extend our ability to use survey data in measuring systemic variables. One of the unexpected results of the testing program was the discovery of an apparent Dalton Culture cemetery site in the basin. This find is discussed by Dan F. Morse in another paper presented at this meeting. [to be included in Cache River Project publication]

Sampling the Population of Sites in the Basin

The aspect of the Cache Project that I want to talk about at this time is our use of probability sampling techniques to sample the population of archeological sites in the basin (Schiffer, House, and Fehon 1974). There had been extensive reconnaissance in the basin in the past, so we knew the basic sequence and the variability in kinds of artifacts pretty well. But we still knew nothing about the patterns of site density and distribution in the basin. We needed such information about the population of sites for two purposes. First, it was necessary for the Corps of Engineers' purpose of assessing the project impact and scope of mitigation which might be needed. Secondly, we needed this information to attempt to measure some of the variables of prehistoric cultural behavior that most of us, as social scientists, are interested in--

for instance, changes in settlement patterns, population, integration and differentiation in the prehistoric societies in the basin. As emphasized above, the first information need necessarily entails the latter.

The choice of survey methods was partly conditioned by the nature of the modern environment in the Cache Basin. The basin lies within the Mississippi Alluvial Valley, mostly within the region known as the Western Lowlands. The Ozark Escarpment parallels the basin and lies about 20 miles to the west. Within the basin, 90% of the area is lowlands including both late Pleistocene braided Mississippi River terraces and modern floodplains. The major streams are the Cache River and its tributary, Bayou De View. Most of this lowland area is intensively cultivated every year; and, at the right times of the year, the sites are extremely accessible to survey. On the other hand, some areas of bottomland forest and swamp remain in the lowland portion of the basin, and it is almost impossible to recognize sites in these areas. About 10% of the basin is on Crowley's Ridge, an area of old eroded terraces, mostly now in woods and pasture which stands isolated in the alluvial valley. Because of extensive erosion and gullying, the sites on the ridge, chiefly representing quarry and workshop sites for chert and quartzite, are fairly accessible to survey.

As I have said, the basin was not totally unknown archeologically when we started. A total of 543 sites had already been recorded. We knew that extensive Paleo-Indian occupation was present, that the Cache Basin and adjacent basins had perhaps the most intensive Dalton Culture occupation in the Southeast, and that extensive late Archaic and Woodland occupation was present. We also knew that remains of a few large Mississippian villages and numerous apparent farmsteads were present in the upper part of the basin. We had also heard that there were some large mounds in the south end of the basin though we did not really know anything about them.

The sampling design we used to fulfill our new data requirements is illustrated in Figure 1. First, to sample the direct impact area of the proposed channelization project, a zone defined by the Corps of Engineers as 1000 to 2000 feet wide, we divided the 230 miles of proposed channel into nine 24-mile sampling <u>strata</u>. Each stratum was further divided into eight three-mile long <u>sampling units</u>. Then one unit from each stratum was chosen at random for intensive survey. This amounted to a 12.5% sample of the direct impact zone of the proposed channelization project. These data were also used, <u>in part</u>, to make generalizations about the population of sites in the basin as a whole.

To sample the population of sites in the basin as a whole, for the purposes of estimating the total resource base and estimating indirect impacts of the proposed channelization project, we laid out six 1/4-mile wide <u>transects</u> at random--one in each of the strata on the Cache Channel. The transects ran east-west across the basin and averaged about 12 miles long.

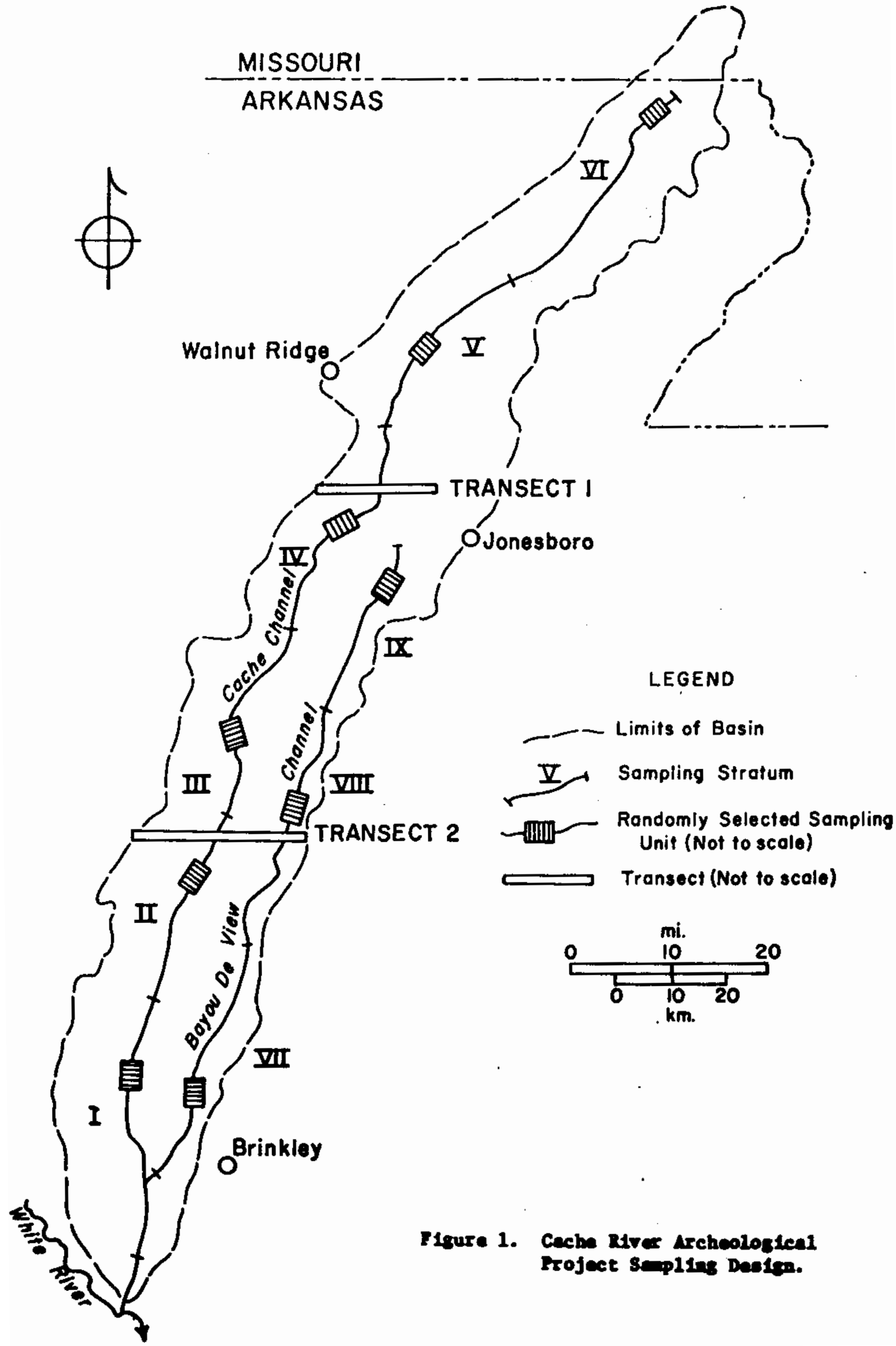

Figure 1. Cache River Archeological Project Sampling Design.

Unfortunately, we had time to complete the survey of only two of the transects in Strata II and IV (see Figure 1).

We also had data from a preliminary intensive survey in the direct impact zone and adjacent areas in the extreme lower reaches of the basin. This was an area in which very little reconnaissance had been carried out prior to the Cache Project.

When data from the various sampling schemes was inadequate to meet the requirements of various research designs, we supplemented them with data from limited reconnaissance in other areas. This reconnaissance included investigation of quarry and workshop sites in the Ozarks as part of the study of lithic raw material procurement in prehistoric times, collection of comparative lithic samples from a large late Mississippian site in the St. Francis Basin, and visits to Mississippian village sites outside the sampling units in the Cache Basin.

In carrying out the survey we recorded a large amount of data from each of the sites visited. These data included extensive surface collections and recording of numerous physical attributes of the sites such as size, presence of midden, and topographic position.

Results: The Resource Base and Project Impacts

The results of the survey are presented in Tables 1-4. We recorded 53 sites in the 12.5% sample of the direct impact zone. Extrapolating from this figure, we arrived at roughly 424 sites in the direct impact zone; but, since the land modification would involve only part of the direct impact zone and the channel locations could be adjusted slightly on the basis of archeological recommendations, we estimate that the number of sites affected by direct impacts of the channelization could probably be minimized to less than 200.

On the basis of data from intensively surveyed areas, we had two methods for estimating the total number of sites in the Cache Basin. First, we extrapolated from the site densities in intensively-surveyed sample units. These densities ranged from 0 to 18.5 sites/sq.mile but averaged about 8 sites/sq.mile (see Table 2). Extrapolating from this we arrive at a figure of 16,870 sites in the basin. The second method was to extrapolate from the ratio of previously undiscovered sites to previously discovered sites in intensively-surveyed areas (the U-D ratio). This ratio averaged 24.47 (see Table 3). Multiplying this by the previously recorded 543 sites in the basin, we arrive at a figure of 13,287 sites. It was gratifying that the two estimates were on the same order of magnitude. We obtained our working estimates of 15,074 sites by averaging the two figures.

The projected indirect impact of the proposed channelization project consists chiefly of site destruction following an intensification of agriculture, additional clearing and land-leveling, in areas where the channelization will substantially reduce flood risk. The extent of land to be benefitted is, of

Table 1. The Quantitative Distribution of Sites in and Near Sample Units--Cache Survey.

Sample Units		ACCESSIBILITY	NEW SITES IN UNIT	PREVIOUSLY KNOWN SITES IN UNIT	TOTAL SITES IN UNIT	AREA OF UNIT (IN MILES^2)	NEW SITES ADJACENT TO UNIT
Stratum	Unit						
I	4	20%	1	0	1	1.136	0
II	4	2%	0	0	0	1.136	0
III	4	15%	4	0	4	1.136	2
IV	4	80%	7	0	7	.568	8
V	4	70%	8	1	9	.568	4
VI	8	92%	26	0	26	.568	11
VII	3	5%	0	0	0	1.136	8
VIII	3	73%	6	0	6	.568	4
IX	7	95%	0	0	0	.568	0
ALL UNITS (DIRECT IMPACT ZONE)		–	52	1	53	7.384	29
TRANSECT	1	90%	29	3	32	2.75	0
TRANSECT	2	52%	4	0	4	3.50	0

Table 2. Minimum site densities for various samples.

SAMPLE	AREA (in miles^2)	TOTAL SITES	MINIMUM SITE DENSITY (in sites/mile^2)
ALL UNITS IN DIRECT IMPACT ZONE	7.384	53	7.18
UNITS IN DIRECT IMPACT ZONE, UPPER END OF BASIN (STRATA IV, V, VI, IX)	2.272	42	18.49
UNITS IN DIRECT IMPACT ZONE, LOWER END OF BASIN (STRATA I, II, III, VII, VIII)	5.112	11	2.15
TRANSECT 1	2.75	32	11.64
TRANSECT 2	3.50	4	1.14

Table 3. The relationship between Cache Survey-discovered sites to previously known sites among various samples (U-D index).

Sample	U-D Index (not applicable if denominator is zero)
All units in direct impact zone	53.00
Preliminary survey (Direct impact zone only)	7.00
All sites, direct impact zone, lower Cache Basin	10.67
Sites in units in direct impact zone, upper end of basin	42.00
Sites in units in direct impact zone, lower end of basin	--
TRANSECT 1	9.67
TRANSECT 2	--

Table 4. Site Components in Intensively Surveyed Sample Units.

Sample Unit	Components								Total
	P	EA	MA	LA	AI	W	M	I	Sites
Preliminary Survey in Direct Impact Zone	0	3	0	6	0	26	4	1	27
Transect 1	0	11	0	20	1	5	7	5	32
Transect 2	0	1	0	4	0	2	1	0	4
12-1/2% Sample of Direct Impact Zone	2	14	0	28	11	14	7	9	53
Total Components	2	25	0	58	12	47	19	15	181/116
Percentage of Total Sites	2	25	0	50	10	40	16	13	

Components:

P: Paleo-Indian
EA: Early Archaic
M: Middle Archaic
LA: Late Archaic
AI: Archaic, substage indeterminate
W: Woodland
M: Mississippian
I: Prehistoric, stage indeterminate

course, difficult to estimate; but the Corps of Engineers predicts 95,000 acres of land clearing--both on terraces and floodplains--as a result of the channelization, in addition to intensification of agriculture in already-cleared areas. Using procedures similar to those employed in estimating the entire resource base, we estimate that the acceleration of site destruction processes following on the channelization would affect at least 5000 sites.

Results: Patterns of Component Distribution

The Cache data indicate that multicomponency is the rule rather than the exception in the Cache Basin; one-half of the sites were occupied during more than one prehistoric stage. The survey data also indicate an overall gradient of increasing to decreasing site density from north to south in the basin. However, there seem to be many more Woodland components in the southern part of the basin. This may be related to a greater duration of Woodland occupation in the southern part of the basin--that part of the basin had at least some middle, and perhaps early, Woodland occupation while the northern two-thirds of the basin seems to have been gradually repopulated only in late Woodland times. The occurrence of components of various stages in four intensively-surveyed sample units is presented in Table 4.

Data from Transect 1 indicate that the highest site density during all stages seems to be on the edges of terraces overlooking floodplains. There are numerous sites on high areas in floodplains, but interfluvial areas on terraces seem to be practically devoid of sites except for those on sand dunes and natural levees beside relict braided Mississippi channels (modern sloughs).

Evaluation of Survey Methods

A number of factors have to be taken into account in evaluating the Cache Project survey methods. First, the sampling fraction is extremely small comprising only about 0.5% of the area in the basin. However, this does represent about 10 square miles of intensively surveyed area and a fairly large sample of sites. Second, the population parameters are unknown in every respect. Thus no "adequate" sample size or fraction can be determined; the only thing we have to measure the results against is our impressions gained by previous reconnaissance.

Another factor which must be kept in mind in interpreting the data is the fact that the number of components per prehistoric stage does not reflect functional variability and changes in settlement pattern. In spite of the rather small sampling fraction, the sample of sites obtained by the Cache Project seems to represent fairly well the population of Paleo-Indian, early and late Archaic, and Woodland sites in the basin. The population of Mississippian sites in the basin, however, is known from reconnaissance data to probably reflect what Sanders and Price (1968: 115) have called a stratified settlement system typical of chiefdom and state level social organization. At least some of the human population was nucleated in large villages of as many as 1000 inhabitants. Sites of such large villages, though few in number and easily missed by random sampling techniques, are of key importance in understanding the prehistoric Mississippian societies in the basin.

As indicated in Table 4, 14% of the sites in intensively-surveyed sampling units had Mississippian components. That is, in itself, relatively meaningless as an indicator of the scope of Mississippian occupation in the basin since it represents only the very numerous sites of isolated farmsteads and probable extraction camps. The previous reconnaissance data indicate that, in addition to these two kinds of Mississippian sites, there are numerous small village sites and at least two large village sites in the basin. Reconnaissance and following-up of site leads obtained from collectors and amateur archeologists thus proved to be an invaluable complement to the random sampling techniques employed by the Cache Project. Neither random sampling nor traditional reconnaissance alone would have given the well-rounded picture of the resource base we needed.

One of the major problems we faced was the integration of a number of different research designs with different data requirements. The sampling design we used (Figure 1) was something of a compromise with the goal of estimating direct project impacts having the most input into the design.

On the whole, however, we are satisfied that the data we obtained are a significant advance on previous data gained by reconnaissance and that they complement the previous data. We feel that our estimates of the direct and indirect impacts of the channelization and the scope of needed mitigation are much more realistic than would have been possible otherwise.

Conclusions

The purpose of the Cache River Archeological Project was to provide an estimate of the nature, extent, and significance of the archeological resources in a 2000 square mile basin in the Mississippi Alluvial Valley and to estimate the impact of over 230 miles of proposed stream channelization upon those resources. This was obviously a vast undertaking; but, with a fairly large budget and more than a year at our disposal, we felt that we should experiment with some methods and approaches which might give us much more complete and reliable data than would traditional reconnaissance methods. The application of a probability sampling design was just one of several innovative approaches we tried.

We can say in retrospect that we are, on the whole, satisfied with the results obtained. We feel that one of the major factors contributing to the usefulness of the data produced by the application of a probability sampling design was the fact that extensive reconnaissance had previously been carried out in the Cache Basin. The Cache Project provided kinds of data not produced by earlier investigation and which nicely complemented the previous data.

We are convinced that the challenges of North American archeology in the coming decade--dealing with cultural resource management in the face of land modification on an unprecedented scale--will frequently require the rigorous application of probability sampling on a regional basis and will require the asking of questions of significance in the broadest possible framework. The methods used by the Cache Project were an attempt to meet this challenge. In spite of many problems we faced, we feel that the general approach used by the Cache Project would probably be applicable to many similar conservation and mitigation problems elsewhere in the Southeast and especially in the Mississippi Alluvial Valley.

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Interdisciplinary Approaches to Archaeological Problems

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The Southeast has many attractions, but southeastern archaeologists have been shortchanged in three important ways. First, preservation of prehistoric material items other than stone and pottery rarely occurs; and, from preceramic levels, chipped stone remains provide practically the only clues to human occupation. If specimens manufactured of other materials are recovered, they are seldom found in reliable association, and we can say only that we think they go together. Second, the Southeast was the first area of North America contacted by Europeans. Since the first visitors were poor ethnographers, there are practically no reliable or detailed accounts to tell the archaeologist what he wants to know about how the material items functioned in the culture in order that the direct historic approach might be used. There were no James Cook nor Lewis and Clark to write down all that was observed. Third, the Indians of the Southeast were culturally obliterated early, and thus a great body of oral history has never been available, nor are there individuals living to demonstrate techniques of manufacture. Chipped stone implements and pottery then form the overwhelming percentage of all cultural remains recovered, but they probably represent a very small percentage of the total technological achievements of the people who used them. There is the danger of doing prehistoric populations a great injustice by attributing to them a cultural complexity only as great as the remains available for study.

To aid interpretation and broaden the knowledge of the past, new dimensions might be added by utilizing more fully the potential of artifactual and non-artifactual evidence. One way to do this is to use available methods to examine the physical properties of archaeological finds.

Thermoluminescence

Dr. Genevieve Roessler of the Nuclear Engineering Department at the University of Florida and I are exploring the feasibility of dating thermally-altered chert materials by the thermoluminescence technique. These investigations will be extended eventually to include pottery; and, hopefully, the Nuclear Engineering Department will be able to offer this technique as a service to archaeologists throughout the Southeast in the future. At the present time thermoluminescence is not a simple routine laboratory procedure. The method succeeds well in theory, but practical application depends upon the solution of a number of problems: (1) To adapt this technique to heat-altered chert has necessitated the development of an efficient means of preparing samples without generating so much heat that the luminescence is lost. A water-cooled lapidary unit equipped with a diamond blade seems to provide the solution. Since the sample to be used in the TL reader must be very small, the chert is imbedded in sealing wax, fitted with dowels to hold it, sawed as close to 3x3x1 mm as possible, and then ground to the exact dimensions. (2) Although both pottery and flint have luminescent properties and thus have the potential of being dated using the TL method, it is necessary to determine the type of radioactive materials present in the sample and the susceptibility of the sample to radioactivity. This is called self dose. (3) It is important to check the radioactivity of the soil in the area where the remains are recovered in order to determine the amount of radioactivity being imparted to the sample from the soil environment. To accomplish this we have planted dosimeters (radiation detectors) in the field which will be recovered at regular intervals. (4) Another factor to be taken into account is whether the sample to be tested was subjected to sufficient heat when it was fired in the past to release the luminescence and return the sample to the ground state. If it was not, the technique simply will not work, as the calculated date will be false. Despite the problems to be overcome, this method looks very promising. Dr. Roessler and I are actively involved in this project and hope to have some concrete results soon.

Elemental Analysis

There are a number of methods available to study the composition and internal structure of archaeological specimens through elemental analysis including X-ray fluorescence, atomic absorption spectroscopy, and neutron activation. Elemental analysis is an objective, quantitative method and can be used to (1) determine whether specimens are made of local or non-local materials, thus providing clues to prehistoric migration and/or trading practices; (2) provide information pertaining to intuitive preferential selection by aboriginal craftsmen for quality of raw materials; (3) "fingerprint" sources of raw materials, particularly clays for pottery making; and (4) identify the components responsible for the production of thermoluminescent traps.

The Soils Department of the University of Florida has been cooperating for several years with elemental analysis. Drs. Breland and Zelazny of the department assure me, for instance, that since Florida clays have been classified, it should be possible to pinpoint at least to county the geographic area of the source of clay used to manufacture aboriginal pottery. We have just completed an elemental analysis of chert samples from 24 different locations; 13 elements and their percentages were determined. We are looking for trends. When used in conjunction with other analyses this information should tell us a great deal. For example, we now have over one hundred petrographic thin sections primarily of Florida cherts but some of non-Florida flint samples as well. As with thermoluminescence, elemental analysis has great potential, but its reliability depends upon data from many samples and interpretation by qualified personnel.

Preservation

I have gotten involved with the preservation of the wooden remains from the Key Marco site which was excavated by Frank Cushing in the early 1890's. Dr. Jacob Huffman of the Wood Products Laboratory in the School of Forestry at the University of Florida has been assisting me with the technical aspects of preservation. It generally agreed that polyethylene glycol (PEG) is the superior product. Since the Key Marco objects are extremely dry, warped, checked, and in an advanced state of degeneration, we are not simply subjecting them to increasing percentages of PEG. They are first put into humidity chambers to increase the moisture content in an effort to prevent further stress. This method may also heal some of the cracks.

We did an interesting experiment with a "post" which was recovered from the site. It was sawed into three pieces. One piece was kept as a control and polyethylene glycol (Union Carbide Carbowax 4000) and an Elmer's Glue-All product used as preservatives for the other two pieces. When wet, the treated specimens had both gained the same percentage of weight indicating that they were saturated. When the specimens dried, the piece preserved in PEG retained a significant amount of the weight while the specimen treated with the glue did not. This indicated that the glue was acting only as a surface preservative while the PEG had penetrated the mass and stayed there. This fact was confirmed by strength tests conducted after the specimens had dried. The control specimen was very weak and almost spongy. The piece preserved with glue had increased only in surface strength; there was no resistance to pressure after the surface was penetrated. The PEG-treated specimen was preserved throughout. The glue-treated specimen is actually in worse shape now than before because saturation subjected it to new stresses.

Initially I became interested in the Key Marco specimens because of what they could have revealed about what was being made and how with stone or shell tools. But soon something equally important occurred to me. The fiber remains, i.e., the wood and cordage, constituted 90% or more of all cultural items recovered from the Key Marco site. This means, in reverse, that under normal recovery conditions, 90% or more of the material inventory is missing. Throughout time, wood probably played a very important part in man's technology because it was easy to work and usually readily available. This is true in our own culture today and among pre-industrial peoples who still exist.

I saw another example of this last summer when I visited Daugherty's Ozette Village site on the Olympic Peninsula where he is recovering items from prehistoric houses buried by a mud slide. There are some bone and stone items; but, again, if the wood and basketry items had not been preserved, over 90% of the house remains would have been lost including the houses themselves. Certain thoughts come to mind. The people of the Northwest Coast of North America have always been credited with having the most sophisticated woodworking technology, and I'm willing to agree with that, but the Northwest Coast was contacted 250 years after Florida. By then it had become popular to record everything about native cultures still in existence because the conquering countries realized that many cultures had become extinct and little was known about them. If the chronology of discovery were reversed whereby the cultures of the Northwest Coast were destroyed before those of the Southeast and before detailed descriptions were made, would we have any conception of the elaborateness of the woodworking technology there? Since preservation is poor in both places, under these conditions the discovery of the Ozette site and the Key Marco site would put the states of Washington and Florida on an equal basis. This is not the way it is, of course; nor are we likely to find another site as elaborate as Key Marco. It becomes, therefore, even more important to utilize all of the information available for interpretative purposes.

Problems

Problems are encountered when interdisciplinary studies are attempted. Because of what might be called intellectual curiosity, specialists in other fields are interested in the problems we wish to solve. They are usually willing to test a few samples or whatever to help us out. When we propose initiating a project on a continuing basis, we find things are different. No matter how good a guy someone is, he is already fully employed. He has his own research projects, teaching duties, and many other commitments. Many techniques we wish to explore need to be readapted to local conditions. Equipment might be available but is already in use and has been calibrated for other purposes. There are no provisions for training students and faculty who do not have the background necessary to conduct the experiments. No discipline depends upon the expertise of others as much as archaeology, but our relationship with others remains largely parasitic because we can seldom reciprocate. How might we make this a symbiotic relationship? We must generate interest and money. We can generate interest by generating money. We need to convince granting agencies that equipment is needed even though it may duplicate equipment already available. We need to provide cooperating departments with funds for student assistants. We need to let cooperating specialists share our glory if our projects succeed. We need interdisciplinary courses to provide the needed knowledge without having to take so many courses outside our own field that we weaken our programs. We need to investigate the possibility of short courses for ourselves and our students at institutions where trained personnel exist.

We should not be excavating to merely provide additional specimens for museum shelves. We must always ask, "What were those people doing (how, why, where, when), and what prompted them to change and do it another way?" Interdisciplinary approaches may provide the answers.

Sexual Dimorphism in the Etowah Mound C Crania

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Etowah is a Mississippian mound site located in Bartow County, Georgia. The site contains three major pyramidal mounds designated archeologically as A, B, and C.

The skeletal remains removed during excavations at this site include material from Mound C and from the surrounding village area. The village area material consists of burials from both Mississippian and Lamar periods, while Mound C remains represent only the Mississippian period.

Under the auspices of L. H. Larson, Jr. and the Georgia Department of Natural Resources, Historic Preservation Section (formerly the Georgia Historical Commission) an analysis of the skeletal material from Mound C has been undertaken. As a result of that analysis, this paper demonstrates the range of variation for certain cranial characteristics in the Mound C crania and attempts to analyze that variation in terms of its cultural and genetic implications.

Mound C Material

Crania and cranial fragments from 26 individuals removed from Mound C were examined for seven characteristics which are sexually diagnostic according to W. M. Bass (1971). The traits are:

1. Brow ridge size
2. Mastoid shape
3. Shape of the mandible at the symphysis
4. Muscularity of the nuchal area
5. Parietal bossing
6. Shape of the orbit edges
7. Position of the posterior end of the zygomatic process

The sex of these specimens was determined on the basis of the angle of the pubic symphysis, the size of the sciatic notch, and the maximum diameter of the femur head. As many of these criteria as possible were applied to each individual specimen with most importance placed on the pubic symphysis and the sciatic notch. The state of preservation did not allow every specimen to be examined for all of these characteristics.

Table 1 compares the seven cranial traits for the 26 specimens. In all specimens which preserved the occipital a pronounced area of occipital muscle attachment was observed, either in the form of a bun or a well-developed ridge. All the female specimens had a zygomatic root beginning just in front of the external auditory meatus. This was found to be the condition for the majority of the male crania; however, three of the males had a posterior zygomatic that began further in front of the external auditory meatus than did any of the female specimens.

Examination of brow ridge size, mastoid size, the shape of the mandible at the symphysis, parietal bossing, and the shape of the orbital edges indicates that the female range of variation lies entirely within the male range of variation; thus, the female range appears to be a more restricted one. For example, both male and female specimens are found with no trace of brow ridge; however, there are no female specimens with medium-sized brow ridges although there are males with brow ridges of this size. The apparent restriction of the female range of variation may be the result of sampling error, as the sample size is smaller than the male; or it may indicate that, while it is possible to distinguish some male crania on the basis of the aforementioned cranial characters, it is not possible to distinguish females as their range of variation for these traits lies within the male range.

The apparent total range of variation can best be seen by a comparison of two specimens, #2094 and #378D. These specimens were chosen as they each represent extremes in the range of variation; furthermore, in terms of gross dimensions, they are metrically similar. #2094 has a cranial module of 150.7, and #378D has a cranial module of 152.8. The choice of these two specimens, therefore, rules out trait variation due to gross size differences. In addition, they are of similar ages. #2094 was approximately 45 to 50 years and #378D was over 45 years at the time of death.

Comparison of #2094 and #378D

Both #2094 and #378D show a pronounced degree of intentional occipito-parietal deformation. In addition, #2094 shows an associated frontal flattening which is not observed in #378D. A greater degree of intentional cranial deformation is seen in #2094 which consequently has much larger parietal bosses and a well-developed nuchal bun in contrast to the nuchal ridge in #378D. A more prominent temporal line is seen in #378D which also has a greater bizygomatic and bigonial breadth.

#2094 lacks prominent brow ridges while #378D presents a medium-sized superciliary arch. The mastoid process is also larger in #378D. The frontal is less sloping in #2094--a difference that is apparently the result of the frontal deformation in this specimen. The orbit edges are sharp in #2094 and blunt in #378D. In both specimens the posterior root of the zygomatic process begins in front of the external auditory meatus.

#2094, except for the muscularity in the nuchal area and the pronounced parietal bosses, presents a series of gracile characteristics. One might conclude on comparison of the traits normally used to distinguish sex in the crania that #2094 was

Table 1. Comparison of Cranial Traits

Specimen	Sex	Brow ridge	Mastoid	Mandible at Symphysis	Occipital Muscularity	Parietal Bossing	Orbital Edges	Zygomatic Position
440	F	trace	---	---	---	medium	sharp	---
720	F	---	---	narrow bilateral	---	---	---	---
1523	F	small	small	narrow bilateral	---	---	---	in front*
1576	F	none	small	intermediate narrow	pronounced	medium	---	in front
1863	F	none	---	narrow bilateral	pronounced	medium	sharp	in front
2499	F	trace	---	---	---	---	---	in front
378D	M	medium	medium	---	pronounced	medium	blunt	in front
436	M	trace	small	---	pronounced	large	sharp	in front
456	M	none	medium	---	pronounced	medium	---	in front
467	M	medium	medium	---	---	---	---	in front
483	M	small	small	wide bilateral	---	medium	sharp	in front
724	M	medium	small	---	---	medium	---	far in front
728	M	---	medium	---	---	---	---	---
831	M	---	medium	---	---	---	---	in front
939	M	---	large	wide bilateral	---	medium	---	far in front
BR 70	M	small	small	intermediate	---	---	---	in front
1795	M	---	medium	wide bilateral	---	large	---	in front
1897	M	---	medium	---	pronounced	---	---	in front
1899	M	medium	large	---	pronounced	medium	---	far in front
2094	M	none	small	intermediate	pronounced	large	sharp	in front
2162	M	small	medium	---	pronounced	large	blunt	in front
3540	M	trace	medium	---	---	---	---	in front
3552	M	none	small	narrow bilateral	---	---	sharp	in front
3558	M	trace	small	wide bilateral	---	---	sharp	in front
3564	M	medium	medium	---	pronounced	medium	blunt	in front
3565	M	medium	large	wide bilateral	pronounced	---	sharp	in front

*in front of external auditory meatus

a female and that #378D was a male. Examination of the pelvis indicates that both were male.

An attempt to sex these two crania by discriminant function was made using the method of Giles and Elliot (1963). It was not possible to use their coefficients, as the intentional cranial deformation in the Etowah material influenced cranial length and cranial breadth. Coefficients were subsequently generated from 386 Arikara Indian crania whose measurements were provided by Richard L. Jantz. The measurements used were:

1. Basion-bregma height
2. Basion-nasion length
3. Basion-prosthion length
4. Minimum frontal breadth
5. Bizygomatic breadth
6. Nasion-prosthion height
7. Nasal height
8. Nasal width

The sectioning point for this discriminant was 0.402064. For #378D the function had a value of 0.431927 and for #2094 a value of 0.396447. This placed #378D in the male range of variation and #2094 in the male/female grey zone with respect to the Arikara material.

The metric differences as well as the morphological characteristics indicate that these two specimens represent a wide range in variation with #378D having definite male characteristics and #2094 presenting a number of characteristics usually associated with females.

<u>Explanation of Trait Differences</u>

The intentional cranial deformation has had an obvious influence on parietal breadth and subsequently parietal bossing as well as the muscularity of the nuchal ridges. This cultural practice masks any genetic or sexual differences in these traits rendering it impossible to use these characteristics as sexual determinants.

Brow ridge size, mastoid size, the shape of the mandible at the symphysis, the shape of the orbit edges, and the position of the posterior end of the zygomatic process, all have ranges of variation in which the male range exceeds the female and in which the female range lies within the male range. Therefore, while it is possible to recognize males who fall within the upper range of variation as does #378D, it is not possible to distinguish between males and females who fall within the lower end of the range of variation.

It may be possible to distinguish females from males metrically with the use of a discriminant function for sex, but due to a lack of complete female crania it has not been possible to demonstrate this.

Comparison of the Etowah Crania with Moundville

C. E. Snow (1941) analyzed seven male and eight female skulls from the Middle Mississippian at Moundville, Alabama. He determined that it was possible in most cases at Moundville to distinguish male and female crania.

Although parietal bossing and nuchal muscularity are again influenced by intentional cranial deformation, there are definite male/female differences in the size of the supraorbital torus and the mastoid process.

Metrically, Snow demonstrates a typical range of variation in the Moundville specimens. For each measurement there is a male and a female end with some overlap between the two. The combined male-female range is greater than either the male range or the female range alone.

This does not appear to be true for the Etowah crania. For example, Snow contends that at Moundville the nasal aperture is broader in females than in males. Female nasal breadths ranged from 24-29 mm, and the same measurement for males ranged from 23-27 mm. Etowah Specimen #2094, with gracile cranial traits, has a nasal breadth of 22.2 mm, and #378D has a nasal breadth of 27.2 mm. Apparently, both the ranges of metric variation and the ranges of morphological characteristics are different between these two sites in material from the same time period. This may indicate that there are a number of differences in the gene pools of these two populations despite many cultural similarities.

It will be necessary to examine other southeastern Middle Mississippian populations in order to determine if the ranges of variation observed in the Etowah Mound C crania are characteristic of the Southeast as a whole during this time.

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An Archaeological Survey of Lake Blackshear

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Columbus Museum of Arts and Crafts

The source of the Flint River is in Atlanta, Georgia; and it flows through the central part of the western half of the state until it reaches its confluence with the Chattahoochee River where they form the Apalachicola River at the Georgia-Florida border. For approximately one-third of its length the Flint passes through the Piedmont until it breaks through Pine Mountain at Spewrell Bluff and shortly enters the Coastal Plain. The Flint is relatively unaltered except at its southern terminus (Lake Seminole) and in Albany, Georgia (Lake Worth). The only other impoundment of the waters of the Flint is at Lake Blackshear located between Americus and Cordele.

In September of 1973, the waters of Lake Blackshear were lowered eleven feet for a period of approximately four months. This power reservoir was built over forty years ago before the widespread popularity of power boats and water skiing and had not been cleared of trees or other obstructions. These were being removed to increase recreational safety on the lake. It was the first time in those forty-plus years that the waters had been dropped to that extent, and it is not likely to happen again.

Even with the water lowered to that extent, less than 20 per cent of the original land surface was exposed. The Columbus Museum of Arts and Crafts felt, however, that this would be an excellent opportunity not only to obtain archaeological information, but also to test certain questions and hypotheses concerning the effects of reservoir construction on archaeological resources.

At the Twenty-sixth Annual Southeastern Archaeological Conference an informal paper entitled "Archaeological Resurvey: A Relatively Unexplored Potential" was presented (Schnell 1969). An attempt was made to point out that in the years after flooding of a reservoir much additional information can be salvaged as shoreline sites are eroded away and as shallows are exposed in the winter. There was also some speculation that sites might, at times, be encapsulated.

Lake Blackshear gave us an excellent opportunity to examine an end-result of inundation over a long period ot time. We began our survey with certain preconceived notions as to what we would find. We particularly were hoping to find encapsulated sites to determine how well they were preserved. The results of our investigation into this particular subject may best be characterized as: most pessimistic hypotheses confirmed, most optimistic hypotheses denied.

With the exception of brief comments about the Neisler site above Lake Blackshear and the work in the Jim Woodruff

Reservoir basin (Lake Seminole), little can be learned about the archaeology of the Flint River from the literature. In fact, practically no other detailed work has been done in that drainage until very recent years. We were therefore anxious to learn something about an entirely unknown section of the state.

Mr. R. Donald Gordy, formerly of the museum, was contracted to conduct the actual surface reconnaissance of the lake bottom and to supervise limited testing on selected sites. During the period from September 1973 to January 1974, 219 sites were recorded. Two hundred and one of these sites were either within the flooded area or directly on the edge of the modern shoreline. On the eastern side of the Flint, 106 sites were located in or adjacent to the lake, and seven similarly situated sites were located in Worth County. No sites were located in Dooly County. On the western side of the Flint, 75 of these sites were in Sumter County, while 13 were in Lee County. As we noted in the report on the Walter F. George Lake resurvey (1969: 55-56), Lake Blackshear may be divided into three sections with the central section producing the greatest concentration of sites. Part of this is coincidental, but part is not. As at Walter F. George, the area closest to the dam is flooded to such a depth that most of the sites utilizing riverine and bottom land resources were never exposed. In the upper section of the reservoir erosion and siltation are so drastic that most of the vulnerable sites appear to have been totally destroyed or deeply buried. If any are encapsulated in this part of the lake, there appears to be no way of detecting them.

In terms of the distribution of sites, one anomaly should be mentioned here. Although 16 per cent of the shoreline is in Lee County, only 6 per cent of the sites were located there. Several factors probably contribute to this, but it is interesting to note that the Lee County soils on Lake Blackshear are of the Lakeland-Eustis association of the Southern Coastal Plain with "sandy and droughty" characteristics, while the rest of the lake is in either the Norfolk-Tifton-Rains association with sandy surface but loamy subsoils, or the Greenville-Magnolia-Carnegie association with "coarse loamy surface layers." (Perkins and Ritchie 1965)

Insofar as the sites located within the reservoir area are concerned, all located seem to have been subjected to sheet erosion. Though the degree of this erosion varied, it undoubtedly contributed to the fact that we did not find one conventional aboriginal feature in the reservoir. In most places, remaining stumps suggested that approximately 20-40 centimeters of the surface had been washed away. An additional 10-15 centimeters had been thoroughly worked by various factors. At Lake Blackshear it appears that a major element in this "sub-bottom" disturbance is the activity of mussels. Literally millions of recently dead mussels were noted during our reconnaissance and in the top 10-15 centimeters of all lake bottom tests.

It should be noted in this connection that not only were there no aboriginal period mussel shells recovered from the lake bottom, despite their abundance on non-flooded sites, there did not seem to be any recent mussels which appear to have been dead for more than one or two years. Though this phenomenon needs further investigation, when coupled with the fact that no aboriginal period bone or charcoal appears to have been located, the conclusion is inescapable that all organic remains were destroyed by the flooding within a relatively short period of time.

We were able to delineate two interesting pre-flood recent features. One of these, which was detectable only because of an increased soil density at about 15 centimeters, was a network of farm roads around the periphery of a former field. The other feature was the remains of what had obviously been a Prohibition-period still. The only obvious indication of a former aboriginal feature was found in Sumter County next to a now submerged limestone sink. This was a large cache of chert choppers, knives, and preforms. The only feature-like characteristic was the fact that these tools were located in a very restricted area. No outline or soil stain of any kind was detectable. Apparently the mass of these tools was such that they were not significantly disturbed by water or mussel action. There may well have been other similar features. There was some suggestion of hearth areas in concentrations of firecracked rocks.

Slightly over a quarter of a ton of archaeological material was recovered from Lake Blackshear. According to John R. Swanton (1946: 542), the Muskhogean name for the river was "Lonoteeska," which means "flint picking up place." Previous research near Albany, Georgia and our recent survey certainly justify that accolade. At least half of the material recovered in our survey was chert, and several chert outcroppings were recorded within the lake boundaries. As will be seen in our discussion of the Cannon site (9Cp108), there is even further justification for our growing interest in the exploitation of chert resources on the river "Lonoteeska."

With few exceptions the rest of the material recovered was ceramic. Another flooding factor with which we were concerned was the effect that it would have on the ceramic material. Again, our worst suspicions were accurate; the ceramic material had deteriorated considerably. All of the ceramic material recovered from the flooded areas shows considerable "scrubbing" which tends to obliterate surface decoration. A contributing factor to this is the fact that the hardness of the material seems to have deteriorated after over 40 years of submersion. Preliminary comparisons of similar material from flooded and unflooded sites suggests a loss averaging 1.5 on Moh's scale. Adding to the problem of detailed examination of ceramic material was the frequent occurrence of stain and/or algae. Much of this material could not have been adequately examined without the use of an ultrsonic cleaner.

There was one decorative mode represented on sherds from almost every ceramic site which stirred considerable interest.

This is cord marking. Cord marking is found throughout the Southeast, of course, in varying degrees of frequency. In the Chattahoochee and (until now) the Flint drainages of the Gulf Coastal Plain it has appeared only rarely in publications and manuscripts, and where it does occur it is only a very minor percentage of the total ceramic spectrum for a given site. Caldwell defines Fairchild's Cord Marked in his manuscript on the Fairchild's Landing site (9Se14) in the Jim Woodruff reservoir, but it is only one to one and a half per cent of the total amount of decorated pottery (n.d.). Willey defines West Florida Cord Marked in both early and late varieties, but he states that the percentage from his sites was so small that he could not reach any significant conclusions (1949: 389). At Lake Blackshear, not only does cord marked pottery occur at almost every site, but at most sites it is the predominant decorative mode. A highly significant percentage of the rims are folded, with cord marking on the folds. All indications are that this material is not closely related to Wilmington or Savannah Cord Marked of the Georgia coast. A curious parallel to the cord marked situation of the Flint may be found in Mobile Cord Marked noted by Trickey and Holmes on Tensaw River near Mobile Bay (1971: 120). Although it does not appear anywhere in the literature, I understand that material very similar to that from Blackshear occurs on the lower Ocmulgee, the next closest river. Associated with the cord marked pottery with folded rims, we frequently found a great number of triangular projectile points.

Because no features or organic remains were being recovered from the bottom of Lake Blackshear, we decided that we should pick a site which was not flooded or only partially flooded to test and attempt to gain additional information. We were particularly anxious to get a radiocarbon date in addition to acquiring nonflooded comparative material.

In one area where there were a number of sites showing cord marked pottery and triangular points, we found an unflooded site with appropriate surface material which we named the Cannon site (9Cp108). By careful reconnaissance of the surface of the site we were able to locate one area in this level field where a few flecks of deteriorated mussel shells occurred on the surface. Upon removal of the plowzone, we were quickly able to identify a large, regular pit outline 273 centimeters long on a north-south axis and 182 centimeters wide. We were surprised at the regularity of the pit outline but certainly did not expect what was found in addition to soil, bone, sherds, shell, and charcoal.

We discovered that the primary purpose of this large rectangular pit 120 centimeters deep was for a multiple interment tomb. Before I go any further, let me point out that we have not been able to find any suggestion that there was a mound over this tomb, and there is no remembrance of land levelling by the owner. The answer to this puzzle must await further research on the site.

The tomb cleared of midden fill revealed a total of five interments, each apparently placed in the tomb at a different time, suggesting that this tomb, at least, is not an example of a "fossilized single ceremony" as suggested by Sears for the Kolomoki site (1956: 93).

The burial furniture from this tomb has not been fully analyzed, so we will only briefly and tentatively catalogue the material recovered in this paper. The first encountered (and most obvious) was a thirteen strand necklace with slightly over 2200 beads. Strung on one strand it would have been over seven meters long. Close by this necklace were a number of other items including flint knapping fragments, bobcat (?) claws, a bone knife, a shell cup, a turtle shell rattle, and a very curiously shaped fragment of antler. My main reaction at the moment is that this must have been part of a head-dress. In amongst two partially disarticulated burials which also had marginella beads and a complete flint-knappers kit was a ceramic pipe with a generalized Woodland appearance. A very tightly flexed burial also had a large number of items including a "normal" graded necklace, still another knapping kit, a raccoon baculum, cut wolf(?) jaws, a broken small shell pendant, and a sandstone abrader.

These knapping kits included a full range of items, including anvils, drifts, antlers (tap hammers?), broken up pieces of chert (possibly heat treated), and points including one apparently unfinished. All of these points are triangular, but their basic configurations vary.

We started out to conduct a three-day test for stratigraphy and possibly a carbon date and ended up with an extremely complex situation which took us through Christmas and a good part of January. With the clearing of the tomb, we reached that all too frequent state where we were confronted with far more questions than we anticipated. What is the source of this apparent cultural isolate? Is our radiocarbon date from the tomb fill of A.D. 1225 ± 65 an accurate reflection of the time spectrum of the material recovered? If so, does this reflect a Late Woodland enclave retreating to an environmental niche which was not particularly suited for a Mississippian environmental exploitation system? Perhaps it will be profitable to pursue a hypothesis that this ceramic complex and associated cultural traits represent a Late Woodland enclave in an intermediate position between the Gulf Coast and the north.

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Archaeology, History, and Human Ecology: Applied Anthropology For Public Use Areas

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The archaeology of prehistory has long defined extinct cultures through artifact types, mortuary practices, house and community patterns, and to a lesser degree through economic and ecological information. Historic archaeology has more often been archaeological documentation of known cabins, forts, or towns. This approach is less likely to research ecological, economic, or mortuary aspects of the occupations. For this reason the divergent fields of archaeology rarely produce comparative information relevant to human behavior. Prehistoric and historic archaeology with increased use of subsistence information, historical records, and ethnographic analogy can pave the way for a uniform holistic approach to the study of human ecology in the eastern United States.

Though prehistoric archaeology has long used analogy and certain aspects of ecology in its interpretive reports, the application of it through a general systems theory approach is relatively recent (Willey and Sabloff 1974). The use of ecological and ethnological analogy in museums and interpretive centers at historic and prehistoric sites has been even more rare. Too often public archaeological and historical interpretive centers amount to little more than art museums or relic collections with token exhibits on culture change, social organization, and subsistence activities. Such museums reflect little of the potential interpretations of the data actually present (historical museums are particularly deficient in this respect).

Archaeology and Anthropology as an Applied Science

Archaeology and anthropology have long been considered esoteric "sciences" with little benefit to the public other than to provide them with information and artifacts to look at thereby "enriching" their understanding of mankind. While archaeology has been undergoing a crisis in research direction (Taylor 1948; Leone 1972; Redman 1973; Willey and Sabloff 1974, and many others), ethnology has been wrestling with the concept of applied anthropology and the purpose of research goals (Hymes 1974). This school of thought suggests that as a behavioral science anthropology can do more than simply "enrich" the intellectual development of an interested portion of society. It is felt that applied anthropology can create greater social harmony between ethnically distinct groups through education and the concept of culture. Such an approach may be criticized on the grounds that it could be used to benefit or perpetuate political or ideological movements by manipulating the populace at large in a structured and calculated manner. Conversely, some see contemporary anthropology as a product of various ethnocentric institutions such as racism or nationalism and serves to benefit only the Western cultural systems. From this perspective, anthropology is viewed as serving as a means to dominate other cultures, though not in a premeditated logically defined sense. See Reinventing Anthropology edited by Dell Hymes, 1974.

Archaeology, in an applied sense, has already been utilized to build national pride and to document and justify the doctrines under which some contemporary societies are functioning (Ford 1973). I am sure that we will all agree that American archaeology and anthropology should not be used to achieve political ends. However, archaeology as an applied behavioral science could provide the public with an interesting understanding of viable alternative lifeways which at one time lived in the same environments we are presently exploiting. At the same time, applied archaeology interpretive centers could provide an understanding of the relevance of other sciences such as geology, ecology, and social anthropology.

If, for a moment, we assume that we could develop public lands, museums, and interpretive centers so as to provide an accurate picture of archaeology and history as human ecology, several important questions arise. First, how would it benefit the public; and, secondly, would they really care? Finally, and perhaps most important, how would such a program benefit the science of archaeology?

Government and private archaeological sites open to the public are predominantly considered to serve them as recreation areas, and few are viewed solely as centers for intellectual or cultural enrichment (U. S. Department of the Interior 1972; Brockman and Merriam 1973). I see a distinct difference between what the National Park Service states as its goals and the parks which are a manifestation of its actions. Admittedly, the N.P.S. is involved in many programs, but thus far only the parks serve to articulate public resources with the people.

The spectacular and popular sites of the Southwest demonstrate that archaeological sites can be significant recreational and financial resources if effectively developed. The mounds of the eastern U. S. apparently are not as awe inspiring to the American public as the masonry cliff dwellings of the Southwest, and thus need "help" in inspiring public interest. Such a goal could be achieved through interpretive programs pertaining to the land and the occupations so as to broaden the base of interest by incorporating research from different fields by way of a human ecology approach. To provide information of historical or cultural importance, it would seem that a cross cultural presentation would enable visitors to better grasp concepts of human variation and traditional historical significance. An interpretive center of this nature would not only provide people with educational recreation, but it would hopefully provide an opportunity for a humanistic enrichment and understanding as well.

The second important question is, "if such interpretive centers were provided, would the public really care?" Many archaeologists and museum curators have thought that the American people possess some perspective through which the only things they can conceptualize about the past is that people made pretty pots, practiced elaborate burials, and occasionally participated in a quest for food. Until recently no one had ever conducted a "market research" program to actually determine what the public actually found interesting in the way of exhibit designs and topics. In April 1973, the 32nd annual meeting of the Society for Applied Anthropology was held in Tucson, Arizona. A symposium, "Museums and Applied Anthropology," covered some of the more recent reassessments of museum programs and goals. Other research regarding attendance distribution at Cranbrook Institute of Science (Guy 1972) demonstrates that the Physics Hall is consistently more popular than other exhibits in this natural history museum. The exhibits in this area are predominantly of a kinetic nature with which visitors can interact. I believe that the development of contact-interaction exhibits in other areas of natural history would increase their educational effectiveness and attractiveness to visitors.

The pretty pot approach appears to have been a product of archaeologist's interests and not necessarity the public's (Fritz 1973). Recent research has, among other things, determined that there is a positive correlation between the public's interest in natural history and ecology and the attainment of higher education degrees (Brockman and Merriam 1973). With literally tens of thousands of college graduates being produced each year we can expect a continued boom in environmental research and salvage. As of yet, archaeological salvage is comparatively unknown to the public in the eastern United States.

Ultimately, federal and big business monies for research come from taxpayers and consumers. In a tight money economy I foresee increasing resentment and opposition to expensive recovery of "stones and bones" unless the public is educated in the multidisciplinary relevance of archaeology as an ecological behavioral science. Such a broadening of the public interest and support could only benefit scientific research. Those who had previously been interested in only archaeology, history, or ecology would find that they had, in fact, a vested interest in related fields. By incorporating various sciences in such multidisciplinary interpretive centers for sites and public lands the scope of the public understanding would broaden, thus creating a wider base of interest and financial support. We need to look only as far as the environmentalist's political lobby to realize that when properly directed the public interest energies are, in fact, an important resource.

There seems to be an increasing air of professional snobbery towards amateur archaeologists which appears to be paralleling the acceptance of a paradigm touting a banner of "hard science." Often the professional archaeologist wishes that the public or amateurs would just "go away." Obviously, the nonprofessional cannot carry out all of the activities of a trained specialist, but it must be realized that not all of their activities are detrimental to the resource base of archaeology. This public reserve of manpower and finances can certainly be utilized to increase the efficiency of large scale survey, site salvage, etc.

An additional benefit, and by no means less significant, would be the numerous job opportunities which would arise. Certainly we have a well stocked reserve of trained specialists on which to draw to fill new employment positions.

Archaeology and Public Interest

It seems apparent that archaeology has, for the most part, failed to stimulate broad public interest, while in a few short years the interest in ecology has expanded tremendously. For a brief moment, let us turn to the major points of interaction between the public and the sciences of ecology and archaeology, the museums and the interpretive centers.

Private, state, and national parks and museums built around prehistoric sites "interpret" past cultures by displaying artifacts, mortuary practices, chronologies, archaeological methodologies, with smaller exhibits on subsistence and social aspects of culture. Such parks are invariably based upon sites where there are "open air" features to see, such as cliff dwellings, rockshelters, or mounds. The museum or interpretive center provides a collection of things removed from this central point of interest. The sites which are opened to the public seem to be viewed through an unwritten and undefined theory of our culture that a spectacular manifestation from the past, and the things which it yields, is somehow more significant than inconspicuous open sites. In the eastern U. S., the redeeming social value of such sites apparently lie in the elaborate religious and burial practices of people still considered as "mound builders" by the public.[1] Too often the museum associated with the mound sites reflect such a perspective as well. Such museums are most often set up so that one may begin viewing the exhibits at any point, or any series of points, and still comprehend the various themes presented. Essentially, each theme or cluster of traits is viewed as a separate cultural manifestation. From this view, chronology, excavation, mortuary/religious activities, subsistence, distributional information, and ethnographic analogy may be and have been freely interchanged in the exhibit program implying that each works independently from the other but together manifest the past culture. Often the high point of the exhibit has been centered around burial information such as at Etowah, Moundville, Dickson Mounds, Norton Mounds, and Ancient Buried City.[2]

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[1]Morse (1973) notes that some people in Arkansas are not even sure if the Indians who left the archaeological sites were human.

[2]The following is stated from the tourist brochure of Mound State Monument, Alabama (Moundville Site): "Stop 2. Archaeological Museum. Here you will see exhibits explaining daily life at ancient Moundville. Two wings of the museum were built over burial areas. LOOK FOR: 57 Indian skeletons, uncovered but left in the ground along with their 'treasures,' exactly as the archaeologists found them." What more can I say?

This country has long had state or national forests, but the emergence of numerous private and public nature centers or interpretive centers associated with areas of public access have sprung up only within the past decade. Ecology and ecological equilibrium has been illustrated in an explicit and logical manner by way of the concepts of habitat, biome, niche, and food chain. Such interpretive centers illustrate the interdependence of various aspects of the ecological continuum through educational programs and exhibits. These programs, though widespread and gaining in popularity on both local and national levels, view environment as a discrete unit, an entity apart from man and culture.

The significant point that too often escapes ecologists and too often receives no more than passing comment from archaeologists is that man and culture have been an integral part of North American food chains since the close of the Pleistocene. Thus, one can hardly define an ecosystem without including the extractive activities of man, and conversely, it is inaccurate to discuss prehistoric or historic human populations without considering how their exploitation affects the ecology of the environment.

Man and Environment: A Systemic Approach for Interpretation and Education

General systems theory, as applied to anthropology, defines culture as a number of interrelated subsystems serving to extract energy, matter, and information from the environment by means of cultural adaptation. Culture change is viewed as a dynamic state of readaptation to environmental change or a shift in efficiency of exploitation. A static cultural system is essentially one which is in equilibrium with the environmental situation which it occupies. A very simplistic and perhaps abused example would be to view a cultural system as divided into three main components--technological, sociological, and ideological. Each serves a purpose for the other, and all comprise a cultural system which extracts energy and resources from the environment. Certain aspects of cultural organization serve as homeostatic mechanisms to maintain equilibrium within the cultural system itself (for further information on systems theory see Buckley 1967; Von Bertalnffy 1972, and Anderson 1973).

The two systems, culture and ecology, are intimately intertwined and form an ecological continuum neither aspect of which can or should be discussed without the other. Thus, if one accepts the human ecology and systems theory proposition that a cultural system is interlocked with environmental systems, then it follows that definitive and interpretive programs should take such an approach as well.

A Model Format for the Illustration of Human Ecology

To best illustrate a systems approach to defining cultural/environmental interaction a major shift must be made from traditional museum galleries and exhibit sequences to one which reinforces and demonstrates the cyclical conceptual scheme of ecological systems theory. In the past, a building was designed, and museum exhibits were put in it. In this manner the architectural limitations affect the interpretational programs. On the other hand, a museum designed to illustrate a particular aspect of systems theory could be used to demonstrate any application of a systems perspective. A museum designed and arranged in such a manner would be less dependent upon any one cultural perspective than previous museum arrangements. In this way it is hoped that a systems interpretive center would be an unbiased cross cultural study and would avoid illustrating specific cultural fetishes such as a fixation on non-western burial practices.

A systems interpretive center should utilize a modified linear approach as opposed to the prevalent shotgun method of exhibit arrangement. Due to a need to maintain conceptual continuity for those uninitiated to a systems perspective, the various components would have to be stacked in a unilineal manner, yet still illustrate their interdependence. Ideally, this would take the form of a doughnut shaped exhibit hall, the last exhibit of which would merge into the first. Each component would have a separate wing which would more fully demonstrate the principles in the main hall. The entrance to such an explication wing would also serve as an exit so that a visitor could not help but pass through, and hopefully come to an understanding of, the entire systems theme. The various wings would be partitioned off so that one could not skip the interdependent aspects illustrated in the main hall but would be able to look across from one wing to the next and grasp their general interdependence (Figure 1).

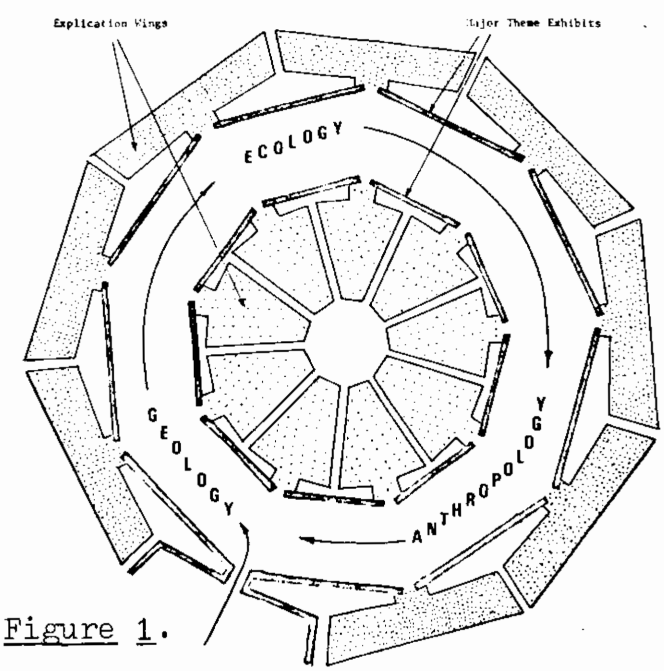

Figure 1.

SYSTEMS INTERPRETIVE CENTER
schematic floor plan

A model of such an interpretive center is as follows. The first component which one would have to enter would be geology/geography in which the formation of rocks, minerals, soils, and geographic features are illustrated. This component would be bridged to an ecology/environment component by various factors such as climate and soil limitations on vegetation and how some vegetational associations prepare soils for subsequent habitats in an ecological succession. The ecology/environment component would stress that species are often specialized and have habitat preferences and are most often not randomly distributed across the landscape. Each habitat, each forest type, is a system with a set of components within itself; and the whole serves as a component within a larger ecosystem. In each habitat is a complex interdependence between herbivores and flora and between carnivores and prey. Man's cultural exploitation of various food resources in these food chains would serve as the bridging link to man and cultural behavior. Such information on subsistence would necessitate illustrations of technology utilized to extract foods and process various natural resources. The technology and resources would, in turn, serve to demonstrate aspects of social behavior such as hunting patterns and the permanence of settlements in relation to food resources. Social aspects, technology, and ethnographic analogy would aid in illustrating possible ideological or world view perspectives, the final component. It is after all the world view of a people which defines how they understand their universe, how they value it, and how they exploit it--points which would be illustrated in the geography, ecology, and culture components divided into technology, sociology, and ideology. The ultimate purpose then would be to demonstrate the interrelatedness of culture and the environment and would, in effect, appear as a "benzene ring" of exhibits with no beginning and no end.

It would seem that such an exhibit arrangement, like the traditional museum approach, would work best when illustrating a single cultural manifestation at a particular point in the past. Unlike the traditional museum structure, a Systems Interpretive Center would provide facilities to illustrate and define two or more conceptual schemes simultaneously. The inside ring of exhibits would serve to illustrate an alternative viable ecological-cultural system. This inner circle could define our own contemporary cultural activities within the same environment, or it could center upon land use patterns during an earlier stage in our national development. It could also illustrate a temporally different aboriginal culture occupying the same region or even a cultural manifestation similar to the major theme exhibited in the large outer ring of exhibits but in a different region or different environment. Human population adaptation of mountain environments and population expansion appear closely parallel, as illustrated in the Great Smoky Mountain National Park interpretive center which deals with white pioneer groups and as discussed by Zubrow (1972) for prehistoric groups in the Hay Hollow Valley in the Southwest.

These two examples appear to be ideal for a cross-cultural and cross-ecological comparison of human behavior through a Systems Interpretive Center format.

A systems interpretive center may also be modified to fit the particular theme of a public facility. That theme--be it geology, ecology or culture, or a combination of several of these systems--may be greatly expanded upon in the explication exhibit halls. This could be done by employing a greater number of the explanatory wings than might be utilized in a generalized natural history approach. When a specific aspect is illustrated, the other factors might be downplayed by excluding the additional wings, but the major outline should remain intact. If the major goal of the museum is a specific aspect of culture, such as industry, the Systems Interpretive Center may serve as an introductory hall to the role of industry.

Systems Interpretive Centers and the Archaeologist

If such an approach to the development of historic and prehistoric sites would benefit the science of archaeology, what then should be the role of the archaeologist? Archaeology should continue and expand approaches to economic and social aspects of human behavior through archaeological deposits. The archaeologists should press for the application of the data and the interpretations of their work in areas of public recreation. The role of the archaeologist as a behavioral and ecological scientist must continue to develop and expand. Archaeologists must press for the application of their research in public use areas, through both archaeology and ecology, to demonstrate the continuity of the two fields.

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Social Dimensions of Dallas Burials

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Two years ago I began a long range project designed to study mortuary patterning in the Dallas archaeological culture of eastern Tennessee and northwest Georgia. Thanks to Alfred Guthe the excellent WPA-TVA files of the McClung Museum were opened to me; and these, along with data supplied by David Hally, provided me with 1284 burials from 19 sites as a data base.

This paper will deal with two phases of the research project. First, I will mention some of the findings of the artifact accompaniments analysis which was the first step in deriving a "social status" typology. Second, I will discuss the stature of these same burials in light of the status typology. This latter topic is dealt with more fully in a paper co-authored by myself and Pat Willey and should be in print soon.

First, let us consider the status typology. The term "status" commonly refers to the ascribed and achieved rights and duties accumulated by each individual in a society while alive. Saxe (1970) and Binford (1971) have shown that most societies <u>symbolize</u> the status of their members upon their death--that is, during the funerary proceedings, symbols of one's achievement and standing while an active member of the group are used in a commemorative manner. A knowledge of the mortuary symbols associated with an individual in a society will therefore give clues to his specific status in life. At the same time, a knowledge of the mortuary symbols associated with every member of the society will suggest a) patterns of status relative to other members, and b) general social principles operating in the society. Whether one views tangible mortuary symbols as <u>direct</u> evidence for particular status positions, such as the badges of office recognized by Larson in Mound C at Etowah (1971), or <u>indirectly</u> in a larger symbolic system, it is clear that mortuary accompaniments both qualitatively and quantitatively appear to be sensitive indicators of age, sex, and other social dimensions of status.

Chart 1 illustrates the artifactual indicators of the dimensions of age, sex, and intra-site location in the Dallas sample. Adult males, regardless of their location, are seen to be associated with pipes, celts, and various elements of a stone tool manufacturing tool kit. Females and subadults in the village areas are primarily associated with utilitarian ceramic vessels and shell artifacts.

No doubt all societies recognize age and sex specific statuses, and many of the artifact types catagorized in Chart 1 have just such a symbolic connotation. The important question is what aspects of status are being symbolized by the additional dimension of location, that is, burial in the mounds.

Chart 1. Dallas Mortuary Artifacts Showing Statistically Significant Correlations with Various Dimensions.

	Male	Female	Age	Location
Age	(All adult-male) Ceramic pipes Stone pipes Celts Triangular points Flint blades Cores and/or flakes Awls	(All adult-female) Scalloped disk gorgets Shell spoons	(All subadults, i.e. unsexable) Olivella beads Large columella beads Rattlesnake gorgets Conventionalized human gorget Other gorgets	(Subadults in Village) Pulverized shell Shell pendants Jars Effigy jars and bowls Small and medium columella beads (used as necklaces)
Location	(All adult-male in mound) Mica Red ocher Other minerals	empty	same as age/ location	Bottles (mound) Massive columella beads (mound) Conch shell vessel (mound) Turkey cock gorget (mound) Copper headdress (mound) Copper earspools (mound) Small and medium columella beads (mound) (used as leg and arm bands) Ceremonial celt (mound) Bone pins (mound) Bone beads (village)

To answer this question let us consider the nature of the artifacts themselves. These are listed in the bottom left and bottom right cells of the chart. Their most apparent feature is that they are all non-utilitarian. Negative painted and effigy bottles, copper ornaments, and objects made of imported shell were, no doubt, scarce items and required numerous man hours of specialized labor to produce. Their nearly exclusive association with the mound burials implies a social dimension which transcends those of age and sex alone and, as a result, shifts our attention away from egalitarian principles of social relationships. Could this added dimension imply instead principles of social ranking which according to Fried (1967) and Service (1962) connote a chiefdom level of socio-political integration?

To answer this let us consider three lines of evidence--first, the function of these artifacts.

The southeastern ethnohistoric literature of the 1500's and early 1600's contains numerous descriptions of ranked societies using these same artifact types in symbolic contexts. According to Swanton:

1) Small and medium shell bead bands were worn on the legs and arms of "chiefs and women of high rank" in Florida and similar artifacts were observed in Georgia (1946: 521).

2) Copper was said to have been worn in the ears and hair of "men and women of the upper classes" in North Carolina and Virginia (1946: 491).

The fact that both men and women were recognized as being of high rank suggests a degree of ascription or hereditary basis to status in these societies and a symbolizing of it with artifacts analogous to Dallas types.

Second, Saxe (1970) has demonstrated that high ranking hereditary groups which regulate the flow of restricted resources in a society also designate a restricted area for their exclusive use as a burial location. To the extent that this describes the Dallas economic system, as indeed it would if Dallas was structured as a chiefdom, then this would also explain the restricted distribution of high status items to mound burials.

Finally, Chart 1 shows that most of these artifacts are found with individuals of any age or sex as long as the burial is located in the mound. As a matter of fact, several infants in the mound sample were accompanied by copper headdresses, negative painted bottles, and hundreds of drilled pearl beads. It is highly improbable that these infants <u>achieved</u> their obviously high status in their short lifespans. Instead it is much more probable that the artifacts symbolize an <u>inherited</u> position which, by virtue of birth, entitled the corpse to a predetermined symbolic display.

I contend that these lines of evidence all point to the same conclusion--that many, if not all, of the Dallas sites studied were interwoven into one or more multivillage social units and structured according to principles referred to by Service as the "chiefdom level of socio-political integration."

The acceptance of this conclusion has some important consequences in that it allows us to exploit the rich ethnographic detail of the generalized chiefdom model. Similarly structured groups thus become a source for hypotheses concerning our next problem, stature and status in Dallas society.

Stature, as we know, is a product of both genetic and environmental factors. Differences in height may be caused by age, sex, and genetic composition as well as variations in diet and illness. In analyzing the Dallas burials I have corrected for the age variable by including only adults and for the sex variable by analyzing the two sexes separately. Only genetic make-up, nutrition, and illness need be considered as variables affecting stature.

The first step in the analysis was to deduce a set of testable hypotheses concerning the probable nature of the status-stature relationship from our general chiefdoms model.

Chart 2 lists the major and subsidiary hypotheses along with the test results.

The results of the completed tests provide us with some additional insights into Dallas social organization. Among males, stature and status are closely correlated. The mound burials tend to be consistently tall while considerable differences are seen within the villages. We can tentatively explain the overall pattern as a complex blend of ascribed and achieved statuses which in several ways resembles the kinship structure reported for ramage organized chiefdoms by Sahlins. A diagram of this structure is illustrated in Chart 3.

In such societies the chiefly ramage is recognized as theoretically higher in status than all others. This is based on the community-wide acknowledgement of Ramage 1's closer lineal descent from the "founding father" or mythical "culture hero." Individual A is the "chief" by virtue of his geneology while Individual X, his most distant relative, has the lowest status. In reality, however, heads of less important ramages (I and Q) may enjoy actual benefits of status even greater than some of the chief's close kinsmen.

If we conceive of Ramage 1 on the chart as the chiefly kin group (and thus the core of the mound burial population), then the heads of Ramages 2 and 3 would be those village burials with tall stature and high status artifacts.

Is there any independent evidence for this? I believe there is. High status village graves often contain rather unusual artifacts--unmodified or slightly modified animal bones such as deer skulls, bear and canine jaws, etc. Peebles (1971) has described the spatial dimension of similarly accompanied male burials at the Koger's Island site in northern Alabama referring to certain types of slightly modified animal bone artifacts as "local symbols." Their distribution throughout the Moundville area implies, as they do in the Dallas area, an association with individuals of particular local importance who are in intermediate status positions in the regional hierarchy. I would argue that ramage heads in most chiefdoms function with a similar status.

Yet another line of evidence is the location of these individuals. Very often their graves are immediately adjacent to the mounds. Given the evidence for a locational dimension to mortuary status presented earlier, spatial proximity in this case might well symbolize close social proximity to the chiefly descent group.

Finally, concerning females, we note a lack of congruence between status and stature. While several possibilities are open to testing, I suggest that the lack of patterning may be a result of the acceptance of the husband's status prerogatives after marriage whether high or low.

To conclude, let me repeat that the Dallas mortuary project is a continuing one. I hope to present further insights into the nature of Dallas social organization at subsequent meetings.

Chart 2. Hypotheses Concerning the Relationship Between Stature and Status in Dallas Society.

Hypothesis 1: Among adults the average stature should be greater for high status individuals as compared to low status individuals.

Test 1: F-test of artifactual status for males and females

Sex	Male			Female		
Artifact Status	High	Low	None	High	Low	None
Total Burials	26	49	42	8	36	50
Average Height	67.0	65.5	65.1	62.5	62.5	61.8

Males: $F = 6.640$, d.f. = 2 and 114, $P < .01$, significant
Females: $F = 2.059$, d.f. = 2 and 91, $P > .05$, not significant

Results: High status males are significantly taller.

Test 2: Behrens-Fisher t-test of locational status for males and females.

Sex	Male		Female	
Location	Mound	Village	Mound	Village
Total Burials	39	78	21	73
Average Height	66.4	65.3	62.7	62.0

Males: $t = 2.90$, d.f. = 100, $P < .01$, significant
Females: $t = 1.07$, d.f. = 80, $P > .05$, not significant

Results: High status males are significantly taller.
High status females are not significantly taller.

Sub-hypothesis 1a: This primarily due to a nutritional component. Low status individuals may not have achieved their full stature potential due to periodic nutritional stress during childhood. High status individuals were under less nutritional stress because of their closer relationship to the chief, the redistributor of both materials and food. (The stature of well nourished individuals would also be less affected by prolonged childhood illness.)

Results: untested

Proposed test: Significant difference in number of osteological stress indicators (Harris' Lines, dental hypoplasia) between high and low status groups.

Sub-hypothesis 1b: This is primarily due to a genetic component. The chief and his relatives come from a line of tall individuals. This tallness may have played a historically important role in the establishment of this as the chiefly kin group. That is, initially stature affected status rather than the other way around.

Results: untested

Proposed test: Osteological indicators of genetic distance between status groups without an accompanying difference in stress indicator.

Hypothesis 2. Within the dominant kin group nutritional advantages will lead to a full attainment of adult stature. This will result in a homogeneity in stature within the mound regardless of specific status.

Test 3: Comparison of artifactual status within the mound population.

	High	Low	None	
Male	66.6 (15)	66.2 (13)	65.5 (11)	range = 1.1
Female	63.2 (5)	62.3 (6)	62.6 (10)	range = 0.9

(number of burials in parentheses)

Results: Both males and females statures are homogeneous.

Hypothesis 3. Within the remainder of the population variation in status will covary with variations in stature.

Test 4: Comparison of artifactual status within the village population.

	High	Low	None	
Male	67.7 (11)	65.2 (36)	64.6 (31)	range = 3.1
Female	61.3 (3)	62.7 (30)	61.4 (40)	range = 1.4

Results: Both male and female statures are heterogeneous.

Sub-hypothesis 3a: Tallness results from the early attainment or hereditary assumption of stress alleviating roles.

Sub-hypothesis 3b: The attainment of high status roles is a result of tallness.

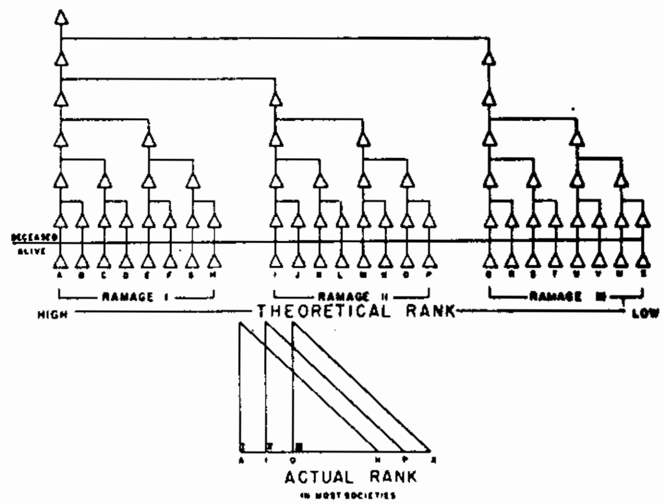

Chart 3 : Theoretical versus Actual Rank in Ramage Organized Chiefdoms
(after Sahlins, 1958: Figure 1)

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Excavations at Site 40RE124, A Late Woodland Burial Mound

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In spite of the great number of Late Woodland Hamilton focus burial mounds which have been excavated in East Tennessee, few attempts have been made to synthesize mortuary practices, construction techniques, temporal associations, and demographic information gleaned from these investigations. Numerous low, conical burial mounds, usually visible and easily accessible from the major rivers of East Tennessee, have stimulated the curiosity of professional and amateur archaeologicats since the nineteenth century. Reports by Cyrus Thomas (1894), C. B. Moore (1915), and M. R. Harrington (1922) initiated professional interest in the mounds. During the 1930's and 1940's, salvage archaeology of burial mounds was sponsored by the Tennessee Valley Authority in areas affected by the creation of the Norris, Chickamauga, and Watts Bar reservoirs (Webb 1938; Lewis and Kneberg 1946). More recent nuclear reactor projects have resulted in excavation of Hamilton focus mounds in Rhea and Roane counties. Yet several factors have hampered the thorough investigation and interpretation of this Late Woodland mortuary complex. Since the vast majority of mounds were excavated prior to the advent of radiocarbon dating methods, only the most recently excavated mounds--a total of five--have provided absolute dates (Schroedl 1973e). Furthermore, almost no Hamilton mounds remain intact for investigation, most having been damaged by erosion, plowed down by farmers, disturbed by earlier investigators, or vandalized by relic collectors. Thus, until recently, investigation of a Late Woodland mound in its original context has been virtually impossible.

Site 40RE124, located along the Clinch River in Roane County (Figure 1), is a unique exception. Too far from the bank to be noticed by earlier, river-going archaeological expeditions, the mound was not recorded until the survey of the Watts Bar Reservoir in 1941. In 1973, when construction of the Clinch River Breeder Reactor Plant was planned for the area in which 40RE124 is located, the site was tested for the first time (Schroedl 1973a). Although it was located in a formerly cultivated area, testing indicated that the mound itself was never plowed, nor had it been disturbed by relic collectors.[1]

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[1]Information presented here is of a summary nature and will be expanded in a subsequent report which is presently being prepared. The research represented here was made possible by the Project Management Corporation, Mr. Peter S. Van Nort, General Manager, and financed under TVA Contract TV39483A. Principal investigator and director for the Clinch River Breeder Reactor Plant archaeological program is Dr. Gerald F. Schroedl of the University of Tennessee. The author is particularly grateful to Dr. Schroedl for his help and suggestions throughout the preparation of this article.

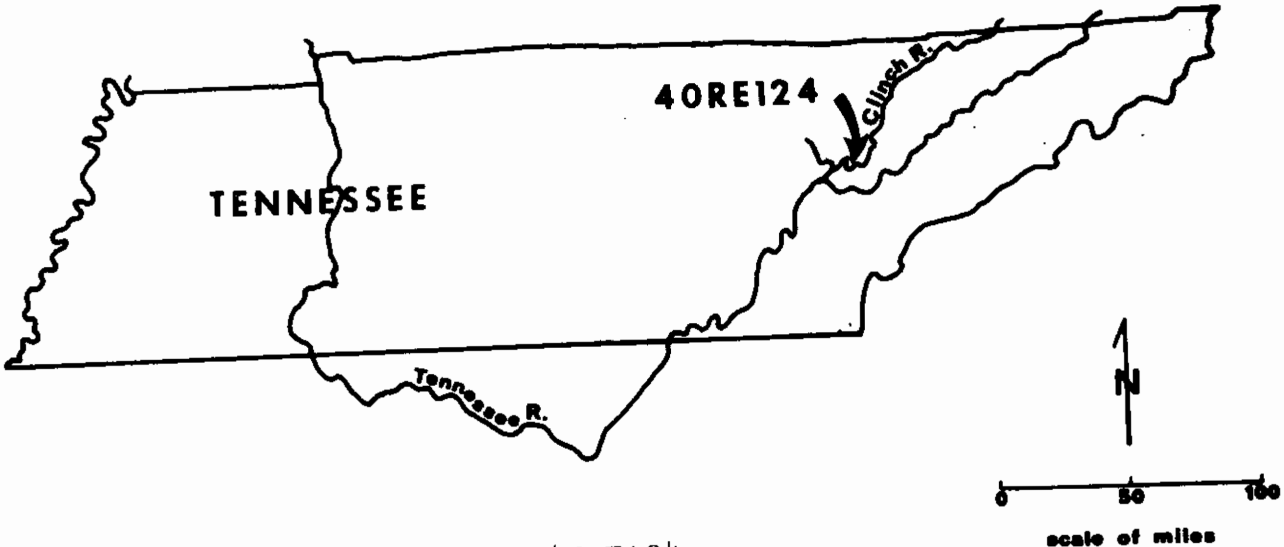

Figure 1. Location of Site 40RE124.

Site 40RE124 presented a unique opportunity for investigating mortuary practices, construction techniques, temporal associations, and demography; so the excavation strategy was designed to maximize recovery of this information (see Schroedl 1973b, 1973c, and 1973d). Entire quadrants were excavated simultaneously in 10 or 20 centimeter levels parallel to the mound surface, thus exposing at once all features and burials at a given level below the surface. This, as well as the maintenance of stratigraphic profiles crisscrossing the mound, aided in visualization of the aboriginal construction process. Also important in mound construction were limestone slabs and charred log features capping each construction stage. Measurement of the angle of inclination of the limestone slabs and charred logs indicated the contour of former mound slopes. also, charred log features yielded abundant charcoal for radiocarbon dating of all three construction stages. Finally, since preservation of bone was generally poor, in situ identification and measurement of individual bones provided considerable information about burial orientation and demography which would have been lost had such observations been delayed until lab analysis was possible. Considering the mound stratigraphy, occurrence of limestone slabs, charred log features, and burial placement, it is possible to determine mortuary practices and details of mound construction. Excavation indicated the presence of three distinct construction stages and revealed an Early Mississippian midden adjacent to the mound (Figure 2).

Construction Stage 1

Mound construction was begun with a single interment, a pit burial (Burial 28) covered with a low mound of highly organic fill. Two more individuals were laid upon the southeast edge of the mound and covered with additional moundfill, thus completing the first construction stage interments. Large limestone slabs (Feature 10) were placed on the first construction

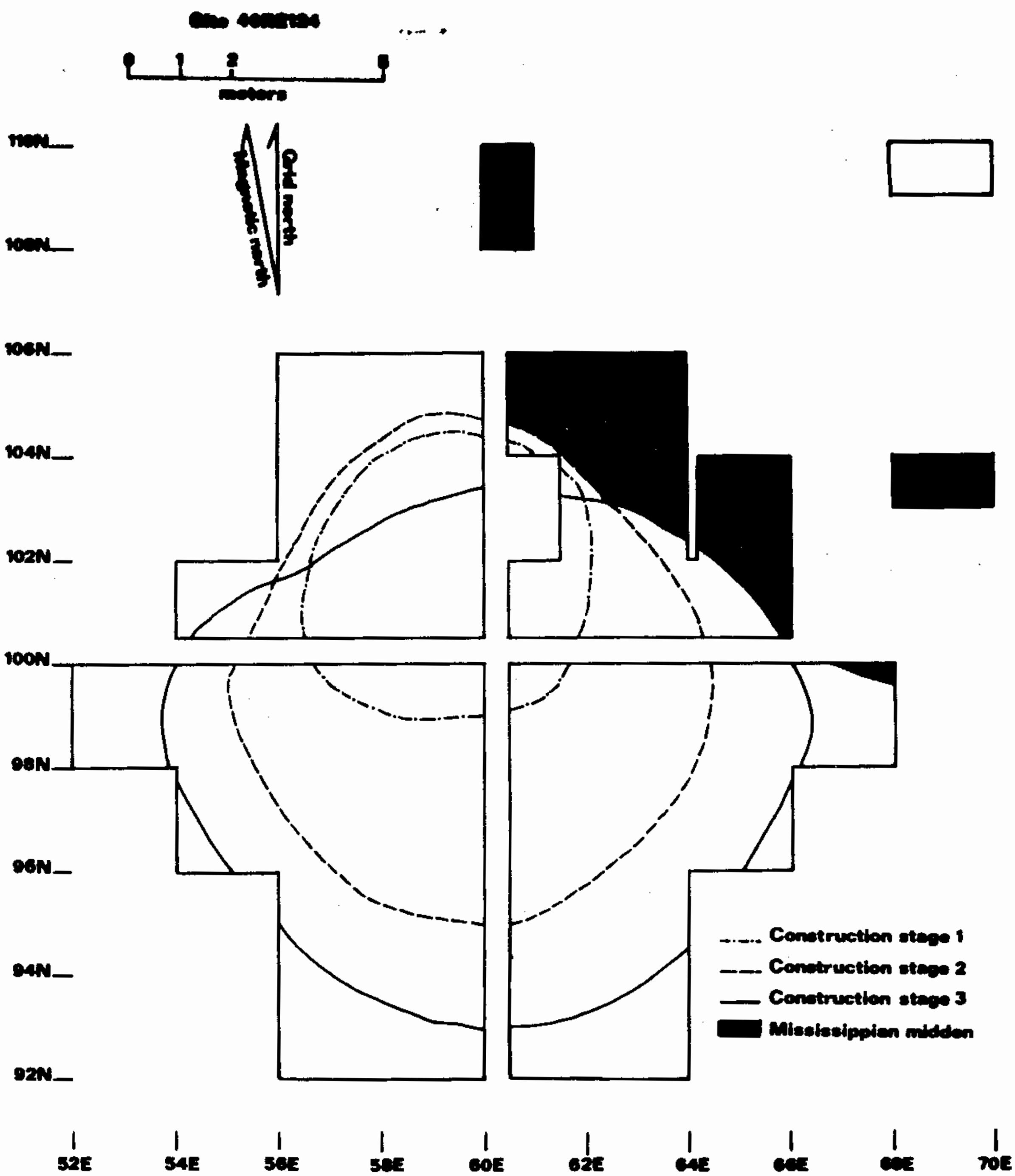

Figure 2. Plan View of Grid, Mound Construction Stages, and Adjacent Midden Deposits (after Schroedl 1974: 4).

stage, forming a ring on the mound slope and leaving an approximately 2 meter gap in the southeast portion of the circle. Available evidence suggests another such gap occurred opposite the first although the second gap is less evident due to disturbance of limestone slabs by construction stage 2 burials in the northwest quadrant. The central mound burial (Burial 28) is at the center point on a direct line between these two openings (Figure 3).

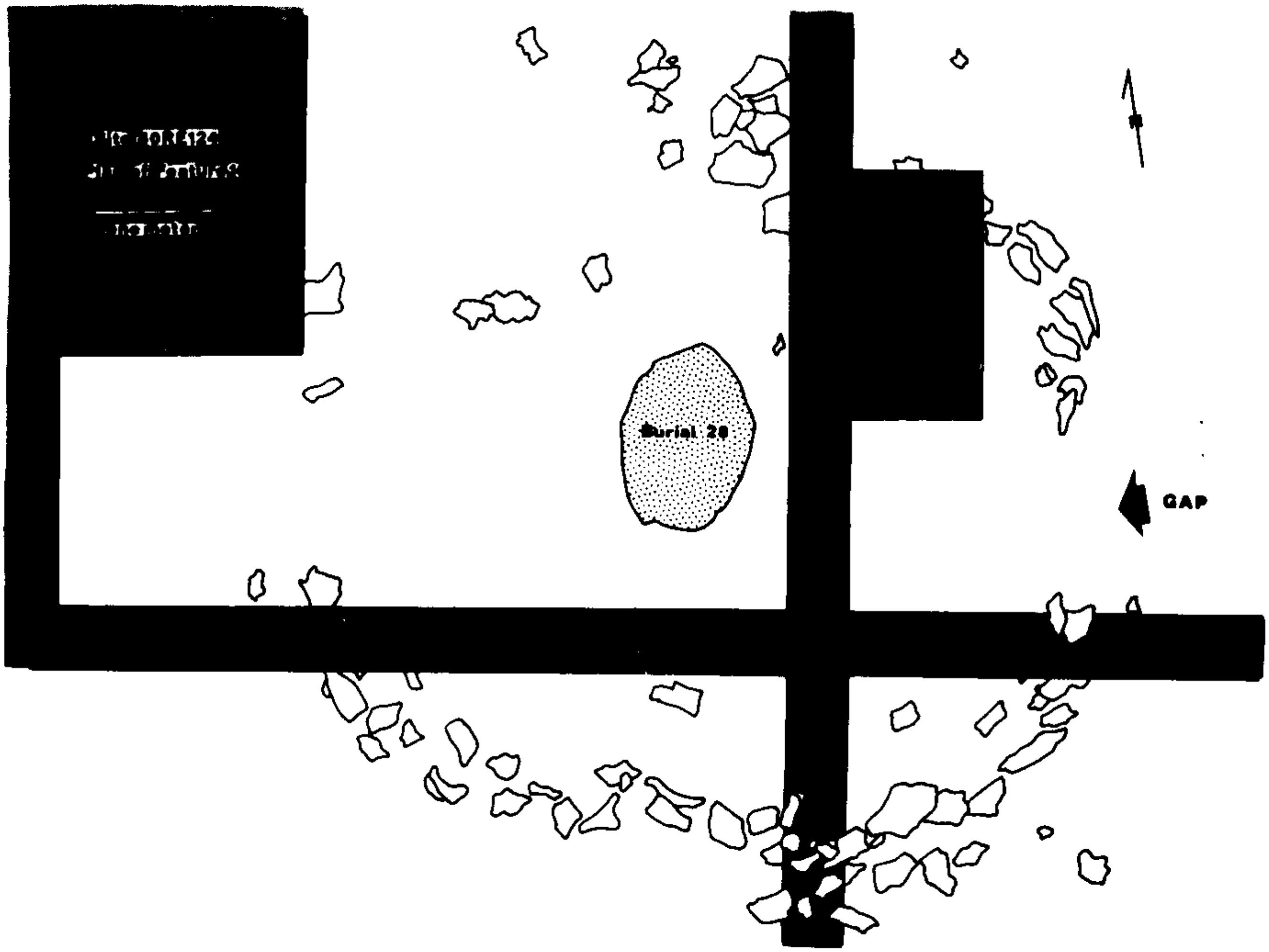

Figure 3. Distribution of Limestone Slabs (Feature 10) with Construction Stage 1 and Central Burial Pit (Burial 28).

All three individuals in this level were buried with grave goods. Two large preforms and a large vessel fragment impressed with both cord-marking and check-stamping were associated with the central burial pit. The second burial contained drilled conch columellae beads near the cranium, while the third included a ground greenstone gorget fragment. The relative abundance of grave goods in construction stage 1 is particularly noteworthy considering the overall scarcity of grave goods in the mound as a whole. There is a decrease in the percentage of burials with grave goods from the first to the third construction stages (Table 1).

Construction Stage	N	%
1	3	100%
2	5	38.5%
3	3	21.4%

Table 1. Number and Percentage of Burials with Associated Artifacts in Each Construction Stage

Construction Stage 2

When construction stage 2 was begun, placement of three of its burials disturbed the northwest portion of the first construction stage. However, the majority of the 15 burials included in the second construction stage were placed on the southern slope of the existing mound resulting in a shifting of the mound to the south (Figures 2 and 4). Grave goods are scarcer in this construction stage, consisting of a drilled conch columella bead near the cranium of one burial, a river mussel shell with a second burial, and a single triangular incurvate projectile point with each of three additional burials. Due to poor bone preservation, it was impossible to determine whether these points had been inflicted or not, although their positions in relation to the skeletons suggest infliction rather than simple placement with the burials.

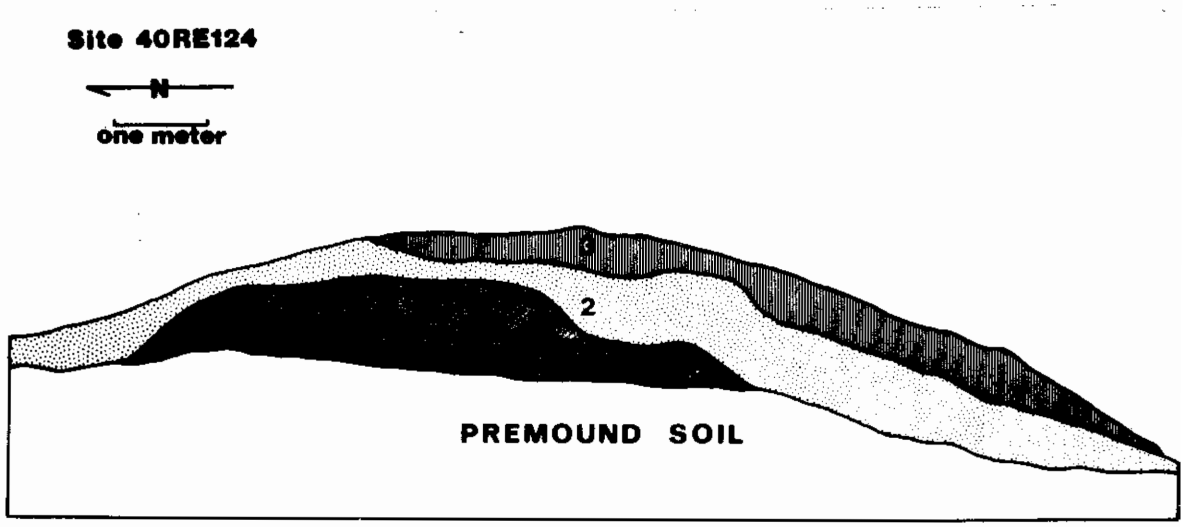

Figure 4. North-South Profile of the Mound Showing the Three Construction Stages.

Most of the burials were laid on the periphery of the existing mound rather than on top of it, thus forming a ring around construction stage 1. Eleven of thirteen burials were laid with their heads oriented clockwise while only two were oriented counterclockwise. Furthermore, burial of individuals with the head to the west was favored throughout mound

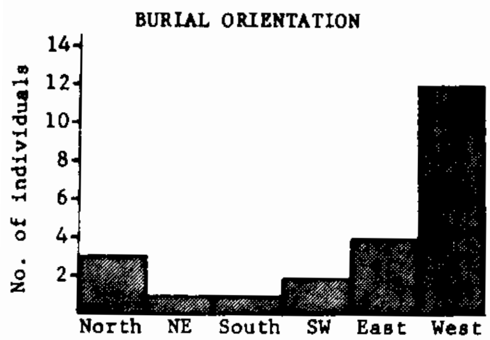

Figure 5.

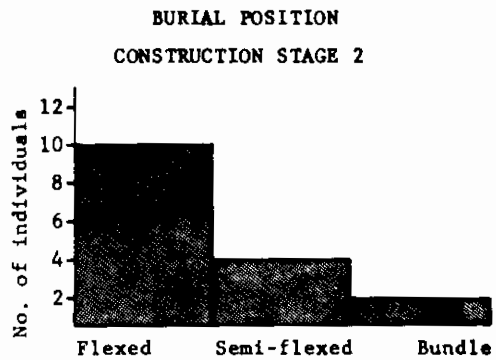

Figure 6.

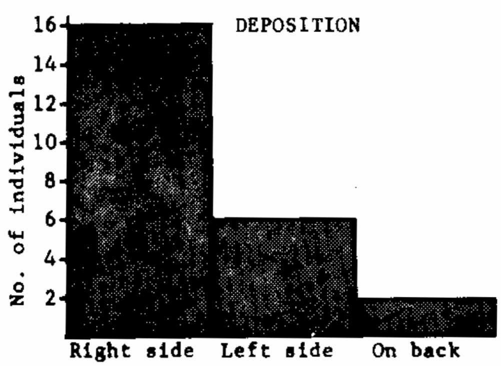

Figure 7.

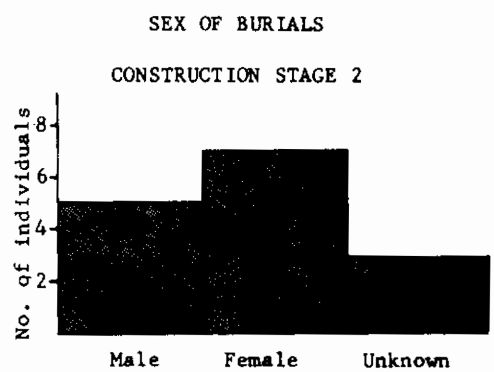

Figure 8.

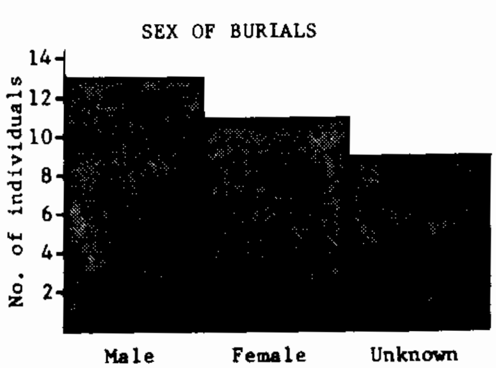

Figure 9.

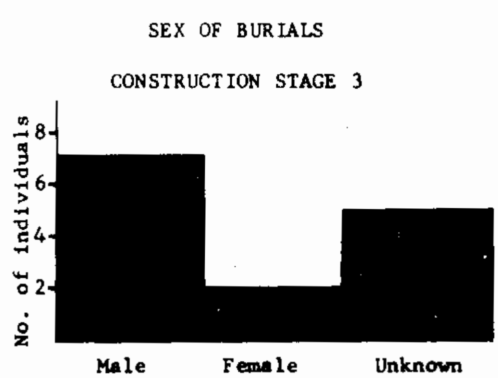

Figure 10.

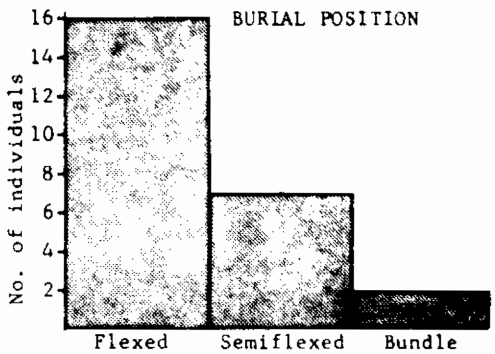

Figure 11. Position of Burials Included in All Three Construction Stages.

construction (Figure 5), and 75% of those buried with head to west occurred in construction stage 2. The only two bundle burials found in the entire mound occur in this construction stage and were both males. Otherwise, flexed burial position was favored, a style more popular here than in the other two stages (Figure 6). Individuals were usually laid on their right sides in construction stage 2, a characteristic common to all three stages (Figure 7). The number of determinable female burials exceeded the number of male burials slightly in construction stage 2 (Figure 8)though the site as a whole contained slightly more males than females (Figure 9.)

On this construction stage charred log features appeared in addition to scattered limestone slabs. The former consisted of large sections of charred logs or planks laid parallel to each other on the mound. Although sometimes associated with burials, the features do not form containers or covering for burials except in one possible case in which the partially charred skull of one individual was found beneath a log feature. The absence of ash and the slightly burned earth around these features suggests that the logs or planks were placed on the mound while smouldering and then extinguished with water or additional moundfill.

Construction Stage 3

The third and final construction stage continues the offsetting of the mound to the south (Figures 2 and 4). In fact, it does not even cover the northern edge of the previous construction stage. Grave goods were found with only three of 14 burials in this level, and the typical Hamilton artifacts--columellae beads and triangular points--are absent from this construction stage. Some river mussel shell were found near the cranium of one burial, and an assortment of Early Mississippian vessels including a hooded water bottle and a red-filmed bowl with a small bird effigy on its rim was found with a second burial. In a third burial, which was covered by a group of long, narrow limestone slabs laid parallel to each other across the skeleton, a single human rib not belonging to the interred individual was found near the knees.

Most of the burials in the third construction stage were oriented with the head to the west and were placed on their right sides as in construction stage 2. Yet construction stage 3 differs from the preceding one in burial position--semiflexed burials now equal the number of flexed burials, and there are no bundle burials. Also, males rather than females definitely predominate in the third construction stage (Figure 10), although sex of several individuals was indeterminable.

The charred log features used in capping the second construction stage were not utilized for the third although a few smaller charred log features on the periphery may have been used to stabilize the mound slope. Again limestone slabs were placed on the mound surface. Geologic investigation indicates that both the fossiliferous and non-fossiliferous limestone used throughout mound construction were probably brought from the ridges to the north of the mound (Schroedl 1974). Considering their size and abundance, considerable group effort must have been involved in their transpotation.

Radiocarbon dates from the McDonald and Leuty sites, which are less than 40 miles south of 40RE124, indicate a closer affiliation of Late Woodland and Early Mississippian cultural development than was previously suspected (Schroedl 1973e). Investigations at 40RE124 provide more information concerning Late Woodland-Early Mississippian transition because during excavation of the northeastern quadrant of the mound, an Early Mississippian midden was discovered adjacent to the mound slope (Figure 2). Its cultural affiliation is indicated by shell-tempered sherds found within it. No redeposited moundfill was found below the midden suggesting that it was deposited just after or during mound construction. The midden, along with the construction stage 3 burial containing Early Mississippian grave goods, suggests a close relationship between Late Woodland and Early Mississippian occupations at 40RE124. Further excavation of the midden is planned to obtain radiocarbon samples and additional cultural remains which will surely shed more light on this relationship.

Conclusion

Site 40RE124 consists of a central burial pit underlying three construction stages which are marked by changes in moundfill, limestone slabs, charred log features, and burial placement. Mound construction indicates considerable group effort on the part of its builders. Burials occur in all three stages with three in the first, 15 in the second, and 14 in the third. Most burials are single, articulated individuals laid on their sides in a flexed or semiflexed position (Figure 11) with the head to the west. Males predominate slightly over females although the number of indeterminates could swing the balance either way. Except for one 12-15 year old, all individuals are adults usually in their 20's and 30's. Six radiocarbon dates covering all three construction stages place the mound at roughly A.D. 700-1000, a temporal designation which coincides with the four previously radiocarbon-dated Late Woodland burial mounds (Schroedl 1973e). Furthermore, on the basis of mound construction technique, burial placement, and grave goods, 40RE124 fits previous descriptions of Hamilton burial mounds (Webb 1938; Lewis and Kneberg 1946; Griffin 1952: 201-206).

Because a complete burial pattern from an undisturbed context was recovered at 40RE124, analysis of these data will form the comparative base for synthesizing information from other Hamilton focus burial mounds in East Tennessee. Finally, the virtual absence of typical Hamilton artifacts in the third construction stage and the appearance of an Early Mississippian burial in the mound as well as an Early Mississippian midden adjacent to the mound indicate a close relationship between Late Woodland and Early Mississippian cultural development.

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Kincaid Environs Archaeology

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Survey[1]

During the summer of 1974, the Southern Illinois University Field School in Archaeology worked for the fifth season in the area surrounding the large platform mound center of Kincaid. As in previous seasons, the initial work was concentrated on site-location survey followed by the excavations at selected sites. Intensive survey of the Black Bottom proper of the Ohio River is now virtually complete--approaching nearly 70% of the total area of the Bottom proper, comprising some 49,000,000 square meters of a total area of slightly over 70,000,000 square meters. In addition, some 10,000,000 square meters have been surveyed in terrace and upland zones (Map 1). Most of the remaining unsurveyed areas are either in swamp or timber, but recent clearing and drainage has ensured that those zones are adequately covered in the survey. While such a large sample may seem excessive, it was deemed necessary both in terms of understanding the structure of Mississippian society in the environs of a large site and in terms of obtaining as complete an inventory as possible in an area as yet relatively undisturbed by urban or rural "development." As our research program progresses, this unparalleled completeness should allow us to test hypotheses with a high degree of confidence. A further feature of our survey has been the recording of <u>all</u> find spots of aboriginal and historic debris. Our results from survey and excavation, when compared to earlier surveys of the same area and of other areas, suggest that the criteria for what constitutes a "site" have often been set too high.

Altogether some 116 sites have been recognized as Mississippian, but there are a large number of sites of indeterminate status (many of which are probably Archaic) as well as many sites of time periods ranging from Archaic to Late Woodland. Most of the Mississippian sites are very small in size--less than 0.25 hectares (0.6 acres), although these smaller sites often cluster in certain areas of the sort that traditionally are recorded as "sites." One of the more interesting results of the survey is to show that "large sites," even including Kincaid itself, are usually clusters of many smaller occupation areas. The smallest site size (barring find spots of one or two objects) is less than 0.01 hectare. It is certain that problems of visibility cause such sites to be underrepresented

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[1]This section was prepared by Jon Muller.

in the survey. These small locations of 100 to 1000 square meters, as shown by our excavations over the past years, generally consist of a single, or at most several, wall-trench houses with relatively little specialization of areas and show evidence of a broad range of subsistence activities. Sites from 1000 to 5000 square meters in area consist of no more than 15 or so structures and may show somewhat greater complexity in use of the various areas of the site. A large site such as Kincaid is made up of a number of smaller residential units. In the next phases of our research we hope to investigate the nature of the relationship of sites within site clusters, most especially with a view to testing certain auxiliary hypotheses about redistributive economic systems.

Kincaid, at least in terms of residential use, does not seem to be the largest cluster of occupation areas. The fortification at Kincaid encloses an area of roughly 60 to 70 hectares (depending on the interpretation of the aerial photographs as to the location of the palisade). Of this, present evidence indicates only about 4.5 hectares was intensively occupied (not including the mounds). There are at least two other clusters of similar size in the Black Bottom which have a total occupation area of 7 or 8 hectares per cluster (with average site size in these clusters of 0.4 to 0.6 hectares). On the other hand, only Kincaid has a surrounding fortification and substructure mounds. Nonetheless, mound construction certainly does not indicate a large resident population at the center itself and does not necessarily call for enormous numbers of people in any event. While such calculations are rightly subject to criticism, it may be informative to try to estimate the "cost" of mound construction in a specific case. Mound Mx^{o}9 (University of Chicago) at Kincaid has a volume of something like 3500 cubic meters. Assuming that an individual could excavate 2 cubic meters of fill a day and carry the same amount 100 meters, the construction of Mx^{o}9 would have involved some 1750 man days in its construction (of course, none of these mounds was actually erected in a single phase of construction). One hundred people could have erected the mound in something like 17 days then. Calculating a diet of 2000 calories per day per person, feeding such a crew on corn alone would require about 1275 kilograms or only about 50 bushels. Even supposing Mississippian corn yields to have been half that of modern varieties, this still is little more than the production of one acre--not a very high cost in either people or produce! When the construction of mounds by stages is taken into account, the investment required in time and numbers of people for the total mound construction at Kincaid simply does not have to be interpreted as evidence of high population and complex social organization. Although it is probable that Kincaid was a chiefdom, it is primarily the long-term duration of the system that seems to suggest this, for the construction of a typical mound does not seem to be out of reach even for "Big Man" type social systems (see Sahlins 1972).

Our earlier work in the Black Bottom had given us a good picture (Blakeman 1974) of the Mississippian floral diet, but poor bone preservation meant that we had little indication of faunal exploitation. Accordingly, work during the 1974 season was devoted to a small late Woodland and Mississippian site (IAS Mx-109) which had good preservation of bone and shell.

Faunal Analysis[2]

What follows should be interpreted as a preliminary analysis of the faunal material from two pits excavated at Mx-109. In addition, previously unreported material comes from the University of Chicago excavations at Mx^V-1A (Chart 1). The distribution of species shows that the Mississippians were engaged in the exploitation of both aquatic and terrestrial species.

PRELIMINARY FAUNAL REMAINS: Mx^V-1A and Mx-109

CHART 1

SPECIES	mx-109 No.	mx-109 %	mx-109 Min. No.	mx-109 Lbs	Mx^V-1A No.	Mx^V-1A %	Mx^V-1A Min. No.	Mx^V-1A Lbs
MAMMALS								
Deer	31	43.7	2	200	194	91.4	8	800
Squirrel	26	36.6	4	4	13	6.0	4	4
Raccoon	7	9.9	2	16	3	1.0	1	8
Muskrat	2	2.8	1	.5				
Gray Fox	2	2.8	1	1.0				
Domestic Dog					3	1.0	1	
Opossum	1	1.4	1	8				
Eastern Cottontail	1	1.4	1	.5	1	.3	1	.5
Woodchuck					1	.3	1	.5
Mouse	1	1.4	1					
TOTAL MAMMALS	71	100.0	13	230.5	215	100.0	16	813.0
BIRDS								
Wild Turkey					15	100.0	4	
TOTAL BIRD	5				15	100.0	4	
REPTILES								
Eastern Box Terrapin	57				14			
Painted Turtle	1							
Cootes Turtle					4			
Soft Shell Turtle					1			
TOTAL REPTILES	58				19			
FISH								
Drum	4				2			
Long Nosed Gar	3							
Channel Catfish	2							
Pearch	1							
TOTAL FISH	10				2			

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[2]This section was prepared primarily by Robert H. Lafferty, III.

The fish and aquatic reptiles would have been available in the stream to the north of the site or in Mud Creek located 400 m to the south as well as at the terrace edge in time of flood. Fifty-seven per cent of the animal remains analyzed were fish. Most of these have not been identified as to species and consist mainly of vertebrae and ribs recovered by flotation. It is expected that in the final analysis fish remains will be even more important as only about 5% of the flotation material from the two features has been processed. The relative scarcity of fish at Mx^{V}-1A can probably be attributed to the lack of flotation techniques in the 1930's as well as to poor preservation. The fish remains at Mx^{V}-1A consist of one large vertebra and two drum palate sections.

Mammal bones accounted for most of the species identified. The most numerous bones in the analysis were those of deer, squirrel, and raccoon. These species accounted for 90% of the identified mammal bone. In terms of the amount of meat represented by the minimum of 13 mammals in the feature, 200 estimated pounds was from deer. This amounts to over 88% of the mammal meat eaten. The addition of two raccoons and estimated four squirrel brings this total to 95% of the mammalian meat eaten.

The proportion of raccoon bone is not particularly outrageous at 9.5%, but the proportion of squirrel remains is at least 30% higher than any nearby site. A possible explanation for this is that the high proportion of squirrel was a by-product of collecting nuts and harvesting maize. By killing the squirrels the Indians were not only supplementing their diet but were reducing competition for nuts and corn by another species. Deer also exploit maize where it is available (Martin et al. 1961) and could also have been taken as a by-product of defense of other food resources. The presence of nuts and maize in the features indicates that these were being exploited at Mx-109. The testing of this hypothesis depends upon the determination of the seasonal use of the site and can probably be tested by measuring the covariation of nuts and/or corn with squirrel remains. It would be consistent to suggest that the high proportion of squirrel remains indicates that this site was occupied at least in the summer and fall, as the farmer/collector would be protecting his crops or collecting nuts at these times. This would have placed him in direct competition in the same location with the squirrels, thus maximizing the chance of kill. Confirmation of this will have to await microscopic examination of the cementine-dentine interface of teeth which is now in progress.

Unsurprisingly, the most important single item of animal remains in the Mississippian components of Mx-109 and Mx^{V}-1A was the white-tailed deer. In terms of estimated meat from all mammals this was over 88% at Mx-109 and 98% at Mx^{V}-1A. It was thought that if the Mississippian settlement in the Black Bottoms was hierarchically structured in terms of economic central places with a sustaining area, then the deer should have been one of the items involved in sustaining the population of the center, Kincaid, either through trade or by bringing selected cuts of meat to the main site seasonally. In order to test this hypothesis it was decided to test for statistical significance of the different deer bones found at each site against the proportion of bones naturally found in a deer.

It was assumed that deer bones are large enough that those which were identifiable were preserved in the excavations of Mx^v-1A and that most of the identifiable bones were noticed and collected in proportions such that the sample was not biased. Preservation differences were assumed to be minor. A vector was then created based on the number of different bones in a deer--thus skull = 1; humerus = 2; femur = 3, etc. The minimum number of each bone element was counted for each site and used for the predictor vectors. A fourth vector was generated by summing the two vectors.

In carrying out the test of the hypothesis it was further assumed that if the sustaining area was producing deer meat to support the center, then there would be differences in the remains of deer found at the sites, as the deer was probably butchered and processed in the fieldwith only certain cuts being preserved and transported back to the main site. If this is so and the distributions of bone at the two sites are mutually exclusive, then the sum of the two vectors from each site should produce a higher correlation coefficient and R^2 value with the natural vector than should either of the two separately. Furthermore, the correlation coefficient between the two sites should be negative indicating the degree of mutual exclusion of bone elements found at the site.

The resulting correlation matrix (Chart 2) indicates that, given the above assumptions, only a part of the variation is accounted for. At Mx^v-1A it was found that the R^2 value for the vector was .0821 with the natural vector. This means that the bones of deer which were brounght onto the site were not representative of the whole deer skeleton and that selection was being exercised in terms of what cuts of meat were being brought onto the site. The bones which were in greater abundance than the expected consisted of humeri, scapulae, femora, and tibiae, while those which were underrepresented were ribs and to a lesser extent vertebrae. The bones showing greatest over-representation were precisely those from parts of the deer which have the greatest amount of meat.

CHART 2

Correlations and R^2 of parts of Ondocoileus virginianus

	Natural Vec.	MX^v-1A	Mx-109	Mx^v-1A+MX-109
Natural Vector	1.0000	0.0821	0.4624	.4417
Mx^v-1A	0.2866	1.0000	0.1057	
Mx-109	0.6800	-0.3251	1.0000	
Mx^v1A+Mx-109	0.6646	0.2047	0.2047	1.0000

At Mx-109 it was found that the R^2 value was .4624, and the correlation coefficient with the natural vector was .6800. The bones in greater abundance were again femora, humeri, and tibiae with the noticeable addition of skull parts. Ribs were about at expected levels while vertebrae were not found at all. The phalanges were underrepresented at both sites.

The combined vector produced a correlation coefficient with the natural vector of .6646 and an R^2 value of .4417. While both of these values are lower than those for Mx-109, they are much greater than Mx^v-1A indicating that the selection of deer parts at the main Kincaid site was greater than at Mx-109. The correlation coefficient of the vectors Mx-109 with Mx^v-1A was a -.3251 which was predicted in the model being tested. The area of mutual exclusion is in the ribs and vertebrae, while humeri, femora, and scapulae produced higher than expected counts in the combined vector. It appears that cuts of meat with femora, scapulae, and humeri were being selected for. This not unreasonably suggests that some butchering was being carried out at the kill site before being brought into the "farmstead" for further processing. If this is the case, then in order to get a higher R^2 value it will require finding kill sites to provide an additional vector including the bones which presumably were left there.

While the validity of this conclusion naturally depends upon the validity of the basic assumptions, particularly in relation to the representative adequacy of both collections, it does suggest that faunal remains can have some utility in testing hypotheses about differential and perhaps even redistributive distribution.

This preliminary analysis of the fauna from two sites in the Black Bottoms indicates that the species exploited were similar to those used at other Mississippian sites such as the Angel site. The fewer number of species can be related to sample size, the restricted recovery techniques used in the excavation of Mx^v-1A, and the incomplete analysis of the material from Mx-109. The high number of squirrel remains suggest, at minimum, a summer-fall occupation at Mx-109. A statistical analysis of the deer remains suggests that the sites in the Black Bottoms were ordered hierarchically with food from the sustaining area being selectively carried to at least one part of the Kincaid site. I do not suggest that the deer at Mx-109 were the same as those at Mx^v-1A or that the two sites were directly linked, but rather that there were different areas for processing dead deer and that the different elements were consumed, used, and/or discarded at different places. The more highly selected meat cuts at Mx^v-1A may suggest that the best cuts were being carried back to the main site while the poorer cuts were either consumed near where they were taken or were discarded in the field as not worth the transportation cost to the site.

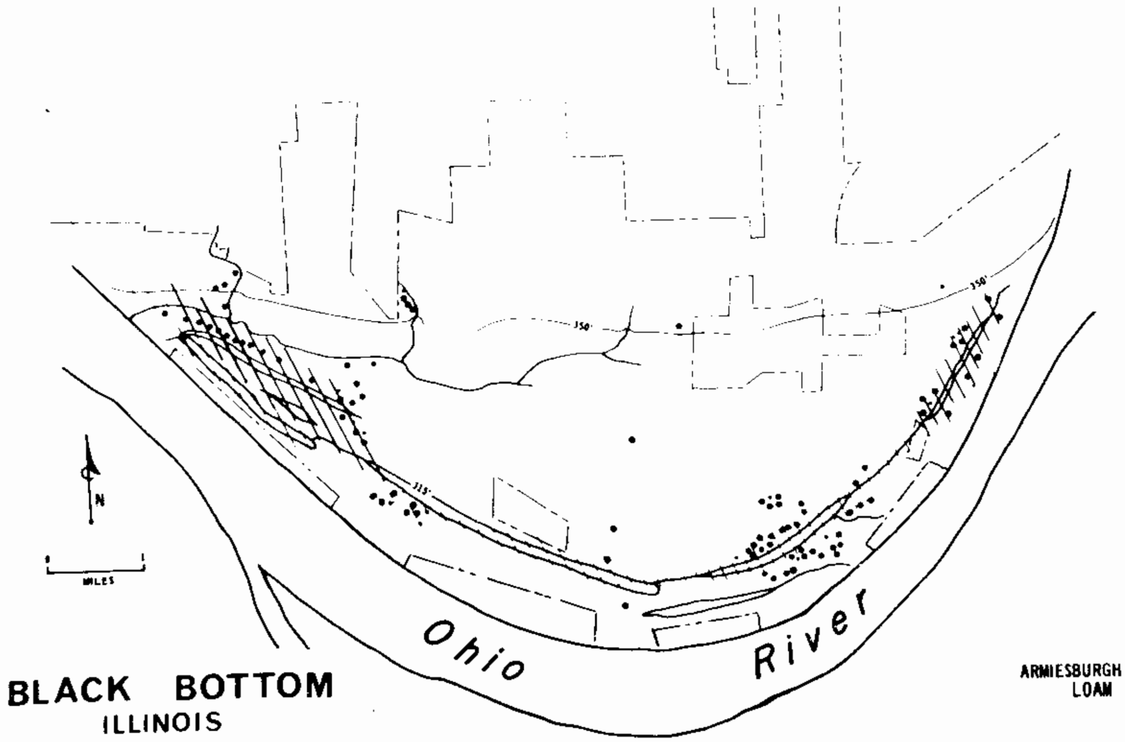
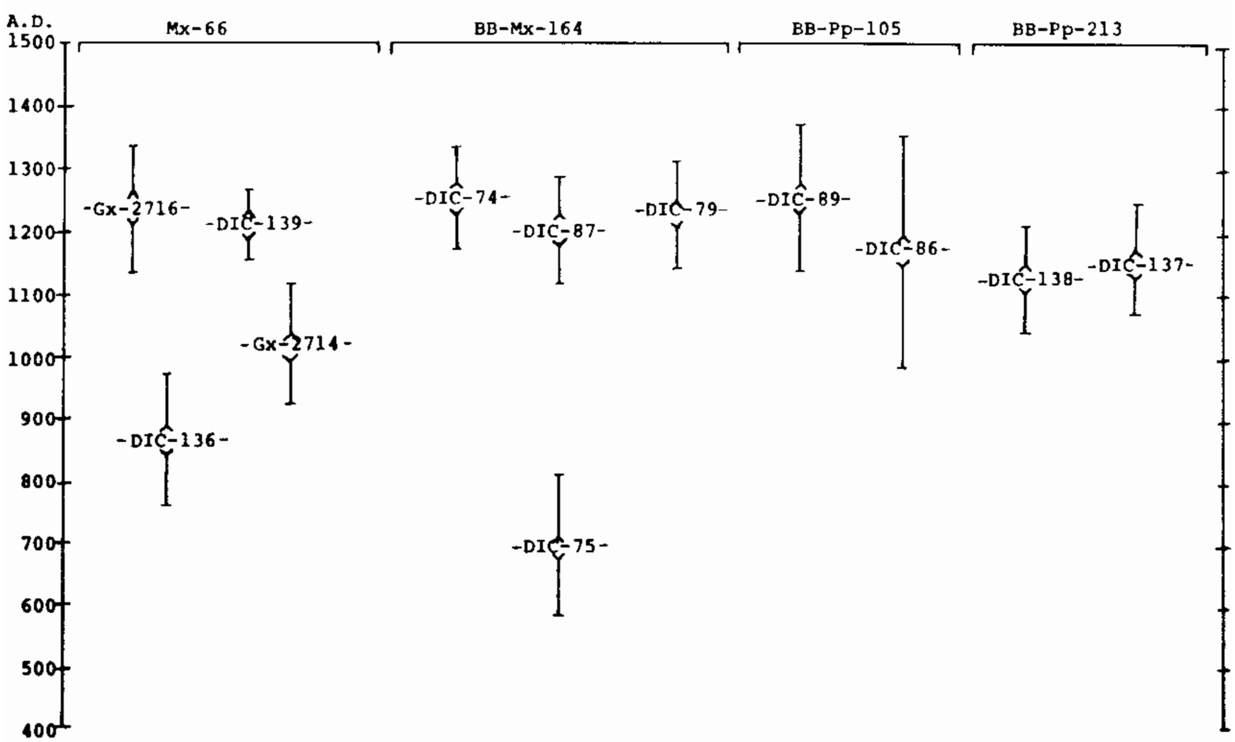


Chart 3. Radiocarbon Dates from the Kincaid Environs (UA tree-ring corrections)



Radiocarbon Dates[3]

The radiocarbon dates obtained so far suggest relative contemporaneity of the four sites on the chart (Chart 3) during the twelfth and thirteenth centuries A.D. and provide some support for hypotheses about hierarchical Mississippian settlement in the Black Bottom. To summarize briefly, Mx-66 appears to be a medium-sized farming hamlet in the bottomlands. BB-Pp-105 is a single-structure "farmstead" which is also in the bottomlands. BB-Pp-164 is also a "farmstead" but in this case situated on the terrace. BB-Mx-213 was initially hoped to be a "fieldhouse" judging from the surface collections but turned out to be a deeply buried western extension of the Kincaid site itself. No dates are available for IAS-Mx-109 which is also located on the terrace.

Of the four radiocarbon dates shown from Mx-66--the two earliest ones, DIC-136 and Gx-2714--are felt to be too early in light of stratigraphic evidence. They are presented here, nevertheless, for the record. DIC-75, from BB-Mx-164, was also felt to be too early. In this case the sample was treated for coal contamination and rerun producing DIC-87, a very reasonable date.

Two of our radiocarbon dates are not shown here. One was from a Mississippian feature at Mx-66 but was some 2500 years too old. The other was from a non-Mississippian stratum at BB-Pp-105 dated to the ninth century B.C. Unfortunately, there were no diagnostic artifacts found in this level. In several cases, as stated before, treatment for coal contamination was necessary. Not only have microscopic pieces of coal been seen in flotation samples, but there is also some evidence that coal may have been used as a possible source of fuel during Mississippian times as has been suggested by Phil C. Weigand and Jon Muller.

Botanical Information[4]

Chart 4 summarizes the preliminary results of our floral analysis to date. Presence or absence are given here rather than absolute counts for two reasons. First, in some cases the nature of the samples discourages quantitative site-to-site comparisons. It can be said with assurance though that maize and various nuts are predominant in all cases. In the case of Mx-109, analysis has only recently begun. For this reason one should draw no conclusions from this chart concerning the significance of the absence of any particular species from this site. It is expected that ultimately the range of species found at Mx-109 will be comparable to the range at Mx-66 or BB-Mx-164.

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[3]This section was prepared primarily by James L. Rudolph.

[4]Chart 4 is primarily based on the work of Crawford H. Blakeman. The preliminary analysis of material from Mx-109 was carried out by James L. Rudolph.

CHART 4

CHARRED BOTANICAL REMAINS FROM THE BLACK BOTTOM, ILLINOIS

	Mx-66	BB-Pp-105	BB-Mx-164	BB-Mx-213	Mx-109
Acalypha sp.			X		
Acalypha ostryaefolia (copperleaf)	X				
Amaranthus sp. (amaranth)			X		
Ambrosia sp.	X				
Ambrosia artemisiifolla (common ragweed)			X		
Carya sp. (hickory, excluding pecan)	X	X	X	X	?
Carya Illinoensis (pecan)	X		X	X	
Chenopodium sp.	X	X	X	X	?
Chenopodium album (goosefoot)	X		X		
Crataegus sp. (hawthorn)	X		X	X	
Desmodium sp. (beggar's-lice)	X				
Diodia teres (rough buttonweed)			?		
Diospyros virginiana (persimmon)	X			X	X
Euphorbia corollata (spurge)					?
Galium sp. (bedstraw)	X	X	X	X	
Gleditsla triacanthos (honeylocust)	X				
GRAMINEAE (grass family, excluding maize)	X				
Iva cillata (marsh-elder)	X				
Juglans nigra (black walnut)	X	X	X		X
LEGUMINOSEAE (pea family)	X				
Phaseolus vulgaris (common cultuvated bean)	X				
Phytolacca americana (pokeweed)	X				
Polygonum sp.	X	X	X	X	
Polygonum pennsylvanicum (smartweed)	X				
Potamogeton sp. (pondweed)		?			

BOTANICAL REMAINS (CONT.)

	Mx-66	BB-Pp-105	BB-Mx-164	BB-Mx-213	Mx-109
Prunus sp.	X				
Prunus americana (American plum)	X				
Prunus serotina (black cherry)	X		X		
Pyrus sp. (crabapple)			?		
Quercus sp. (acorn)	X	X	X		?
Rhus sp. (sumac)	X				
Slsyrinchium sp. (blue-eyed grass)	?				
Strophostyles sp.	X				
Strophostyles helvola (wild bean)	X				
Viburnum sp. (arrow-wood)	?				
VITACEAE (grape family)	X				X
Zea Mays (maize)	X	X	X	X	X

Partially adapted from:

Blakeman 1974
Some of the seeds were identified by Richard Ford of the University of Michigan Museum of Anthropology.

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Consideration of Mississippian Settlement Spatial and Environmental Relationships

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Recent archaeological activities in southeast Missouri have collected varied information on the Mississippian and Woodland traditions of the area. Mississippian settlement systems are currently being investigated in the Western Lowlands by the Powers Phase Project and in the Eastern Lowlands by projects centering on the Lilborn (23NM38) and Towosahgy (23MI2) sites. Funding for these projects has been received from the National Endowment for the Humanities (Grant RO 7728-73-198), the National Science Foundation (Grant GS 1352), and the Missouri State Park Board. Cooperating academic institutions include the University of Missouri-Columbia and the University of Michigan. This paper is but a brief comment on some of the results of this fieldwork.

It has long been recognized that man tends to organize his settlements and distribute these communities over space in such a manner as to safely maximize access to the social and natural environments (Doxiadis 1970). Such a distribution allows for efficient exploitation of these environments and has been referred to as a minimax strategy (Plog and Hill 1971). It is my contention that the location of an individual site or settlement (Chang 1966) is determined by a finite number of social and environmental factors. Neither aspect is the combination of simple factors, nor may they be viewed as mutually exclusive. However, the social factors are the more complex and variable and therefore more difficult to analyze from the archaeological record. Likewise, it may well be necessary to understand many or all of the natural factors before any realistic understanding of the social factors may be accomplished. Important to the environmental aspects are factors such as climate, topography, resource productivity, as well as the social factor of the exploitative strategies of the archaeological culture. In our southeast Missouri work, these factors have been operationalized in the research universe in terms of the relationships between site location and 1) elevation and landform, 2) soil associations, and 3) ecotones and biotic communities.

In the Eastern Lowlands research area of southern Mississippi and New Madrid counties, Missouri, the physical relief is minimal. Elevations rarely reach 300 feet above sea level, and over 50 per cent of the area is under 295 feet. As Lewis (1974) has demonstrated, a principal strategy employed by Mississippian peoples was to locate permanent settlements on landforms and at elevations infrequently inundated. Such an elevation in the Eastern Lowlands is between 295 and 300 feet. All mound centers in the research area are in fact at or more than 300 feet in elevation; and, of the known smaller sites, only two are below 295 feet (both at approximately 293, but both have also been land leveled). With respect to the landforms created by these elevations, all Mississippi mound centers and town, village, or hamlet sites (Cottier 1974) are located adjacent to the ridge margin. This basic distribution was initially displayed on a map showing the locations of sites on Sikeston Ridge made in 1878 (Potter 1880). In the area of the Western Lowlands identified with the Powers Phase, Price (1974) has recognized that the major Mississippi Period settlements are located above 300 feet in elevation and either at the ends of ridges or along ridge margins.

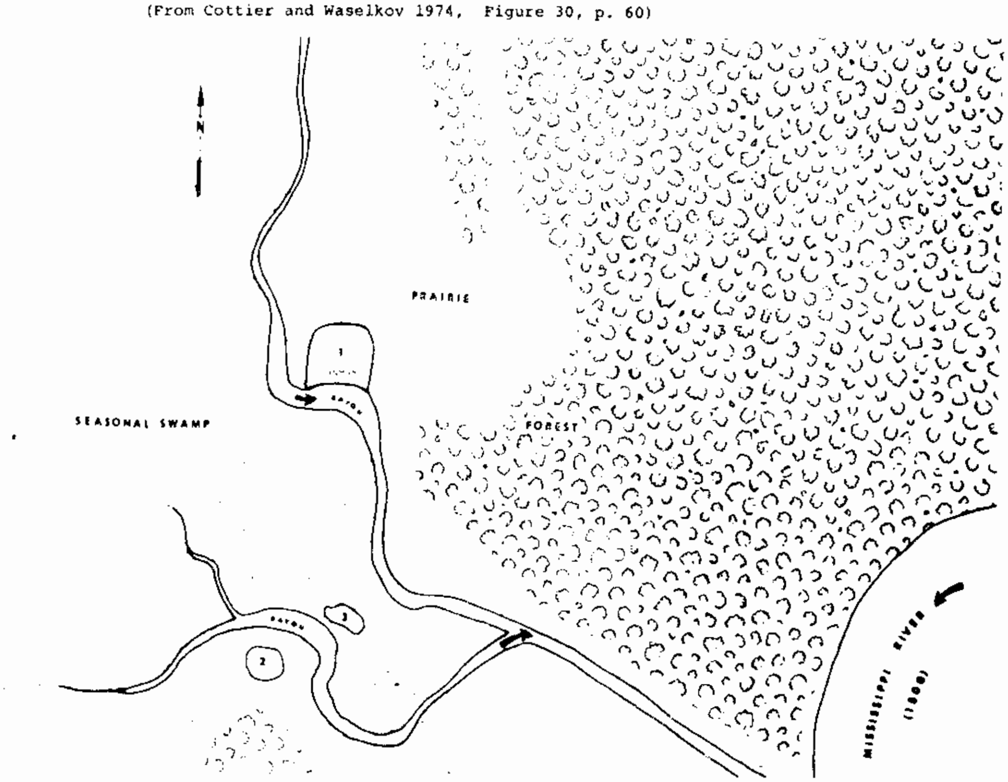
Correlations between some Mississippian site locations and soil types have previously been suggested for the Southeast by Larson (1970), Ward (1965), and others. To demonstrate site and soil association adequately on an area basis (beyond the general statement that individuals employing non-mechanical agricultural practices would exploit sandy loams) is, however, difficult without detailed soil maps. Unfortunately, only one Soil Conservation Service county soil survey has been published for the research area, and its lack of detail (due to its age) precludes it from being very useful. Detailed progressive mapping surveys have, however, been initiated in all southeast Missouri counties, and most of them should be published by 1990. Contact with the field soil scientists in each county has proved advantageous, and we are currently receiving soil distributional information as much as five years before it will appear in published form. The information for New Madrid County is presently available only in the form of advance soil sheets. The final correlations for these sheets was accomplished in September 1974. Three basic soil utilization classes in New Madrid County have been abstracted from this information. Based on their relative carrying capability, Class 1 soils are those which have few limitations to restrict their use. Class 2 soils are more sandy and might represent a possible hazard for non-mechanical agricultural practices during drought conditions or, conversely, be more ideal than Class 1 soils for utilization in periods of excessive rainfall. A third class includes all soils with limitations which restrict their use by all but modern agricultural practices which include primarily land draining but also extensive fertilization, use of modern agricultural machinery, etc.

In New Madrid County, six major soil associations have been determined. A soil association is defined as terrain with a distinctive proportional pattern of soils. A soil association will normally consist of one or more major soils and at least one minor soil. A general statement of the soil association might suggest the characteristics of the nature of the terrain and soils in that association. Two of the soils in Class 1 and one soil in Class 2 form soil association 4 in New Madrid County. These soils are Bosket, Broseley, and Dubbs. This association, in comparison with other soils and soil associations within the county, appears the most suitable for aboriginal practices. Distribution of this soil association in the research universe is largely concentrated on Sikeston, Barnes, and Sugar Tree ridges and in the Moorehouse Lowland. With respect to elevation, about 95 per cent of this association is found at elevations of 295 feet or more. Ninety per cent of the Class 1 soils in the research area, which also includes soils in other associations than association 4, are above elevations of 295 feet. With the majority (over 95 per cent) of known archaeological sites in the area at this same elevation, some correlation of soil association 4, or Class 1 and Class 2 soils with Mississippi site locations is expected. However, preliminary plotting of the soil and site information indicates a correlation with a high confidence level between Mississippi Period sites and Class 1 soils. There is also evidence that a similar correlation exists for sites of the Woodland Period LaPlant Phase (Phillips 1970).

Elevation and soil type affect the distribution of biotic communities. Despite the modern disruption of vegetation, reconstructions of previous plant communities can be made using early deeds and field notes of surveyors. These records vary in quality and coverage, but they do provide a major source of information on the late 18th and early 19th century landscape. Used with some caution (Bourdo 1956), these records may allow us to construct a map of the earlier major plant communities. Southeast Missouri is fortunate in having rather widespread survey coverage at a reasonably early date. A pre-1810 reconstruction of the distribution of three basic major plant communities in the vicinity of the Lilbourn site has been made from these records (Figure 1). These communities are a Sweetgum-Elm-Cypress seasonal swamp, an upland Hickory-Oak forest, and prairie. The specific nature of the prairie vegetation is

Figure 1: Distribution of major plant communities in the Lilbourn (23NM38) site area.

(From Cottier and Waselkov 1974, Figure 30, p. 60)



unknown, but a grassland community can be demonstrated by the development of Bosket fine sandy loam in its dark surface layer and the organic staining on peds in the subsoil. The development of a prairie in this part of Sikeston Ridge might be postulated as a natural succession to Mississippi Period agricultural fields and must be carefully evaluated.

It is apparent that the more we think we understand environmental factors in southeast Missouri, the more complex the interrelationship between these factors and the selection process of Mississippian settlement strategies appears. Factors other than those mentioned here were surely used in the selection process, and our comments on relationships between environmental factors and settlements presented here is certainly too simplistic. In retrospect, the original research designs for the archaeological projects which contributed to this paper were also informal and simple, but without them the present research could not have been organized. Only now are we able to identify with certainty some of the environmental factors which might have been relevant for settlement locations during the Mississippi Period. A better understanding of the environmental factors can be useful in predicting some site locations, and likewise site locational information can be used in demonstrating exploitative strategies which were more economical. In any Mississippi settlement model it will be necessary to not only describe the location of the larger sites, but also identify the other smaller sites within the settlement system. It is probable that the locations of some sites were patterned by different environmental or social factors than those stressed here. However, only with tests of associations between environmental factors and types of sites defined on a functional basis can the Mississippi Period settlement selection process be demonstrated. In other words, I recognize the dangers of what might be called a self-fulfilling prophecy survey which can develop with limited knowledge of environmental factors. Presently, however, with an improved understanding of these environmental factors, I feel one can state and test propositions which offer the potential for providing explanatory value to Mississippi Period settlement and community systems in a portion of the central Mississippi River Valley.

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Identification of Charcoal Fragments from Archaeological Sites

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The first step in identification of charred wood from archaeological sites is characterization of the prehistoric environment. It is an accepted principle of plant ecology that although man-made or natural disturbance of succession patterns may alter the speed of vegetation change, the same kind of climax forest will eventually reclaim the geographical area. In other words, the present-day vegetation of a region is the key to its prehistoric flora. Therefore, the archaeologist must make detailed vegetation lists as well as collections of dried and pressed plants from each site he excavates. These collections are utilized by the archaeological botanist in identification of plant remains from house structures and other features such as garbage or storage pits.

Because neither the archaeologist nor the botanist has any way of knowing the criteria used by prehistoric peoples for selecting firewood, it is usually not practical, in terms of cost and of time, to identify the charcoal from firepits.

The processes for preparing ancient charcoals and modern woods for identification are relatively simple and can be mastered by most laboratory technicians.

In order to embed the modern branches in paraffin wax so that they may be cut into slices 12-15μ in thickness, all of the water must be removed from each cell. This is achieved by soaking the branch in successive ethanol solutions of increasing strength and finally washing them in xylene which is a solvent for paraffin. The twig is then immersed in molten paraffin for 24 hours and finally placed into a mold filled with fresh molten wax which is allowed to cool and harden. This paraffin block is then cut on a sliding microtome, and the thin wood sections glued onto microscope slides and stained with hematoxylin and Bismarck brown. These dyes cause contrast between the plant cells by differentially coloring tissue types.

The ancient charcoal is treated in much the same way; however, the embedding medium must be harder than wax in order to support the fragile charred fragments. Therefore, a mixture of plastic resins commonly used in electron microscopy is utilized. Because the charcoal is already dry, a dehydration series of ethanols is not necessary. In this case, the air must be removed from the cells so that the embedding medium can fully penetrate every cell in the fragment. Each piece is pretreated by soaking it in three successive acetone baths under partial vacuum; it is then put into a liquid solution of the plastic resins for 72 hours. Finally blocks are formed by polymerizing the resin and charcoal in plastic molds. These blocks are cut in the same way as the paraffin blocks but at a thickness of only 6-8μ. No staining of these sections is necessary because of the definition of the charred cell walls.

Because each plant genus possesses a characteristic tissue pattern (similar to a fingerprint), the patterns of the charcoals may be compared with those of the modern branches to make an identification.

The charcoal presently under analysis is from Alabama Ta-1 which is located near the town of Childersburg. This site was excavated in 1948 by the Alabama Museum of Natural History under the direction of David DeJarnette. Although the site report was subsequently published by Florida State University as Notes in Anthropology 6, some of the ethnobotanical remains were not completely analyzed. This author has undertaken this task thanks to the generosity of Mr. DeJarnette, curator at Mound State Monument.

Ta-1 is located between the Tallaseehatchee and Talledega Creeks withing a quarter mile of the Coosa River. It is on the northernmost of a chain of low hills whcih parallels the river. At low elevations the bedrock is composed of limestone and shale, and the vegetation resembles that of the coastal plain where the following trees form the dominant upper story: loblolly, long-leaf, short-leaf, and spruce pines; sweetgum; willow, white, and water oaks; tulip poplar; red maple; elm; beech; and sycamore. At higher elevations there are chert and sandstone ridges upon which black-jack, post, and red oak; pignut hickory; and long-leaf pine are dominant. On the dry exposed slopes the association includes clovers, tick-trefoils, blue and yellow asters, and goldenrods.

"No evidence of the patterns of houses or of other structures was found at Childersburg. However, the many postholes did indicate the placing of posts in a vertical position for erection of structures of some sort."(DeJarnette and Hansen 1960) The charcoal awaiting identification came from four postholes ranging in size from 20-150 cm in depth and from 17.5-82.5 cm in diameter. At present only the charcoal from one feature, number 81, a posthole 20 cm deep and 17.5 cm in diameter, has been definitely identified; it has the characteristics of pine (*Pinus sp.*)

In conclusion, only through complete analysis of the plants used by prehistoric man, including those used in construction, can the archaeologist more completely examine man's relationship to his environment.

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Everyman's Magnetometer

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Introduction

The proton magnetometer is an instrument of great value to prehistoric archaeologists particularly in its ability to locate buried nonmetallic cultural features such as hearths, burned floors, trash pits, burials, etc. Moreover, it is highly sensitive to the presence of iron making it quite useful in detecting features at historic sites as well. While the magnetometer is by no means foolproof, it can greatly assist the archaeologist in locating those areas within a site which are most likely to produce useful data. Hence, it serves to help maximize the amount of relevant information recovered per unit of dirt moved. The advantages of such increased efficiency should be self-evident particularly at a time when archaeologists are commonly faced with the dilemma of having to accomplish specific research objectives within the constraints of very limited budgets and restricted field schedules.

In view of its wide capabilities, it is clear that the magnetometer has not been employed nearly as often as its utility would warrant particularly in areas such as the eastern United States. The reasons for this shortcoming have been manifold. For one thing, the prices of commercially available magnetometers have been prohibitive, generally in the range of $2000-$3000 and up. These commercial instruments offer a very high sensitivity coupled with a digital readout that allows the user to make a "magnetic map" of the site being investigated. The electronic complexity required to produce such an accurate quantitative output is considerable, hence the high price of the instruments. Much recent literature has dwelt on the use of these digital devices and on the formulation of highly sophisticated techniques (usually involving computer analysis) by which magnetic survey data can be more accurately interpreted (e.g., Linington 1970 and Scollar 1970). Such developments have certainly provided us with some powerful research tools, but these are tools which few archaeologists can afford, not only in terms of equipment cost, but also in technical expertise.

It is unfortunate that the recent literature's preoccupation with expensive hardware has tended to obscure the fact that a much simpler device--the differential proton magnetometer (or proton gradiometer, as it is sometimes called)--is adequate in most applications. The unit's simplicity and very low cost are achieved by making the output non-quantitative--it detects archaeological features by means of a qualitative change in the tone of an audio signal which is monitored by the operator on a set of headphones. The device is light in weight, fully portable, and can easily be operated by a single individual. It is a bit less sensitive than its highly sophisticated cousins and cannot be used to accurately map the configuration of buried features. It can, however, locate such features just as effectively as its more expensive counterparts and can cover a given area of ground much more rapidly.

Differential proton magnetometers like the one described above are not available commercially, yet it is not difficult to build one at a materials cost of less than $70. The rest of this paper will be devoted to a description of how to construct and operate such a device, which has been tested in a field situation and shown to be reliable and highly effective. In making available these plans, it is our hope that more of our colleagues will now find it within their means to acquire this useful instrument and apply it in their research.

Basic Principles

Before we embark upon the presentation of our instrument's design, it is appropriate that the reader become acquainted with the basic principles by which the differential proton magnetometer operates. The discussion here will be deliberately brief and non-technical. A more comprehensive treatment of the subject can be found elsewhere (Aitken 1961: 7-59).

Magnetic anomalies. Essentially, the differential magnetometer is a device that reacts to minute changes in the earth's magnetic field. Its effectiveness as a detector stems from the fact that certain types of buried remains can, in their immediate vicinity, slightly affect the intensity of the earth's field. These small, localized variations in intensity are called magnetic anomalies. Anomalies strong enough to be picked up by the differential magnetometer are usually caused by one or more of the following kinds of cultural remains:

I) Iron or other ferrous metals.

II) Burned features such as hearths, houses, kilns, etc.; also concentrations of ash, daub, or other baked clay objects.

III) Features which are characterized by midden soil intruding into a matrix of lesser organic content, or vice versa. Specifically, these can take the form of midden-filled pits or wall trenches, or in the opposite situation, accumulations of sterile earth or stone imbedded in a deposit of midden (e.g., walls or foundations).

Of all these categories, the magnetometer is by far the most sensitive to iron. A barbed wire fence, for example, can easily be picked up from as much as five feet away. At the same time, it is important to realize that the instrument is very selective in this respect: the magnetometer does not react to non-ferrous metals.

The anomalies caused by nonmetallic features are usually substantially weaker than those caused by iron. Burned areas are readily detectable due to the property of thermo-remanent magnetism. Detection of features in the third category, however, and of concentrations of daub and ash is a considerably more uncertain proposition. Such anomalies are caused by the juxtaposition of soils with highly contrasting magnetic properties. The degree to which such features are detectable depends not only on their size and their depth, but also on their physical structure, and (most importantly) on the magnetic properties of the soils involved. In general, the strength of such an anomaly is directly related to the degree of contrast between the organic content of the feature itself and that of the surrounding matrix. Thus, for example, a large, midden-filled pit lying in a matrix of subsoil would amost certainly be detected, while a midden-filled pit in a matrix of midden would probably be missed. Ash and burned clay (apart from its thermo-remanent magnetism) also have magnetic properties that contrast markedly from those of sterile subsoil.

Detection. The basic element of all proton magnetometers is the detector coil which consists of a coil of wire wrapped around a plastic bottle or some other suitable container. The bottle is filled with distilled water or some other fluid rich in hydrogen nuclei--i.e., protons.

In order to understand how the detector coil operates, we must first briefly discuss the physical principle of proton free precession. This principle refers to the fact that protons under the influence of the earth's magnetic field precess around an axis parallel to that field. This precession is exactly analogous to the slow gyration of a spinning top. In the case of protons, the frequency of gyration (*i.e.*, the number of gyrations per second) is directly related to the intensity of the earth's magnetic field. The stronger the field, the higher the frequency of precession.

Each proton can in essence be visualized as a small bar magnet. As each one precesses, its tiny magnetic field is capable of generating an infinitesimally small voltage in the surrounding coil. Under normal circumstances, all the protons in the bottle precess at the same rate, yet because their gyrations are out of phase with respect to each other, their individual effects interfere in such a way as to produce no net voltage in the coil. In order for the effects of this precession to be measurable, the protons must be made to act in phase so that the miniscule voltages induced by the individual protons add together rather than cancel out.

It is for this reason that the protons must be subjected to a strong polarizing field before each measurement. An electric current (approximately one ampere) is passed through the coil setting up a strong magnetic field within the bottle. Because this field is much more intense than that of the earth, the protons become aligned along its lines of force. When the current in the coil is abruptly cut off, the protons cease to be constrained by the polarizing field and once again begin to precess around the earth's magnetic field. Having initially been polarized, the protons gyrate in phase, and a small, yet appreciable signal is induced in the detector coil having an amplitude on the order of a millionth of a volt. The frequency of this signal is equal to the frequency of proton precession and hence is proportional to the local intensity of the earth's magnetic field.

Once the influence of the polarizing current has disappeared, however, the protons do not remain in phase for long. Various internal effects cause the phase coherence of the protons to gradually die out and disappear. As a consequence, the induced signal also "decays" and slowly decreases to zero. The time it takes for the signal to disappear entirely is comparable to a value termed the relaxation time. Relaxation time varies from one fluid to the next, being about three seconds for distilled water. When the protons get out of phase, they must once again be polarized before another measurement can be made.

The differential proton magnetometer to be described in this paper basically consists of nothing more than two detector coils, a switching circuit, a high-gain amplifier, and a set of headphones. The two coils are mounted at either end of a six foot long horizontal staff, and the circuitry is mounted in between (Figure 1). The switching circuit controls the timing in a cycle whereby a three second polarization period continually alternates with a three second precession period. A polarizing field is applied to both bottles simultaneously and then is cut off, allowing the protons to precess and causing a precession signal to be induced in each of the coils. These signals are added together and then amplified so that they can be heard through the headphones.

If an area being tested has a constant magnetic field, then the precession frequency induced in each of the coils is the same. When the two identical signals are added together, the operator hears a steady tone which gradually decreases in amplitude as the protons get out of phase and disappears within three seconds.

In the presence of an anomaly, however, a totally different kind of tone is heard. Because the magnetic field at each coil is not the same, the protons in each precess at different rates, and signals of different frequency are produced. As these signals are added together, they interfere with each other: the operator hears a wavering tone, increasing and decreasing in amplitude until it finally dies out. The peaks in amplitude are called beats, and the rate at which they occur is called the beat frequency. The beat frequency is equal to the difference between the two signal frequencies. Clearly, then, the beat frequency is directly related to the degree of difference between the magnetic field intensities at each of the two coils. Restating this somewhat, the more beats that are heard per unit time, the stronger is the magnetic anomaly causing them.

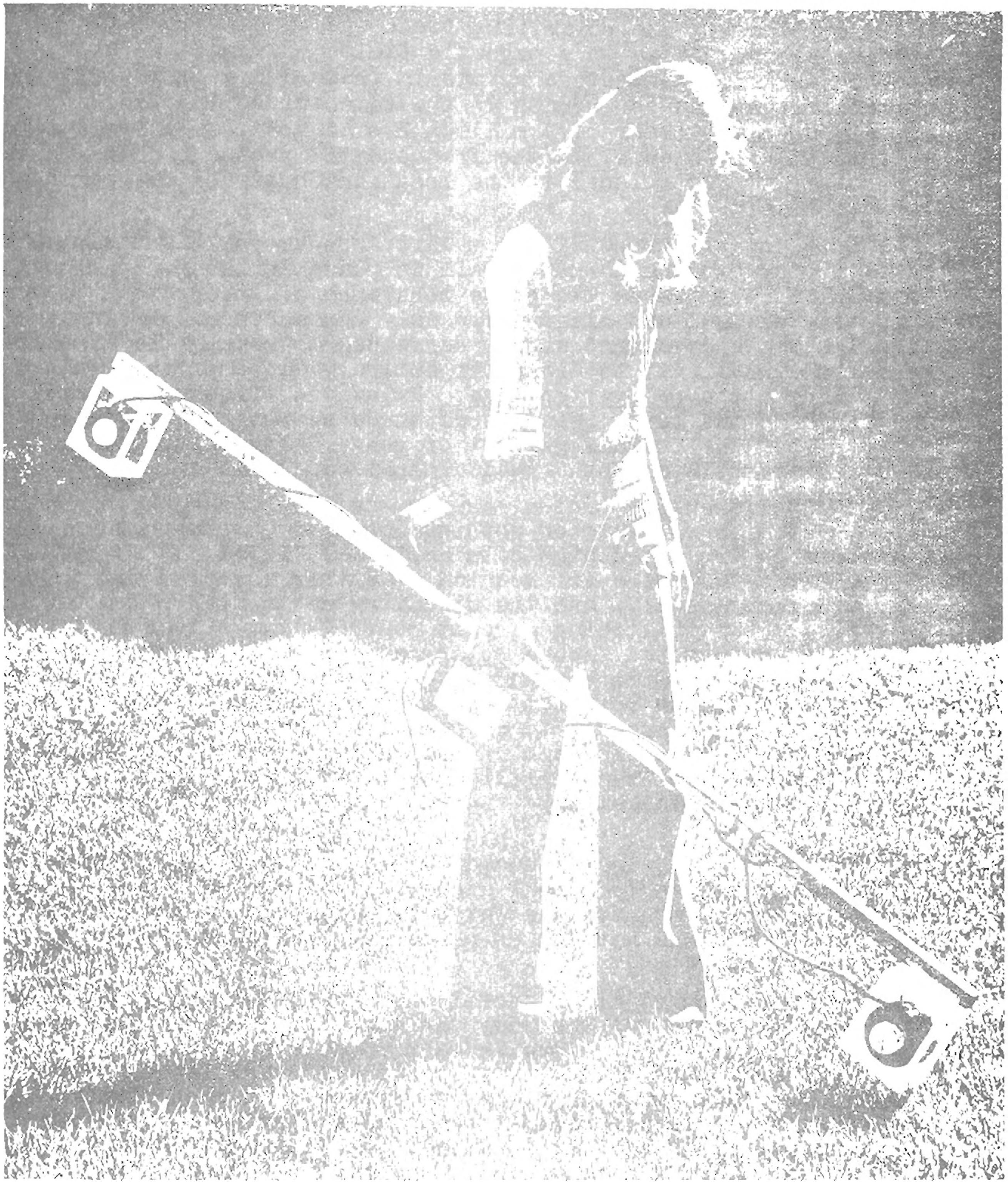

Figure 1. The Portable Magnetometer

Construction

The design presented here is new. Its development was undertaken for the simple reason that other designs we found in the literature were inadequate for our purposes. Some designs were not described in enough detail; others specified components which were either outdated or not available in this country. The instrument described below is comparable in effectiveness to those previously published. It incorporates various aspects of these other designs, but is put together of components more readily available. Particularly valuable as sources of basic design ideas were articles by Aitken (1961: 52-58) and Harknett (1969).

Circuitry. The circuitry in this unit is not especially complicated and can easily be assembled by any competent electronics technician or even by a reasonably proficient hobbyist. The schematic diagram and technical description is presented in the Appendix.

The construction of this circuit is reasonably straightforward, but a few constraints are recommended. Ceramic capacitors should not be used, as they tend to be highly microphonic. Components made of ferrous metal should also be avoided if at all possible. The latter is not to be taken as an absolute restriction, however, because the circuitry is mounted in a position equidistant from the two detector coils where very small amounts of iron will not significantly affect the instrument's performance. Aluminum sockets should be used for the cables leading to the coils.

The headphone used with this unit is a standard crystal headset. In order to prevent oscillation in the output, the wires leading to the headset should either be encased in a grounded shielding braid or be replaced with a coaxial cable.

The completed circuit can be accomodated in an aluminum minibox. Mounted externally on the minibox should be: 2 aluminum coaxial cable sockets (one of which must be floated, i.e., insulated from the minibox itself), a plug for the headset jack, a volume control (R15), a plug for the cable that leads to the batteries, and (if desired) a variable tuning capacitor (C1). The circuit diagram does not incorporate an on-off switch necessitating that the battery be mechanically disconnected when the unit is not in use. There is, of course, nothing that precludes the builder from installing such a switch if it is found to be more convenient.

Detector coils. As long as the electronic properties of the detector coils fall within reasonable bounds, the actual details of construction are for the most part quite flexible. There are two critical conditions, however, that must be taken into account. One is that the coils be waterproof. Even small amounts of moisture in the windings of a coil can serve to destroy its sensitivity. Second, there must be no ferrous metal anywhere in the immediate vicinity of the detectors. If bolts are to be used in construction or mounting, both aluminum and plastics are suitable. Brass should be avoided as it may sometimes contain ferrous impurities.

The coils used in our prototype model were constructed in the following manner: The core consisted of a six ounce polythene bottle 1.85 inches in diameter (available from any chemists' supplier). Two plexiglass endplates (4"x6"x3/8") were machined with holes of the same diameter as the bottle. These endplates were then slid onto the bottle and cemented in place, 2" apart. The coil itself was pile wound (layer winding is not necessary) with 3 pounds (945 feet, approximately 1300-1400 turns) of #20 AWG enamelled copper wire. The leads of the coil were soldered to a coaxial cable which passed in snugly through a hole drilled in one of the endplates. The coil was then entirely boxed in with plexiglass, the pieces being attached with cement (Figure 2). All seams and cracks were sealed to make the coil fully waterproof. Finally, an additional piece of 3/8" plexiglass was cemented to the top of the coil assembly. Into this piece were drilled two holes which were then tapped to receive the aluminum bolts which secured the coil assembly to the frame.

Both coils should be made identically--that is, they should be wound in the same direction and their ends should be attached to the coaxial cable in the same order. This is important because the wiring of the coaxial cable sockets, as shown in the schematic diagram, is such that the coils, when plugged into the circuit, are connected electrically in opposition to each other. The advantage of this arrangement is that it serves to minimize external interference by causing most of the ambient electromagnetic pickup to cancel out.

One other consideration deals with the coaxial cables which connect the coils to the circuit box. Normal cable suffers from electrostatic microphony so that even a blade of grass rubbing up against it can cause an undesirable crackle in the earphones. This problem can be remedied either by enclosing the cables in the frame to protect them from mechanical disturbance or by using a special low-noise graphited cable that largely overcomes the unwanted effect.

<u>Final assembly</u>. The final assembly involves mounting the circuit box and both coils to the frame. There are, of course, innumerable ways in which this can be done. The distance between the coils is not critical and can vary anywhere from five to ten feet. Similarly, the batteries can be carried separately, or they can be attached to the frame. The frame itself can be constructed of aluminum, wood, or plastic; but it should not be made of ferrous metal. Moreover, the coils must be oriented so that their axes are perpendicular to that of the frame.

Given these constraints, our prototype (see Figure 1) was constructed in the following manner: The frame consisted of a six foot long hollow aluminum rod, one inch square in cross section. The coils were positioned at either end of this rod with the capped end of each bottle pointing in the same direction perpendicular to the rod. Each coil was mounted with two

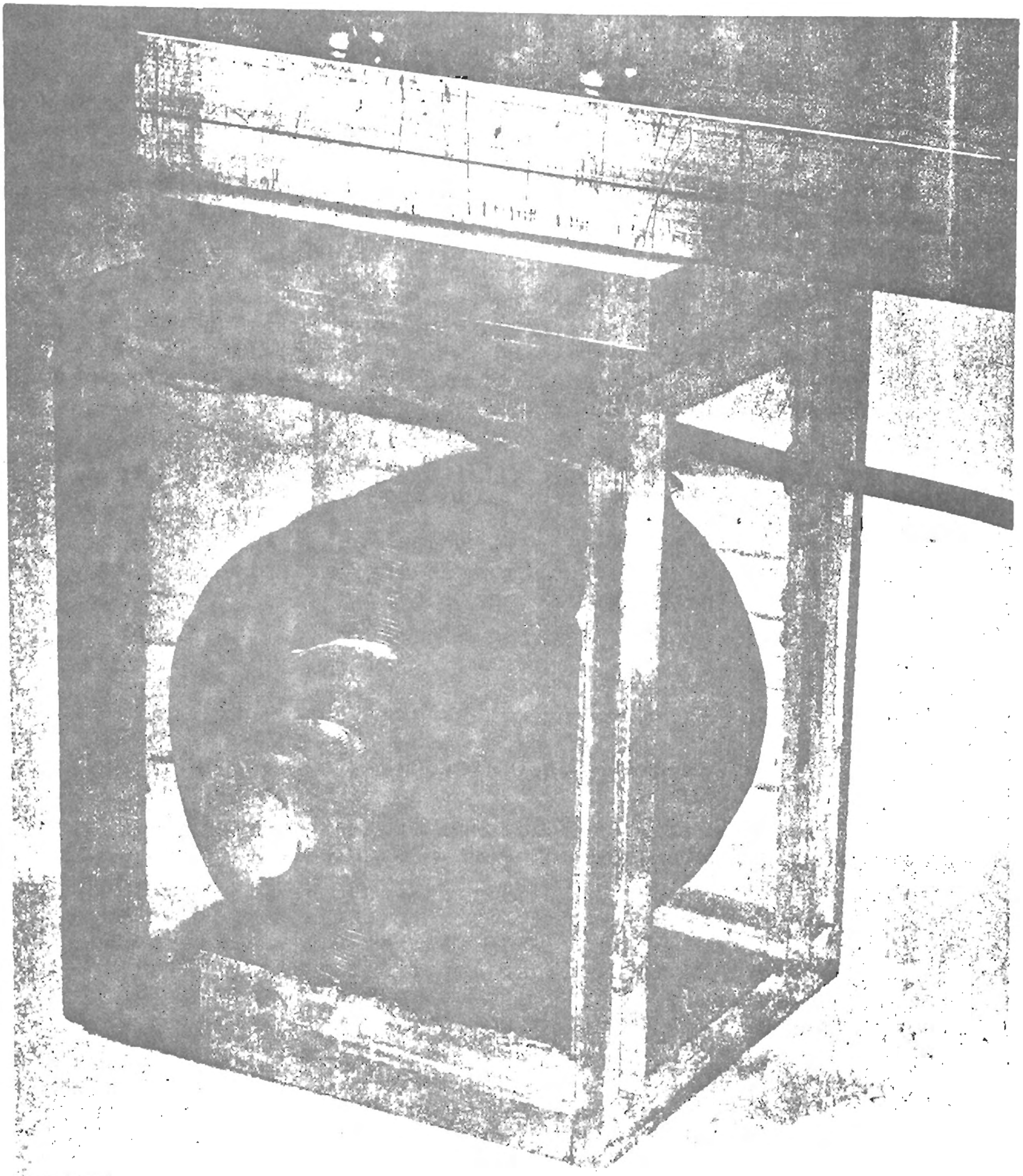

Fig. 2. Close-up of boxed detector coil. (Photo by Hillel Burger)

aluminum bolts which passed down through the rod and into the tapped holes in the top of the plexiglass coil assembly. The circuit box was attached with aluminum brackets directly below the center of the frame leaving enough space between the rod and the top of the box to allow one to use the center of the rod as a hand-grip. The batteries were secured to a belt around the operator's waist. Two conventional six-volt lantern batteries were used, connected in series. In order to prevent false readings, we found it absolutely necessary to remove the batteries metal casings. This task was easily accomplished with a can opener and a pair of pliers.

Operation

Tuning. Before the magnetometer can be operated effectively, it must be tuned to the expected frequency of proton precession which varies with geographical location. This frequency can be derived from the formula:

$$F_p = (4257.6)(M)$$

where: F_p is the proton precession frequency, and

M is the total intensity of the earth's magnetic field in c.g.s. units at the geographical region being investigated (see Appendix).

The appropriate value for the tuning capacitor (C1) is then derived as follows:

$$C = \frac{1}{(39.5)(L)(F_p)^2}$$

where: C is the value of the tuning capacitor (C1) in farads, and

L is the combined inductance of the detector coils (twice the value of a single coil) in henrys.

Each of the detector coils in our prototype magnetometer has an induction of .075 henrys when filled with water. It is highly recommended that the builder empirically measure the value of L for his coils, for variations can be expected to occur due to differences in construction.

Because of the low Q of the coil circuit, precise tuning is not critical. Thus, the instrument can be used over a fairly large geographical area with a fixed value for C1. If, however, it is anticipated that the instrument will be employed in several widely separated areas, then it may be preferable to install a variable capacitor instead.

Field operation. Once the magnetometer has been tuned, it is ready to be used in the field. This instrument can be expected to perform well in a wide variety of circumstances except that it will not work effectively in urban areas or in the immediate vicinity of power lines.

When the magnetometer is operating normally, a three second polarization period continually alternates with a three second precession period. During the former, the operator hears nothing in the headphones. During the latter, a sound is heard which can be divided into two components. The first of these is a crackling and whooshing static that remains at a constant level throughout the period. This static is merely electrical "noise" and should be entirely disregarded. The second component consists of a much purer tone which starts out at a fairly high amplitude but gradually diminishes (in about 2.5 seconds) to a point where it can no longer be heard above the noise. This tone is the proton precession signal. With a bit of practice, the operator's ear becomes attuned to the proton signal and easily sorts it out from the background noise.

A steady decline in the proton signal's amplitude indicates a constant magnetic field, while a wavering decline or a series of "beats" indicates the presence of an anomaly. The strength of the anomaly is proportional to the number of beats heard: the more beats, the stronger the anomaly. One exception is that in the presence of an extremely strong anomaly (almost invariably one caused by iron) the proton signal disappears almost immediately, being referred to as a "killed signal."(Aitken 1961: 46; 1970: 687).

Unlike some other comparable instruments, the one described here is designed to be held horizontally rather than vertically (see Figure 1). Maintaining it in this position is much less fatiguing to the operator. It must be kept in mind, however, that an anomaly can be picked up by either of the two detector coils. In practice, it is more often than not readily apparent which coil is actually doing the detecting, but it is nonetheless important that one be very careful in making certain, for attributing an anomaly to the wrong coil can lead to an error in location of six feet (or more, if the separation between the coils is larger). Whenever any doubt arises as to the actual location, the confusion can almost always be resolved by approaching the locus in question from a different direction. In searching for weak anomalies, or in trying to pinpoint the center of a large one, it is often helpful to keep the forward coil tilted closer to the ground causing it to pick up the anomaly readings more strongly.

If the procedures outlined above are followed and special attention paid to the strictures of construction and operation that we have stressed, then a sensitive operator and experience should produce outstanding results with this modest instrument. We wish you luck!

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Appendix. Circuit Description

The schematic diagram presented here dupicates exactly the circuitry in our prototype unit. We are well aware that it can be improved in a number of ways; yet, because we have not had the chance to test these improvements ourselves and show them to be effective, we have decided not to include them in the present paper. Our design as it appears here may seem inelegant to some, but at least we can be certain that it works.

Switching circuit. Q9 and Q10 form a stable multivibrator controlling the "on" or "off" state of Q8. The duration of each half-cycle is determined by the time constants R32*C20 and R33*C21 respectively; both in this case are approximately 3 seconds. Q7 (turned "on" and "off" by Q8) drives the power transistor Q6. Q6 supplies the polarizing current to the detector coils L1 and L2. R25 absorbs the energy of the inductive surge which occurs when the polarizing current is turned off.

Amplification. C1 forms a parallel tuned circuit with the detector coils L1 and L2, adjusted to resonate in the vicinity of the proton precession frequency. Q1 and Q2 form a low-noise high-gain preamplifier, capacitatively coupled to the op-amp Z1. R15 acts as a volume control by varying the amplitude of the signal passing from Z1 to the high-gain output amplifier Q3.

Q5, D1, and R23 form a voltage regulator which maintains a steady 6 volt supply to the amplifier.

Q4 acts to switch off the earphones during the polarization period. When Q8 is on, D2 is forward biased, and Q4 is switched on, shorting out R20 and preventing a signal from being passed to the earphones. During the precession period, Q8 is off, D2 is reverse biased, and Q4 is off and effectively out of the circuit.[1]

<u>Part list</u>:

C1	Tuning capacitor
C2	.0022mf
C3	22mf/15v
C4	.47mf/15v
C5	1mf
C6	22mf/15v
C7	.047mf
C8	.068mf
C9	27pf
C10	27pf
C11	27pf
C12	.022mf
C13	22mf/15v
C14	1mf
C15	100mf/25v
C16	15mf/20v
C17	4.7mf/35v
C18	6.8mf/35v
C19	100mf/25v
C20	30mf/15v
C21	30mf/15v
C22	30mf/15v
C23	4.7mf/10v
D1	1N5235/6.8v
D2	FD777
D3	1N754A/6.8v
D4	1N914
L1	.075 (detector coil)
L2	.075 (detector coil)
P	phone jack socket
Q1	SE4021
Q2	2N4355
Q3	2N5133
Q4	2N3906
Q5	2N5133
Q6	2N5190 (w/ heat sink)
Q7	2N2907A
Q8	2N5133
Q9	2N5133
Q10	2N5133

R1	110kΩ
R2	150kΩ
R3	30kΩ
R4	120Ω
R5	100kΩ
R6	1kΩ
R7	13kΩ
R8	15Ω
R9	5.6kΩ
R10	2kΩ
R11	2kΩ
R12	360Ω
R13	2.2mΩ
R14	10kΩ
R15	5kΩpot.
R16	200Ω
R17	39kΩ
R18	20kΩ
R19	100Ω
R20	5kΩ
R21	3.3kΩ
R22	33kΩ
R23	1kΩ
R24	10kΩ
R25	1kΩ
R26	4.7kΩ
R27	3.9kΩ
R28	620Ω
R29	100kΩ
R30	15kΩ
R31	10kΩ
R32	100kΩ
R33	100kΩ
R34	5.6kΩ
Z1	301A

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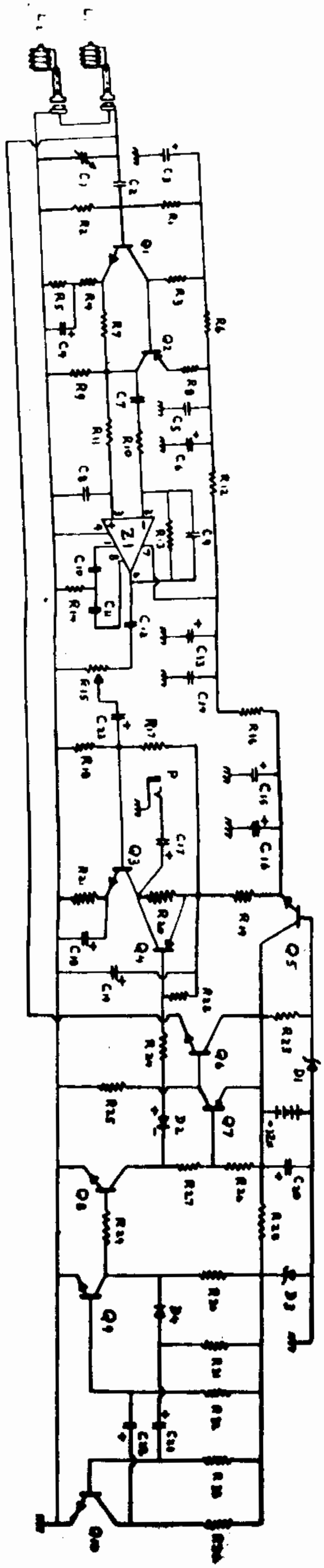
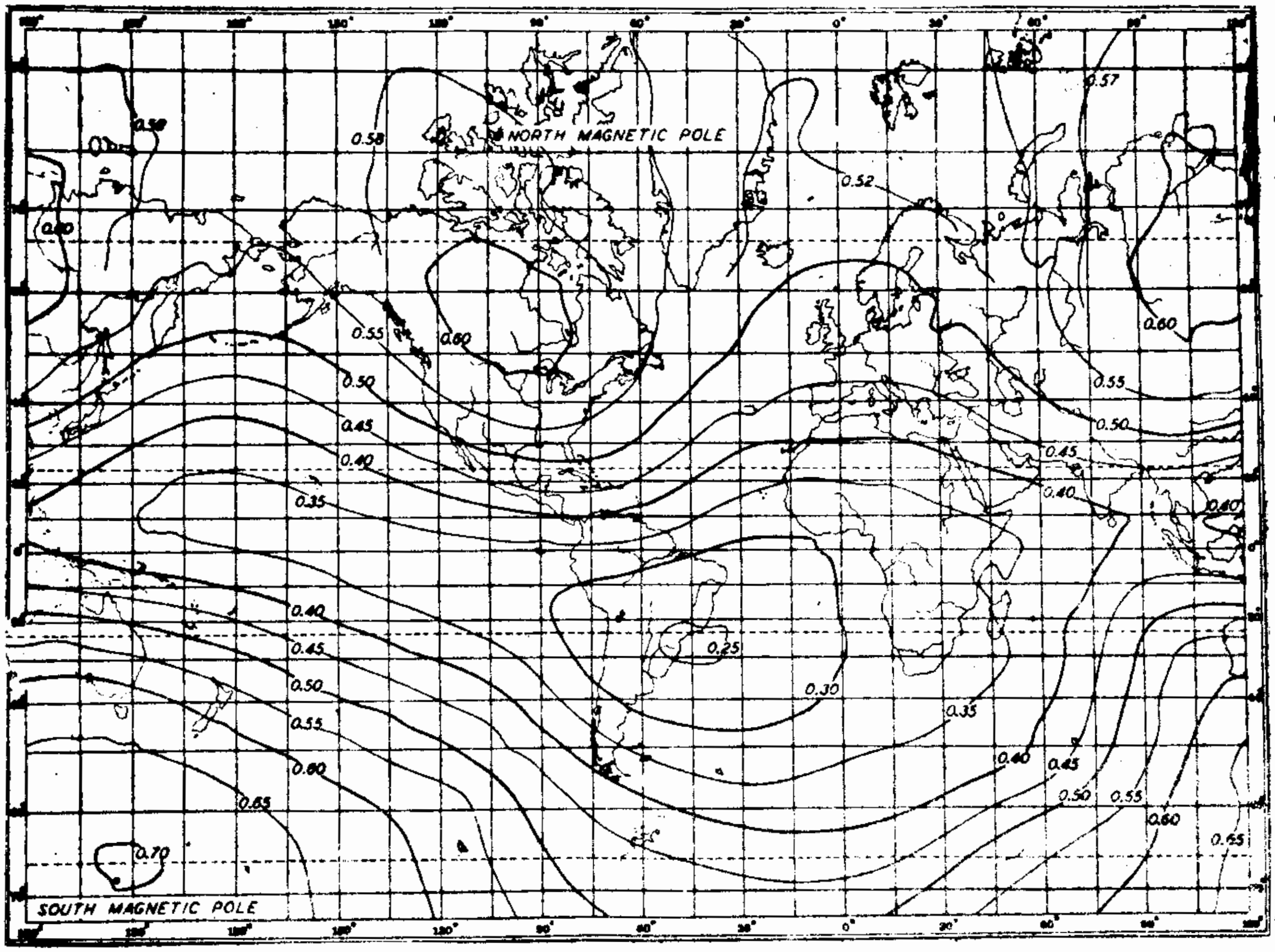
[1]We are greatly indebted to Cecil Hayes (Rutgers University), Sam Maslak (MIT), and Jeff Millman (MIT) for generously giving their time and talents in designing the circuitry presented in this article.



Schematic Diagram

Everyman's Magnetometer.



The geomagnetic total intensity in c.g.s. units for 1945 (Vestine 1961).

Inferences from Distributional Studies of Prehistoric Artifacts in the Coastal Plain of South Carolina

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The intent of this paper is to shed some light on what has long been a relatively unknown area archeologically within the Southeast--the coastal plain of South Carolina. In particular I'd like to discuss the distribution of prehistoric ceramics in light of the available data from this area. In addition to seeking to determine and demonstrate distributional patterning within prehistoric coastal ceramics, I have the additional goal of elucidating associations between these ceramic complexes and various environmental factors present within the coastal plain.[1]

Unlike her neighboring states of North Carolina and Georgia, South Carolina has, until recently, been largely ignored archeologically. Thus, while the work of Coe (1964), Haag (1956), and South (1959, 1960) has done much to reveal the outlines of the prehistoric occupation of coastal North Carolina and in Georgia the WPA related activity of Caldwell, McCann, Waring, and others throughout the state and particularly along the Savannah (as recounted by Waring 1968a) led to an early general awareness of the archeological resources of that state, South Carolina has remained for the most part an unknown. At various meetings of this conference, for example, when the distributions of ceramic assemblages in the region were discussed, the South Carolina area was either ignored (Kneberg 1962; Fairbanks 1962) or else mentioned, usually by Waring (in Sears 1966: 2; Waring 1968b), in passing. Thus many people had a vague or intuitive idea of what was supposed to be present, but there were few examples of hard data to verify these opinions.

This condition has persisted almost to the present day. Thus, recent investigations along the Savannah River at Groton Plantation by Stoltman (1974) and Peterson (1971a) and Milanich's general statement on the southeastern Deptford culture (1971) have all pointed out the lack of data for most of the South Carolina area. In terms of distributional studies, Waddell's work in the early 1960's (1963; 1965) delimiting the range of Thom's Creek and Awendaw pottery and Ferguson's recent work on the distribution of South Appalachian Mississippian mound sites (1971; n.d.) form the only available data encompassing the entire South Carolina coastal plain.

In the present study the ceramic artifacts from a total of 203 sites in the coastal plain were examined. The pottery from

[1] I would like at this time to personally thank Stanley South, Albert Goodyear, and Gordon Brown for their advice and assistance in this project. In particular I would especially like to thank Leland G. Ferguson, whose advice, guidance, and encouragement in a very real sense made this study possible.

each site was analyzed for the incidence of attributes encompassing paste characteristics and method of surface treatment. The artifacts from all of these sites as well as descriptions of each site are available in the files and collections of the Institute of Archeology at the University of South Carolina and the Charleston Museum. In particular, collections were utilized only if the precise location of the site was available.

On the map in Figure 1, dots represent sites whose ceramic assemblages were investigated; included are sites reported by independent researchers whose data were examined for degree of congruity with the data generated by this investigation. In particular, the published work of Phelps (1968), Stoltman (1974), Peterson (1971a, 1971b), and Waring (Williams 1968), as it related to the Savannah River area; Ferguson's work on the South Appalachian Mississippian (1971); and South's work in coastal North Carolina (1960) were utilized.

The artifact samples examined in the preparation of this study were gathered in a variety of ways over a period of 50 years by collectors with widely varying degrees of motivation and training in archeological sampling and recovery techniques. The probability of a high level of inherent bias in the sample must be therefore considered. Comparison of the data with the published material mentioned above has had encouraging results, however, suggesting that its validity is fairly good.

Analysis of the data was accomplished by a breakdown of the coastal plain into several sectors in an attempt to relate observed distributions with environmental variables such as river drainages or soil and forest covers. For purposes of efficient communication, the data have, where possible, been incorporated into South's taxonomic framework for coastal pottery which was presented at the 1973 meeting of the SEAC (South 1973). This taxonomic framework is hierarchical in nature and proceeds from established type descriptions at one end of the classificatory spectrum through ascending orders of integration utilizing ware, ware-group, and ware-group evolution levels of inclusiveness. Thus, for purposes of communication and investigation, it is more convenient to talk of "Stalling's ware-group" material when referring to local fiber-tempered ceramics rather than attempt to enumerate all the types or variants.

The occurrence of Stalling's ware-group material as a minority ware along the South Carolina coast was noted by Waring (1968c: 255), and South (1960: 55, 64) has reported a few isolated sherds from coastal Noarth Carolina. Outside of the Savannah River area its inland distribution has remained unknown, although Griffin (1945: 467) reported one sherd of this material in his discussion of ceramics from the Thom's Creek site.

In the present sample (Figure 2), Stalling's ware-group material was noted along the coast to just beyond Charleston Harbor and inland along all the major river drainages. Moving northeastward from the Savannah River, the Edisto is the last drainage with a high incidence of this material; along the Santee and PeeDee rivers fiber-tempered pottery occurs with very low

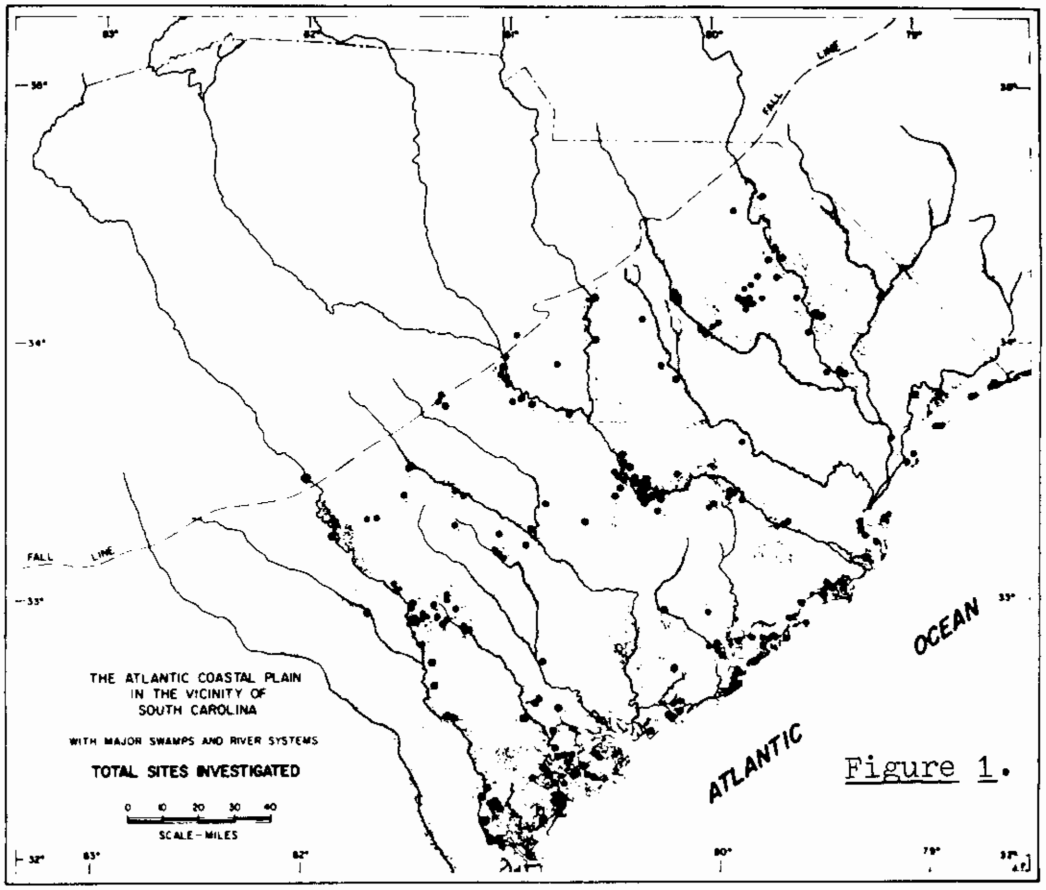

Figure 1.

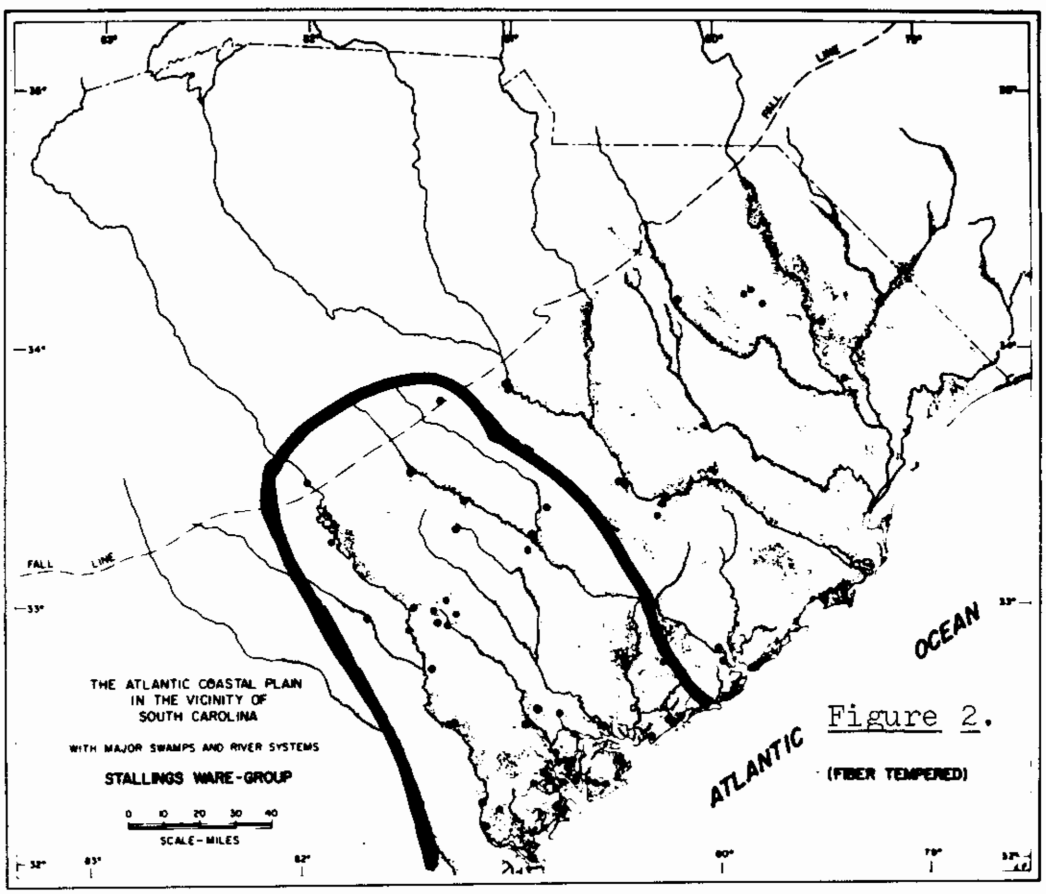

Figure 2.

(FIBER TEMPERED)

frequency. If we can accept the non-statistically random procedures with which these materials were collected, then this decrease in occurrence on the total number of sites in any drainage or coastal area as one moves north has been further corroborated statistically. The distribution on sites in the geographic areas investigated was first checked by the Chi-square test and found to have a significant nonrandom distribution. Using Spearman's formula for rank correlation, this decrease in incidence as one moved northeast from the Savannah was found to have a .90 correlation (Table 1).

Based on the present sample, I would hypothesize the following distribution of this ware group in coastal South Carolina--the area delimited in Figure 2 represents the area where Stalling's material seems to occur both in large quantities on individual sites and on large numbers of sites.

TABLE 1

STALLING'S FIBER - TEMPERED POTTERY : STATISTICAL ANALYSIS OF DISTRIBUTION

DATA: Geographic Sector*	# Sites with Stalling's/Total # sites investigated	%
PeeDee River drainage(inland)	7/38	18.4
Santee River drainage(inland)	9/46	19.6
Edisto/Salkahatchie drainage (inland)	7/17	41.2
Savannah River drainage (inland)	15/39	38.5
Sahtee River-N.C. Border (coastal)	0/10	0.0
St. Helena Sound- Santee River (coastal)	6/26	23.1
Savannah River- St. Helena Sound (coastal)	16/27	59.3

One Sample Chi-square Test

$X^2 = 21$ df = 6 $p < .01$

Spearman's Formula for Rank Correlation

$r = .89$ $p < .01$

* "Coastal" geographic sectors refer to those areas from the seacoast to 10 miles inland, "Inland" sectors are those from ten miles inland to the fall line.

Thom's Creek ware is generally regarded as representative of the earliest sand-tempered ceramics along the Savannah River, overlying and probably later than Stalling's material in that area (Phelps 1968: 29; Stoltman 1974: 236). The type, Thom's Creek Punctate (Waddell 1963), was chosen as a convenient and unambiguous diagnostic for establishing the distribution of this ware (Figure 3). This choice was made because of the difficulties apparent in selecting and separating Deptford, Refuge, and Thom's Creek material, particularly simple stamped and plain types. This is a problem that both Waring (1968d: 200) and Peterson (1971a: 143-148) have noted in their work with these ceramics.

Thom's Creek punctated pottery occurred on over 40% of sites investigated along the Santee and Edisto rivers and on about 50% of the sites in the corresponding coastal sector in the Charleston County area. As one moved either north or south of this area, the incidence and frequency of this type decreased markedly. Along the Savannah River, for example, the type was found on only 10% of the sites investigated with a frequency of less than 1% of the total assemblage investigated. The work of Stoltman on Groton Plantation (1974: 209) and South in coastal North Carolina (1960: 65) have yielded similar distributional and frequency data to that recovered in this study and allow me to hypothesize that the Santee and Edisto River region form the primary center ofoccurrence for this ware.

The relationship of Thom's Creek ware to the fiber-tempered Stalling's ware-group material has been a matter of professional interest for a number of years particularly as more and more radiocarbon dates accumulate suggesting a long degree of overlap in the temporal ranges of each taxon. Although Thom's Creek and Stalling's ceramics would appear from this study to have different centers of popularity, in inland South Carolina away from the Savannah River 74% of the sites where fiber-tempered pottery occurs also have Thom's Creek material. In the region of the Edisto River, both inland and along the coast, a large number of sites were observed in this study with both wares present, and it is probable that work in this area would help resolve this question of relationship. Along the coast, Waddell (1963; 1965; n.d.), Hemmings (1970), Sutherland (1973; 1974), Michie (1973), and Trinkley (1974) have recently been working on this problem.

Refuge ceramics are generally regarded along the Savannah River as a temporally intermediate ware between Stalling's and Deptford ceramics (Waring 1968d: 208). The type, Refuge Dentate Stamped (Waring 1968d: 200; Peterson 1971: 126-127) was chosen as a diagnostic indicator. The present study suggested a low incidence of this ware along the Savannah (Figure 4) which may reflect a position of dentate stamping as a minority type within the series, a position in fact suggested by the data of Waring (1968d: 198-200) and Peterson (1971a:127, 163). I feel that this probably also reflects a distributional factor, as dentate stamping was observed at a number of sites in central South Carolina.

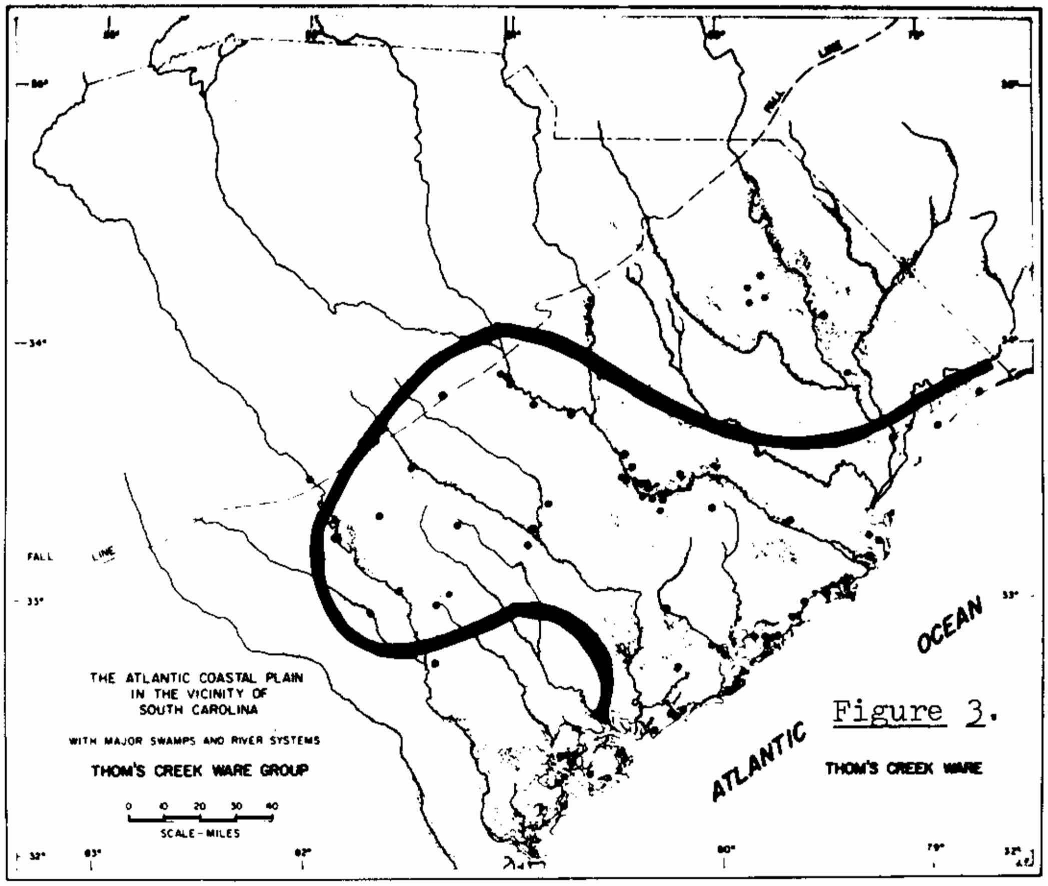

Figure 3.

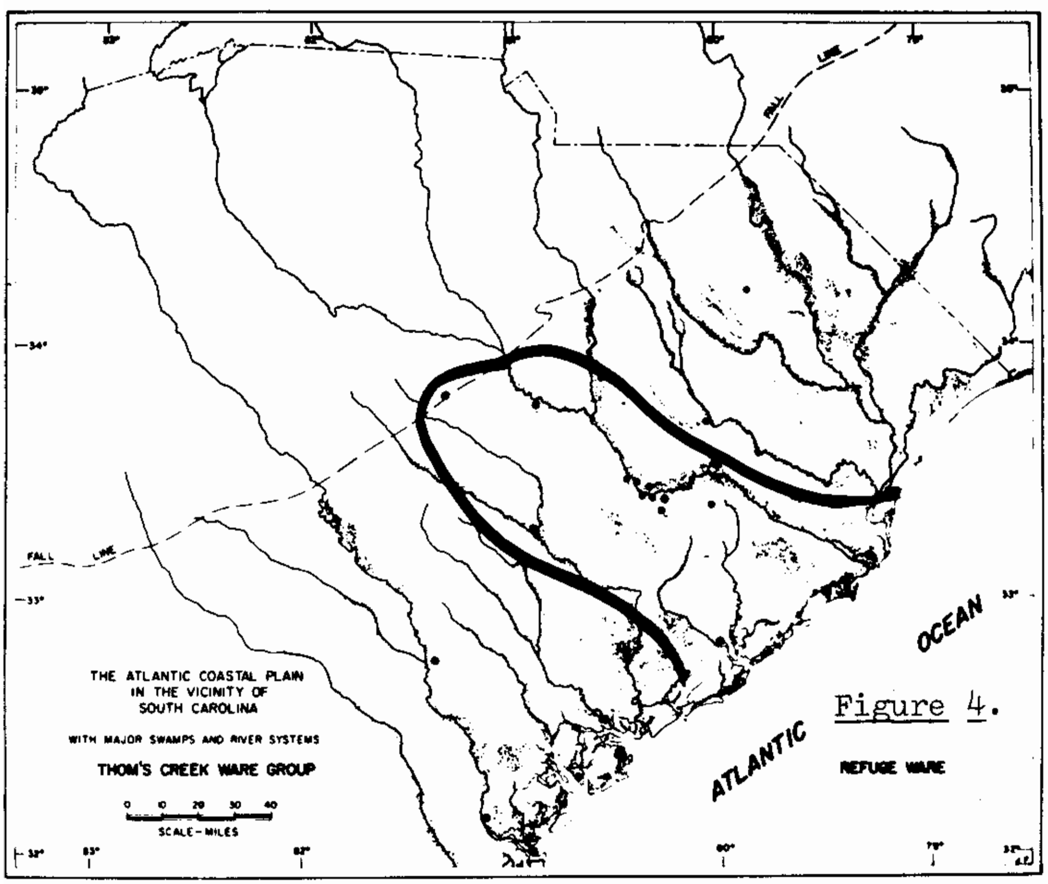

Figure 4.

Given the data at hand, I would suggest a hypothetical center of popularity for this ware along the Santee River. Of particular interest, in the sample inspected, was the clear association of the ware with Thom's Creek and Deptford ceramics. Of the 13 sites in this study in central South Carolina with Refuge ware present, all also had Thom's Creek material, and 11 of the 13 sites were associated with Deptford ceramics. Sears and Waring have both suggested an evolutionary sequence operating within these assemblages (Sears 1966: 2, 20); while I feel that it is premature to draw any conclusions, I would nevertheless state that the data are suggestive.

Deptford linear check stamped pottery (Caldwell and Waring 1939) was chosen as a diagnostic indicator for distributional studies of this ware. The type had a marked incidence on sites along the Edisto and Santee rivers (Figure 5), while in areas to the north and south in the coastal plain a sharp decrease both in incidence and frequency was observed. Along the coast, this material is reported almost exclusively from incidental finds, and large sites with the ware present were noted only at the mouths of two extensive drainages, the Savannah and the Santee. Inland, Deptford sites were recorded along all of the drainages suggesting an adaptation to the rich resources of this area.

The term, Cape Fear ware-group, has been proposed by South (1960: 38-41; 1973) to encompass all ceramics characterized by a sandy or non-tempered paste with cord, fabric, or net impressions found in the coastal plain of South Carolina. This study indicates that Cape Fear ceramics are found throughout the coastal plain (Figure 6). Inspection of the data led to the discovery of a marked patterning in the distribution of the fabric marked ceramics. As one proceeds south from the North Carolina area, both on the coast and inland, the frequency and incidence of fabric marked pottery steadily drops until along the Savannah it is virtually nonexistent.

Using data from surveys by South (1959: 231) and Haag (1956) from northern North Carolina, coupled with South's data from southern coastal North Carolina (1960: 65), and the data of this survey, the pattern was even more pronounced. Over the ten discrete geographic areas investigated, using Spearman's formula for rank correlation, a negative .95 correlation between incidence of fabric marked pottery and location south of the Virginia-North Carolina border was observed (Table 2).

In 1939, Caldwell and Waring defined the type, Wilmington Heavy Cord-marked to refer to a sherd or sand-tempered ware that they observed along the Georgia coast and at the mouth of the Savannah at Wilmington Island. Generally regarded as a hallmark of an intrusion from the north (Waring 1968b: 221; Caldwell 1958: 33-34), the ware is particularly characterized by the use of ground-up sherds or particles of fired clay as a tempering agent in many of the specimens observed.

In 1960, South, working in southern coastal North Carolina and northern South Carolina, observed and described a sherd-tempered ware characterized by cord and fabric surface treatment

TABLE 2

CAPE FEAR FABRIC MARKED POTTERY : STATISTICAL ANALYSIS

OF DISTRIBUTION

DATA: Geographic Sector*	# Sites Cape Fear fabric/Total # of sites investigated	%
Roanoke Rapids, N.C. (South 1959)	24/24	100
Northern coastal N.C. (Haag 1956)	66/75	88
Southern coastal N.C. (South 1960)	59/81	73
Santee River- N.C. Border (coastal)	8/10	80
PeeDee drainage (inland)	18/38	47
Santee drainage (inland)	27/46	59
St. Helena Sound- Santee River (coastal)	8/26	31
Edisto-Salkahatchie drainage (inland)	7/17	41
Savannah River- St. Helena Sound (coastal)	4/27	15
Savannah drainage (inland)	8/39	20

Spearman's Formula for Rank Correlation

$r = -.95 \qquad p < .01$

* Geographic sectors are arranged from northernmost to southernmost in this table.

that he classified as Hanover (1960: 36-38). At that time, South and Waring communicated and decided to utilize separate terminology since the ceramics of the intervening distance were unknown (South, personal communication).

As can be seen (Figure 7), the data indicate that sherd-tempered ware occurs more or less continuously along the coast from Georgia to North Carolina. Interestingly enough, the same

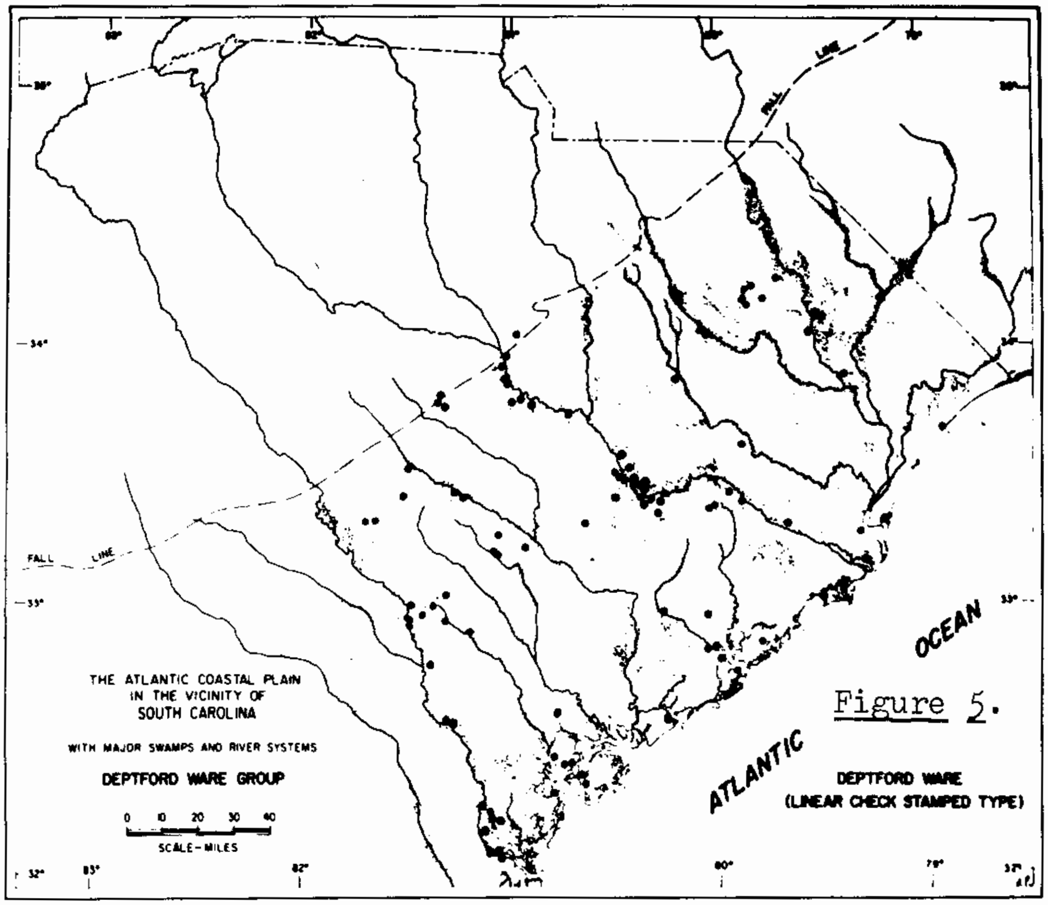

Figure 5.

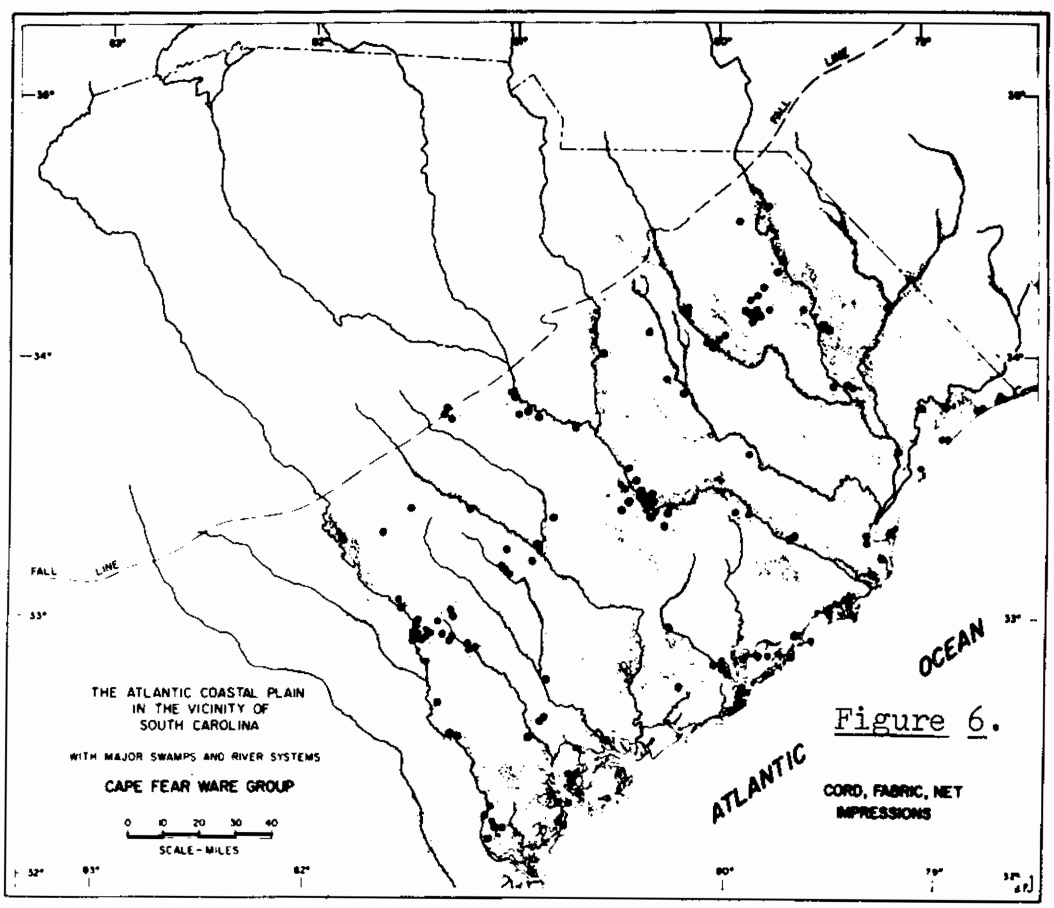

Figure 6.

pattern of distribution for fabric marked pottery occurs with this ware as does with Cape Fear sand-tempered ware--as one moves south the incidence and frequency of fabric drops markedly. Inspection of sherd-tempered assemblages from sites along the South Carolina coast has revealed the relationship of Hanover to Wilmington ware. Material from the Savannah River area called Wilmington is generally thicker, sandier, and somewhat more poorly made than material to the north. The variation is slight, however, and can be detected only in assemblages from the northern and southern areas and not from the individual sherds; within these assemblages individual sherd-tempered sherds may be readily substituted in assemblages over the area.

Along and to the north of the Santee River, sherd-tempered ware is found inland and is characterized by a far higher incidence of fabric marked pottery than the coastal area to the south. Of particular interest is the almost complete lack of sherd-tempered material inland in the coastal plain south of the Santee River. This lack of sherd-tempered cord and fabric ware compared with the presence of Cape Fear sand-tempered cord and fabric ware for the same area strongly suggests a temporal or cultural basis for the observed dichotomy. I would suggest for convenience that sherd-tempered material recovered in the South Carolina area can be best referred to under the heading of South's "Wilmington ware-group"(1973). Such a heading avoids the confusion involved in dealing with sherd and sand-tempered wares with the same surface finish (cord or fabric marking) but with somewhat different geographic ranges when paste is also examined. Thus, strict utilization of the original Wilmington type description, for example, with its emphasis on both sherd and sand tempering, can lead to possibly erroneous conclusions. The use of "Cape Fear" and "Wilmington" ware-group terminology provides for a finer taxonomic breakdown and classification of the observed data.

The term Chicora has been suggested by South (1973) as a convenient taxonomic category for the complicated stamped South Appalachian Mississippian ceramics that occur in the South Carolina area. Chicora ceramics were found along the coast and inland along the rivers in the coastal plain to the fall line, but they occur primarily along major river systems that drain the Piedmont and only rarely along rivers originating in the coastal plain (Figure 8). These major river systems, as well as being excellent lines of communication, are also potentially highly favorable to agricultural food production if one accepts Murphy and Hudson's hypothesis (1968) that intensive agriculture in the Southeast at this period may be related to regular flooding of the rivers allowing for periodic soil enrichment. Those rivers which have large numbers of sites with South Appalachian Mississippian ceramics present also have extensive Piedmont drainage networks capable of picking up a considerable sediment load that would be partially dropped in the reduced gradient of the coastal plain.

Ferguson, in a paper presented at the SAA meetings in Norman, Oklahoma in 1971, discussed the distribution of South

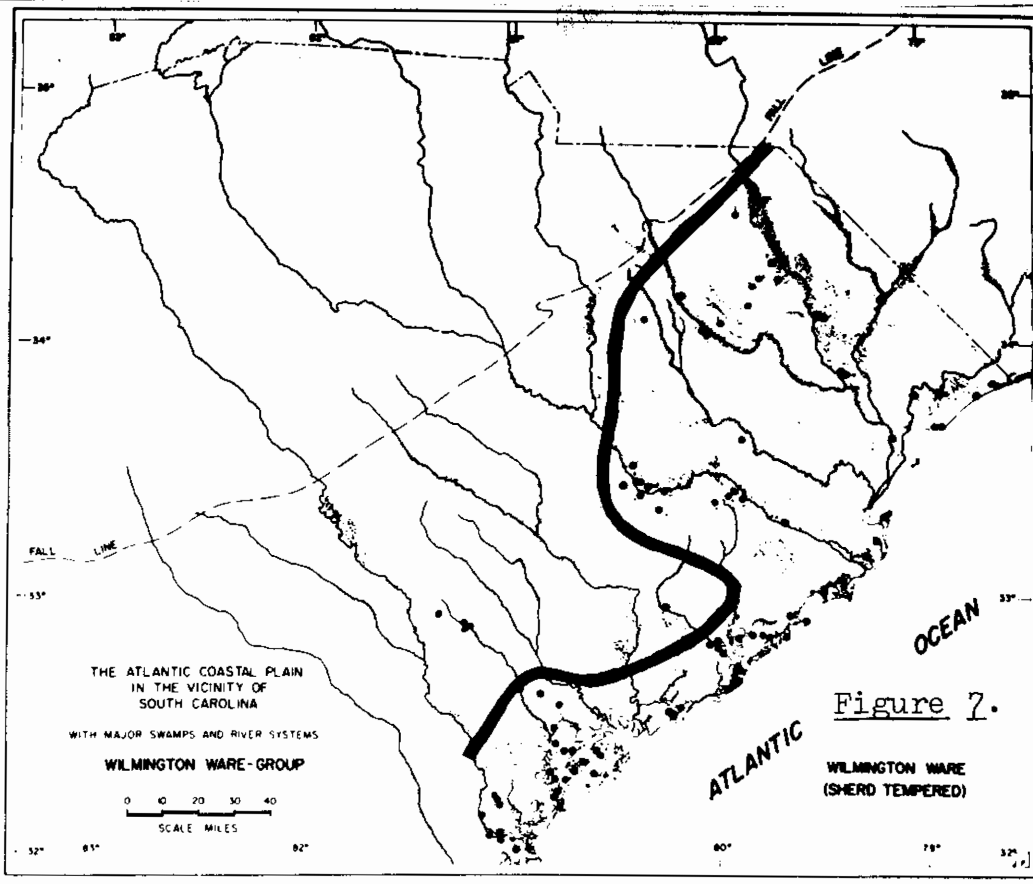

Figure 7.

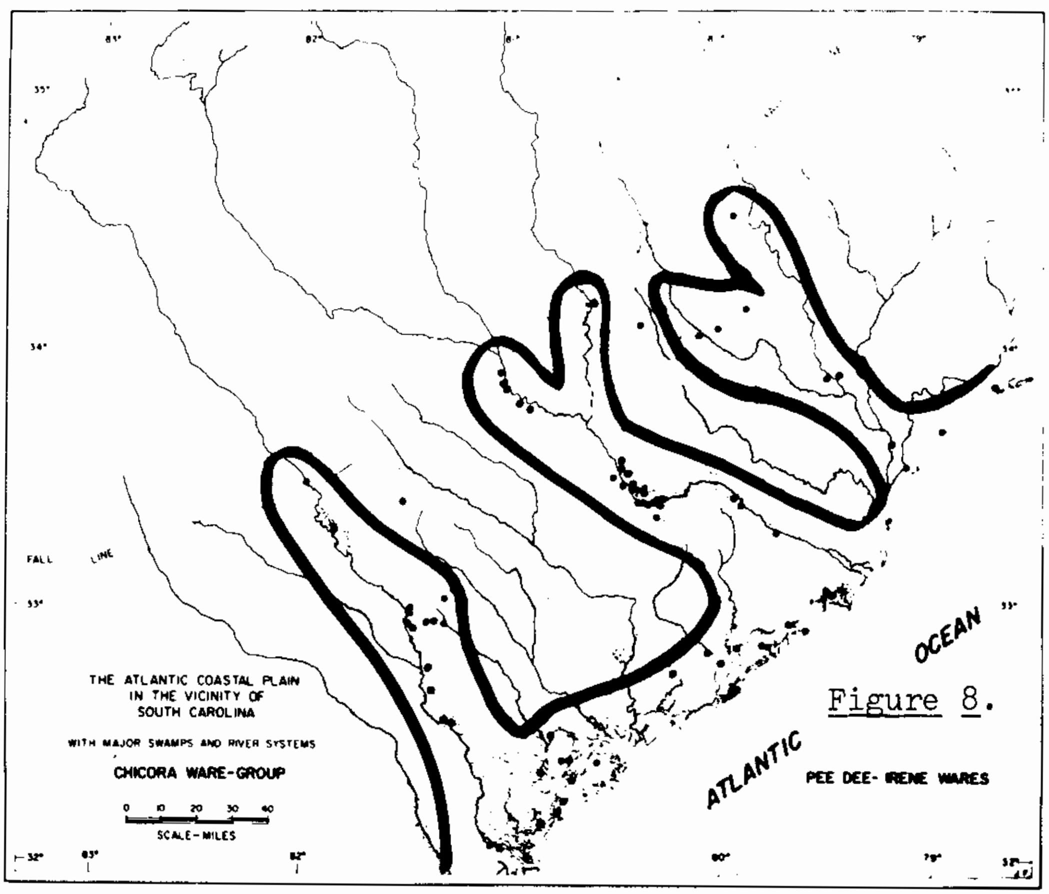

Figure 8.

Appalachian Mississippian sites in the Atlantic coastal plain and, at that time, offered an explanation based on the nature and richness of the local soils for the rather novel appearance of sites of this period below the fall line in this part of the Southeast (n.d.: 5-7). His thesis developed from the observation that forest maps indicate that the relative homogeneity of the forest pattern in the coastal plain of north Florida and in Georgia is markedly disturbed in South Carolina (U.S.G.S. 1969) which could be explained by soil richness and variability. The coastal plain of South Carolina is thus seen as characterized by relatively rich soils and, it may also be noted, by extensive bottomland hardwood swamps (U.S. Army Corps of Engineers 1972: 9). This combination of factors produces a rich biotope quite probably perfectly capable of supporting, on a year round basis, the extensive inland settlements that appear to be reflected in the distributions of ceramics in this area from the earliest periods (Ferguson, personal communication)

In conclusion, from the ceramic distributions presented it would appear that coastal South Carolina, particularly in the region of the Santee River, formed a relatively intensive occupational center during the late prehistoric period. The occurrence of extensive bottomland hardwood swamps and a diverse forest and soil cover are suggested as factors behind this richness in cultural material (as elaborated by Ferguson 1971; n.d.). Furthermore, the interaction between areas to the north and southeast of the South Carolina coastal plain may be seen reflected in the data.

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The Relationship Between Deptford and Swift Creek Ceramics as Evidenced at the Mandeville Site, 9 Cla 1

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The stamping of pottery with a carved paddle had a long history in the Southeast. Holmes (1903: 130), recognizing this, defined the area in which stamped pottery was found as the South Appalachian Province. The focus of this work was upon the geographic distribution of a particular style of pottery. Caldwell later (1958: 34) used a similar term, Southern Appalachian tradition, to focus on the pottery itself. This tradition is characterized by stamped pottery in three main styles--simple, check, and complicated stamping.

The earliest simple and check-stamped pottery is Deptford (the term Deptford is used here in a generic sense; the check-stamped pottery from Mandeville is more similar to the north Georgia Cartersville variety tha it is to the coastal Deptford variety). The earliest complicated-stamped pottery is Swift Creek. Deptford is earlier than Swift Creek although there is some temporal overlap between the two. It is this period during which Deptford check and simple-stamped and Swift Creek complicated-stamped pottery occur together that is the focus of the present paper. Most of this discussion is based upon the author's re-analysis of the Mandeville site, but other related sites will also be mentioned.

Components exhibiting both Deptford and Swift Creek ceramics have been called either Late Deptford or Early Swift Creek; for, as Dan Penton recently (1974: 7) stated, "...when you are looking at a continuum, Late Deptford and Early Swift Creek can represent the same point, dependent only upon the viewer." McMichael, who did a preliminary analysis of the Mandeville ceramics, tried, as the saying goes, to have his cake and eat it too. He defined both a Late Deptford and an Early Swift Creek component for that site.

The Mandeville site, 9 Cla 1, excavated between 1959 and 1962, was a Middle Woodland Hopewell-related site in southwest Georgia. Mound A was a flat-topped occupational mound measuring approximately 240x170x14 feet. The uppermost four feet was a Mississippian cap added to the mound several hundred years after the Middle Woodland occupation. Mound B was a conical burial mound containing such diagnostic Hopewellian items as copper-covered earspools and panpipes, clay platform pipes, and a figurine. Mound B was contemporary with the Middle Woodland portion of Mound A.

In profile, the Middle Woodland portion of Mound A is seen as a series of four midden layers separated by three fill layers. The three components recognized by the original researchers for this mound were as follows:

Mandeville I--Late Deptford
Layer I (premound midden)
Layer II (midden)

Mandeville II--Early Swift Creek
Layer III (midden)
Layer IV (midden)

Mandeville III--Mississippian Rood focus
Layer V (cap)

The Mandeville I (Late Deptford) ceramic inventory, according to McMichael, consisted of predominately check and simple-stamped pottery (ignoring the plain ware which accounted for nearly half of the total pottery for both Mandeville I and II). Complicated-stamped pottery followed check and simple-stamped in frequency of occurrence. Minority wares included cord marked, burnished, punctate, and limestone-tempered plain and cord marked. Tetrapods were primarily medium sized. None of the vessel lips were notched (Kellar, Kelly, and McMichael 1962a: 341-346).

Mandeville II (Early Swift Creek) ceramics, again according to McMichael, were dominated by Early Swift Creek, Crooked River, and St. Andrews complicated-stamped potteries. The check stamped and simple stamped were minority wares. Also found in minor amounts were Crystal River plain, red-filmed, and negative-painted and rocker-stamped sherds of the Santa Rosa series. Small tetrapods predominated, and notched and scalloped lips were common (Kellar, Kelly, and McMichael 1962a: 346-347).

McMichael, recognizing that complicated-stamped pottery did occur in Mandeville I, called it Deptford Complicated Stamped. The following is McMichael's (1960: 211) description of Deptford Complicated Stamped:

> ...medium coarse grit temper; granular paste (as compared with Early Swift Creek); coarser in general than Early Swift Creek. Stamping medium bold, some over-stamping, medium deep, usually curvilinear (simple concentric circles,loops; a few simple rectilinear designs) flat, slightly everted rims dominant. No notching or scalloping.

He continues:

> ...this is not to be confused with Brewton Hill Complicated Stamped, the Georgia Coast "Deptford Complicated Stamped" type; the writer is coining the name for Level I and II, Mandeville Site complicated stamped, which underlies good Early Swift Creek pottery. Possibly in a type-variety system, this could be a variety of Early Swift Creek, but certain diagnostics of Early Swift Creek are lacking, and the stamping is poorer.

Early Swift Creek Complicated Stamped pottery, on the other hand, is:

> ...micaceous, sandy, fine paste; curvilinear motifs of complex nature, some natural forms ?, fine lands and grooves, well executed, little overstamp; jars with semi-conoidal bases, small tetrapods, all over stamping; notched and scalloped lips. (McMichael 1960: 211)

It is quite obvious from the above that many of the criteria used by McMichael to distinguish "Deptford Complicated Stamped" from Early Swift Creek Complicated Stamped are subjective. There is little or no difference between the complicated-stamped material from the lower and upper levels of the Middle Woodland portion of Mound A. The temper, paste, and execution are identical. Motifs remain generally similar although there is an elaboration of motifs in the upper levels. Tetrapods do tend to decrease in size up through the levels, but this is a trend that has been noted many times elsewhere. Apparently notched and scalloped lips are the "diagnostics of Early Swift Creek" that are absent in Mandeville I. This is incorrect, for notched and scalloped lips <u>are</u> found in Mandeville I. A little over 14% of the rims from Layer I alone are notched or scalloped.

Plain and polished wares make up 50% of the total ceramic inventory of the four Middle Woodland midden layers. In layers I and II, the check-stamped, but not the simple-stamped, pottery is more abundant than is the complicated-stamped pottery. In layers III and IV, this situation is reversed with the complicated-stamped pottery outnumbering the combined total of check and simple-stamped pottery. A few red-filmed, negative-painted, and rocker-stamped sherds are found in the lower levels as well as in the upper levels of the mound.

There are not enough differences between the upper and lower levels to justify the naming of the two components, Mandeville I and II. McMichael, in defining these two components, was influenced by the traditional view of many southeastern archaeologists that Deptford people made Deptford pots and Swift Creek people made Swift Creek pots with the implicit assumption that the two pottery types always indicated that two different groups of people were involved. McMichael confused the concepts of pottery type and ceramic complex. A type is "a pattern of attributes that distinguishes a group of artifacts and defines it as a class"(Rouse 1972: 300). A ceramic complex is "the sum total of types, varieties, and modes of an archaeological phase"(Phillips 1970: 24-25).

The present interpretation of the ceramics and other artifacts from Mandeville is that there is an uninterrupted continuum from Layer I up through Layer IV. The addition of some new ideas and traits is evident, but these do not materially affect the ceramic tradition at the site. Mandeville I and II actually represent a single component. The problem, then, becomes one of deciding whether to call this occupation Late Deptford or Early Swift Creek. It would seem more appropriate to use the term Early Swift Creek because it is the overall dominant decorated type at the site and because complicated stamping was a dominant mode in southeastern ceramics from Early Swift Creek up to the historic period while check stamping continued only as a minority type. Having made this decision to call the component at Mandeville Early Swift Creek, it is necessary to define tentatively an Early Swift Creek ceramic complex.

At least three relatively pure Early Swift Creek sites are known. They are Mandeville, Halloca Creek, and site 1 Br 15. In addition, the lower levels of the Swift Creek mound and the Santa Rosa-Swift Creek sites of Florida are Early Swift Creek components.

The Halloca Creek site is an Early Swift Creek village on the Ft. Benning military base south of Columbus. No mounds were associated with this village. Site 1 Br 15 is on the Alabama side of the Chattahoochee River just north of Eufaula. It is a mound and village site. The mound, judging from a manuscript report generously provided to the author by David DeJarnette, is similar to Mound A at Mandeville except that there is less midden accumulation. Because check-stamped pottery outnumbered the Swift Creek pottery, it would seem that the site was contemporary with the early levels of Mound A at Mandeville. The Swift Creek site is a mound and village site near Macon. Early to Late Swift Creek is represented at this site in a stratigraphic sequence in the mound.

The following table of pottery types from the various Early Swift Creek sites is based upon this author's analysis of Mandeville, her perusal of the Halloca Creek and Swift Creek ceramics, DeJarnette's paper on 1 Br 15, and Willey's 1949 definition of Santa Rosa-Swift Creek ceramics. (Table 1) A comparison of the ceramic assemblages from these four sites has prompted the author to propose an Early Swift Creek ceramic complex to include the following types:

Early Swift Creek Complicated Stamped
Crooked River Compicated Stamped
Check Stamped
Simple Stamped
Cord Marked
Plain

Analysis of collections from additional Early Swift Creek sites are needed to test the validity of this list. It seems to be supported by the presence of all thes types in the Santa Rosa-Swift Creek complex of northwest Florida. The above types also seem to occur together on the Georgia coast at least as far north as the Altamaha River (Charles Pearson, personal communication).

Returning to the title of this paper, the relationship between Deptford and Swift Creek at the Mandeville site is as follows: both were an integral part of a total ceramic complex for which the name Early Swift Creek is offered. The consideration of the co-occurrence of Deptford and Swift Creek at

	Mandeville	Halloca Creek	1 Br 15	Swift Creek	Santa Rosa-Swift Creek
Early Swift Creek Comp. St.	+	+	+	+	+
Crooked River Comp. St.	+	+	+	+	+
Check Stamped	+	+	+	+	+
Simple Stamped	+	+	+	+	+
Cord Marked	+	+	+	+	+
Plain	+	+	+	+	+
Polished	+				
Red-filmed	+				+
Negative-filmed	+				+
Rocker-stamped	+				+
St. Andrews Comp. St.	+	+			+
Limestone-tempered plain	+				
Limestone-tempered cord-m.	+				
Fiber-tempered plain	+	+		+	
New River Comp. Stamped		+			+
Alligator Bayou Stamped	+				+
Basin Bayou Incised	+				+
Santa Rosa Stamped					+
Santa Rosa Punctate					+
Crystal River Incised					+
Crystal River Zoned Red					+
Pierce Zoned Red	+				+

Table 1. Early Swift Creek Sites, Ceramic Inventory

Mandeville in terms of a total ceramic complex should prove to be more useful in the explication of cultural dynamics than will be the consideration of each as separate types requiring such explanations as "the sample is mixed," "Swift Creek pottery has intruded into Deptford," or "Deptford traits have lingered into Early Swift Creek."

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Ceramic Technology of the Nodena Phase Peoples (ca. A.D. 1400-1700)

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For the last two and one half years I have been involved in research concerning the late prehistoric Nodena phase peoples who were alive around A.D. 1400 to 1700. This late Mississippian society occupied an area immediately west of the Mississippi River from just north of Memphis to about the Missouri-Arkansas state line. Geographically, this area of the Eastern Lowlands is separated from the Cache River in the Western Lowlands by Crowley's Ridge.

Mississippi and Crittenden counties of Arkansas contain almost the totality of Nodena phase sites although a handful of sites exist in southeast Missouri and along the Tennessee side of the Mississippi River. Soil surveys done in both of these counties by the Soil Conservation Service (Ferguson and Gray 1971) show that large proportions, almost one half, of the soils are clay depsits. These clay beds were formed in slackwater areas of the Mississippi River floodplain and will vary somewhat in such qualities as organic content and color. Lower elevation deposits, which greatly predominate, tend to contain more organic materials and are consequently darker in color. All of the local clays, however, are extremely sticky or plastic and have high shrink/swell ratios. Both of these characteristics are due to the minute size of the clay particles and are distinct disadvantages from the potter's point of view. In addition, because of the manner of deposition, backswamp clays often contain coarse natural inclusions such as vegetable fibers and occasionally a smooth pebble. These particles can be processed out of the clay by letting it slake through a sieve in a water-filled container. If a relatively clean source could be found, the clay might simply be soaked and the rough materials picked out. Some form of water processing is very beneficial to the clay's homogeneity and workability as it allows for all of the tiny clay particles to become thoroughly wetted. Test tiles of standard dimension, 14 x 4 x 1 cm (Rhodes 1957: 200), were formed to measure linear shrinkage rates of various clay species such as Sharkey and Alligator soils which had an average shrinkage rate of 12 to 14 per cent.

To overcome the unfavorable attributes of a gumbo-like alluvial clay, prehistoric potters generally mixed a tempering agent with the processed clay. Woodland ceramic techniques, for example, commonly entailed adding rather large proportions of coarse, non-plastic materials such as sand, grit (crushed rock), or grog (pulverized burned clay or potsherds) which tended to restrict the flexibility of the paste.

With the advent of the Mississippian culture around A.D. 900, during the Fairmount phase at Cahokia (Fowler and Hall 1972), the advantage of using the burned and crushed shells of fresh-water mussels as tempering was realized and subsequently had a revolutionary effect upon Indian ceramic technologies in the Southeast. The distinct advantage of using burned shells is that they have an ability to reduce the extreme stickiness of the local clays in a manner other than the introduction of a relatively coarse, non-plastic material. An identical ionic charge occurs on the surfaces of the clay particles and keeps them slightly repelled by each other when they are wetted. Naturally, this force is a prime reason for the tacky consistency of the local clays. Shell is chemically viewed as calcium carbonate ($CaCO_3$) which, when burned and crushed, is able to negate or neutralize the ionic repulsion. Consequently, when the clay particles collide during their random movement they tend to stay together. This flocculation process is facilitated by the presence of water and creates "large" clay particles which enhance the working quality of fine textured alluvial clays. When burned shell tempering is blended into the clay, the shift in the feel of the clay is distinct and takes place in only a few moments. Limestone and bone also have a flocculating effect on clays, and their use as tempers is known for the Fairmount phase and Caddoan peoples, respectively, of Mississippian culture. Preference for shell was probably due to its greater availability and ease of preparation.

X-ray diffraction analysis of a 6.4 kilogram lump of shell-tempered clay that was excavated from the bottom of an early Mississippian storage pit at the Zebree site, 3MS20, (Morse n.d.) conclusively showed that the temper in the unfired, ready-to-use paste was burned shell.

After observing the paste characteristics of thousands of Nodena phase sherds with a binocular microscope, two distinct paste categories can be established. The first is the basic domestic Mississippian paste, Neeley's Ferry Plain (also referred to as Mississippi Plain, Phillips 1970: 130-135 and Williams 1954: 207-208) which contains a relatively coarse, burned shell tempering. The plate-like shell particles range in size from a calcite "dust" to particles 5 and 6 mm in diameter and average about 3 and 4 mm in diameter. Vessels of Neeley's Ferry Plain tend to fire lighter colors such as buff and light grayish browns. Mississippian potters used this paste to construct jars sometimes quite large and most often with two or four handles and/or lugs. Jars functioned in the home as cooking and storage vessels although they were also placed with burials. A strong correlation exists between the Neeley's Ferry Plain paste, the vessel form for which it was used, and the decorative techniques (incising and punctations) employed.

The second Mississippian paste has been erroneously characterized in previous publications (Phillips, Ford, and Griffin 1951: 122-126; Phillips 1970: 58-61) where it is designated as Bell Plain. As such, it is described as being tempered with very finely crushed shell particles, never approaching 1 mm in diameter. While this is generally true, there is a second temper present which is very important in understanding the use of the ware but has gone relatively unnoticed. This second tempering agent is a finely crushed grog that has been prepared from sherds. A deep wooden mortar would serve ideally for the task. The fine grog particles, usually smaller than 1 mm will considerably improve the working quality of a clay body by giving it a firm, granular texture; and, because the grog is already fired, it reduces the thermal shock that occurs when the vessel is fired. In addition, because grog increases the density of the paste and acts to absorb much heat during a firing with no further effects, it decreases the rate at which the paste, as a whole, will oxidize. This accounts for the characteristically darker colors (dark grays and brownish grays) of vessels of this paste and for the dark grayish "inner core" of the typical Fine Shell and Grog sherd. Fine Shell and Grog is a supple paste that lends itself easily to exotic forms and is perfectly suitable for smooth high-luster surface finishes, the application of pigmented slips, and engraved designs. At Nodena phase sites, Fine Shell and Grog was used primarily for the manufacture of bowls, bottles, and effigy vessels. Bowls are usually well finished and decorated with notched or punctated rims, a notched horizontal applique strip just below the rim, or effigy appendages and appliques. Bottles also normally exhibit nicely smoothed even highly polished surfaces and are occasionally decorated with red and/or white pigmented slips. Effigy vessels, commonly of animal or human form, are almost always shaped from the finer paste because of the limitations of the coarser, Neeley's Ferry Plain paste. Pots of the Fine Shell and Grog ware were certainly used within the household; but, because of their capacity for more aesthetically pleasing shapes and decorations, they also functioned in the ceremonial and funerary aspects of Nodena culture. The table included is a general typology for the Nodena phase ceramic assemblage and is not intended to encompass all products. Rather, its purpose is to show more clearly the interrelations of the two basic wares, decorative techniques, and vessel forms. (Table 1)

Test tiles were formed from variations of both pastes to test the modifications of raw clay shrinkage rates. The exact percentage of tempering in a given paste can be determined by dividing the weight of the temper(s) added by the weight of the whole paste at a modeling state. In this manner, the decrease in shrinkage rates can be measured with some control over the quantity of tempering in the paste. It was learned that a paste containing as little as 10% tempering can reduce the degree of shrinkage so that, with a slow period of drying, a contoured vessel will not crack. Determining the percentage of tempering of a paste is very important as it allows for eventual comparisons between replicated vessels and actual specimens to more accurately estimate the temper/clay proportions occurring in the artifactual evidence. And, since the percentage is based on weights, the powder portions of both the grog and burned shell tempers, which are not visible once mixed with the clay, are taken into consideration. Using these methods, it was found that the Neeley's Ferry Plain paste, as mixed by the Mississippian ceramicists, normally ranged from 10% to 20% burned

NODENA PHASE--LATE MISSISSIPPIAN CERAMICS

PASTE	POTTERY TYPE OR DECORATIVE TECHNIQUE	VESSEL FORM
Neeley's Ferry--coarse burnt shell tempering with visible shell particles averaging 3.0 to 5.0 mm. in diameter. Larger plate-like shell particles tend to align themselves in a parallel manner according to forces of shaping and contouring	1) Neeleys Ferry Plain 2) Parkin Punctated 3) Barton Incised 4) Manly punctated 5) Vernon Park Applique 6) Fortune Noded 7) Kent Incised 8) Rhodes Incised	Jar--two to four strap handles or lugs, lip usually flat or rounded; small jars tend to be decorated, some with arcaded handles.
Fine Shell and Grog Fine granular texture with burnt shell and grog tempers whose visible particle sizes average 0.5 to 2.0 mm. in diameter	1) Carson Red on Buff 2) Old Town Red (Bowls infrequently exhibit the above four decorative types) 3) Nodena Red and White 4) Walls Engraved	Bottles--often have footring, beveled lip
Fine Shell and Fine Grog	1) Notched or punctated lip 2) Notched applique strip immediately below the lip 3) Effigy appendages and appliques	Bowls--flattened bottoms, beveled lip
Fine Shell and Fine Grog	1) Human and zoomorphic characters: owl, bird, bat, frog, fish, dog, human heads, opossum, turtle, serpent 2) Other effigies include: shell, gourd 3) Other vessels include: Compound vessels, teapot vessels, stirrup necked vessels	Effigy vessels--sometimes bottle or bowl shapes are significantly modified to incorporate forms

shell; and the Fine Shell and Grog paste, which shows more variation, contained about 10% burned shell and 10% or 15% grog.

The shells of freshwater mussels which were readily available in lowland streams were burned before use as tempering for two reasons. First, as a practical consideration, it is only after shell has been burned that it can be easily crushed, even with the hands, into fine plate-like particles accompanied by a significant proportion of powder. A second reason has to do with an alteration of the shell's molecular arrangement. As explained by Porter (1964: 3), the difference in crushing capacity is due to a change in the crystalline structure of shell from aragonite to calcite when it is heated above 100 degrees centigrade. Although aragonite and calcite are both chemically viewed as calcium carbonate, there is a volume change which accompanies the shift in the crystalline arrangement. This volume change would drastically weaken or even shatter a vessel during firing if the shell had not been preliminarily heated; therefore, to facilitate crushing and to negate the potentially disruptive volume change, mussel shells were burned before use as a ceramic tempering agent. And, as previously mentioned, this conclusion has been verified by X-ray diffraction analysis.

Once the tempering has been crushed or ground to the desired fineness, it must be mixed with the processed clay to produce a manageable paste. Adding the dry shell or grog temper to freshly processed clay also helps reduce its excessive wetness. Care must be taken, however, not to let the clay dry too much before adding the temper as the paste will become too stiff to work. It was learned that the easiest way to blend the tempering into the clay is when it still has a wet, almost slip-like consistency rather than kneading the tempering into the clay when it is drier. Kneading or wedging is necessary, however, and involves working the paste on a mat or plank with the hands or repeatedly cutting and recombining it for two important reasons. First, it is necessary to force air pockets out of the paste which could explode and ruin the vessel when it is fired. Secondly, wedging distributes the temper evenly throughout the paste. Otherwise, the area which contains more tempering will dry faster, creating strain which could easily crack the product.

After the clay has been tempered and wedged to a consistency slightly wetter than the modeling state, its workability can be much improved by aging. This allows time for each minute particle to be coated with a film of water and allows bacterial action to take place which has a beneficial effect on the clay's plasticity. The lump of burnt-shell tempered clay previously mentioned as having been excavated from the bottom of a storage pit at the Zebree site (3MS20) might have been placed there to undergo such an aging process.

Vessel construction can begin once the paste has been prepared. Artifactual evidences concerning the technique of vessel building are just as valuable to understanding of the primitive potter's methods as are the large scale classifications of sherd attributes such as color and temper. Sherds demonstrating vessel contour, the means of a handle or applique attachment, breakage along coil junctures, and traces of smoothing and scraping are important clues to the construction methods. The interior surfaces of constricted vessel forms such as bottles and small-mouthed jars often display markings from smoothing and scraping. By-products of clay construction which have been unintentionally fired, such as squeezes and coils, although uncommon, are also very helpful in processual reconstruction.

There are basically three ways of forming a vessel available to the pre-wheel potter. The first is the pinch method which is most commonly used for making toy pots and small bowls. Even though pinch pots are probably the quickest and easiest vessels to make, the method limits the size that can be attained. Young Indian girls learning the craft might begin by pinching and forming small vessels from fist-sized lumps of clay. Modeling is a second method which involves direct shaping of a ball of clay. Manipulative techniques such as punching, pulling, and stretching the clay are used to obtain the desired shape. Both of these methods are restrictive in terms of vessel size and variation in shape.

The third basic method of forming a vessel, coiling, has many advantages in that it allows for a far greater variety of shapes as well as sizes to be produced. Coiling was most often employed by both Mississippian and Woodland potters. This method involves rolling out clay coils and building up either a succession of rings or a long spiral in the approximate shape of the desired pot. The uniformity of a coil's thickness is reflective of the potter's abilities while the diameter of the coil is dependent upon the size of the vessel to be built. Generally, the larger the pot, the larger the coil diameter needs to be. As the coils are applied, they are blended together using the finger tips and/or some type of bone, cane, or wooden implement. This blending of coils is very important in building a strong, solid pot which will not weaken along coil lines. In this manner the contour of the vessel and its wall thickness can be well controlled by careful positioning of coils and a skillful hand. For manufacturing larger vessels, a specialized method of manipulating the clay is used--the paddle and anvil technique.

The paddle and anvil are tools used for additional coil blending, thinning the clay walls, and giving shape to larger vessel forms (Shepard 1956: 59-60). The anvil is a mushroom-shaped, fired clay tool that is held by the hand against the interior wall to support and complement the blows of the paddle on the exterior surfaces. It was necessary for anvils to be fired for two reasons. The first is that an unfired anvil will gradually take in water from the wet clay being worked and will stick and pull badly. A second reason is that the anvil's durability is greatly increased if it is fired and is likely to break if it is not. Both faults of an unfired anvil were verified experimentally. The potter's paddle could have been made of oak, hickory, or cypress with a slightly concave depression in the center of one face to aid in keeping a smooth, rounded contour. The paddle could have been wrapped in cord or netting, as were many Woodland paddles, to prevent it from sticking to the wet clay. Mississippian potters most likely did not use cord-wrapped paddles; and, if they did, all traces seem to have been erased in subsequent smoothings. In smaller pots, the walls can be sufficiently thinned and shaped with a shell, wooden, or gourd-rind scraper that tends to leave distinctive markings in the clay unless they are smoothed over.

Many decorations can be applied to a vessel when it has stiffened somewhat from modeling state. Most Mississippian decorations are incised or punctated into the exterior after all surfaces have been smoothed of unwanted irregularities and stray marks. The applique strip and design are often incorporated as the vessel is built. A hematite pigmented slip was sometimes utilized on interior and/or exterior surfaces, and designs engraved on a pot after it has air dired or been fired are not uncommon. If desired, the surface finish can be brought to a high luster by polishing it with a smooth stone when the clay has reached a "leather hard" state. Many polishing stones have been collected from Nodena phase sites, and these exhibit specific areas of high polish and striations.

After a pot has been given its final touches, it must be allowed to dry slowly, probably in some sort of wet box device. A slow and even drying is essential to prevent strains caused by rapid or differential water evaporation rates. Firing has been the most difficult phase of replication experiments to successfully duplicate. Controlled refiring experiments of sherds in an electric kiln place Nodena pottery as having been fired at approximately 600 degrees centigrade in a slightly reduced atmosphere; that is, an atmosphere which contains soot and carbonaceous gases that reduce the relative proportion of oxygen available for combination with ceramic materials. A firing was most likely held outside of places of habitation because of the potential hazard of accidentally setting fire to a building.

Firing methods were undoubtedly well established from generations of experience and experimentation. A possible firing method was designed and tested after initial experiments had indicated three necessary requirements. First, a period of dehydration is needed to remove the free water which remains in the small capillaries of the vessel's wall even after air drying. If this water was not removed by a preliminary warm-up, it would turn to steam upon firing and cause chips to spall from the vessel. Second, an efficient method of protecting the vessels from becoming sooted with carbonaceous materials was necessary. And, third, a relatively hot burning fuel is required.

A firing design which can successfully replicate Mississippian pottery involves, first of all, the excavation of a shallow basin to help retain much of the heat that is lost in above ground firings. A basin should be dug in accordance with the expected firing load. For our experiments, a pit 160 cm in diameter and 32 cm deep was constructed. Such a basin could serve easily for 6 to 8 medium size vessels or a single item. In order to warm-up the basin and especially the pots, a wood fire is allowed to burn down to coals in the pit. The vessels can be adequately preheated by setting them around the rim of the basin to absorb heat. After enough coals have been formed to cover the bottom of the pit, they are spread out, and a layer of large sherds are placed over them. The vessels are stacked tightly atop the sherds, and large sherds are also placed over the vessels until they are amply protected from direct contact with flames. It is not possible to completely isolate the pots, however; and smoke and other gases will create a considerably reducing atmosphere around the vessels. Various fuels which would have been available to the Mississippian potter were tested, and these include corn cobs, corn stalks, bark, wood, cane, and thatch. Of these, dried cane and thatch, both of which were used in house construction, proved to generate a suitable firing temperature. With a continuous burning of these fuels for about an hour in the basin, the resulting, durable ceramic containers are very similar to those manufactured by the Nodena ceramicist.

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X-Ray Radiography in Archeology

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While the use of X-ray radiography in answering basic archeological questions is not new, only a few archeologists are aware of the research value of this analytical tool. Among the more salient reasons for non-use of radiography in archeology are: a) lack of understanding the principles of radiography and the nature of the equipment available; and b) non-familiarity with the kinds of problems to which radiography is applicable.

The present paper discusses the nature of X-ray radiography and describes some of the areas in which radiography can be extremely useful. An objective here is to dispel some misconceptions regarding X-rays in general and to encourage increased usage of radiography in archeology. Due to recent developments in solid-state circuitry and microcomponents, there are radiography systems available today which anyone can learn to use. Many of these systems are small, inexpensive, and can be safely used under proper personnel monitoring conditions.

Nature of Radiography

Basically radiography is a non-destructive process of looking into and through an object which is opaque to light and vision. Such examination is made possible by the use of some form of penetrating radiation such as X-rays and a detection medium such as film or a fluoroscopic screen. The film image is called a "radiograph."

As radiation from a source passes through the material of the object being examined, the radiation is differentially absorbed per differences in material density, atomic number, and thickness. The film--or detector in this case--registers the differential radiation which has penetrated the object. Subsequent processing and development of the film produces an image of the object and its interior.

Most of the X-ray equipment used in medical radiology and industrial radiography is physically large and is found in fixed, shielded installations. Even the so-called "portable" equipment is usually fairly large in size and may be dolly mounted so as to provide mobility. In addition, most X-ray systems use thermal emission--that is, a heated filament electron source for producing X-rays.

The Fexitron

Another rather unique and small electron source, however, has recently been developed. This particular source produces electrons, and subsequently X-rays, through the phenomenon of field emission. In a small vacuum tube, very large electron currents are provided by a comb-shaped cathode. X-rays are formed at a conical tungsten anode by the incident energetic electrons. Due to the construction and operation of the field emission tube, the physical size and cooling requirements of the X-ray system are considerably less than those of the thermionic emission (heated filament) tube type. The Fexitron system will be discussed first.

Many applications for radiography in archeology require that the X-ray equipment be carried to the field or a remote site. This requirement is best met by a lightweight, easily operated portable X-ray system. We have tested such a system and found it suitable for archeology.

The Fexitron X-ray system weighs approximately 50 pounds, is self-contained, and easily operated. The unit may be powered by any conventional AC voltage source including portable generator or battery inverter power pack. The system is of the pulsed type--that is, radiation output is produced by discrete pulses. Exposure parameters are set by a switch which selects the required number of pulses, output voltage, and film-to-source distance required by the object being radiographed. A unique optional capability of this unit is the X-ray tube which can be operated externally to the basic unit within a separate tube head. The tube head can be extended by cable to a distance of 50 feet from the X-ray generator, thus enabling radiography in hard-to-reach areas. Other optional equipment which increases the utility of this unit is a battery pack and tripod for energizing and positioning the remote tube head assembly.

As with any radiation emitting equipment, operating personnel radiation safety is of prime importance. Radiation shielding has been built into this unit where required so that radiation emanating from the equipment is confined to the primary beam which is conical in cross section. Should radiation "scatter" or reflection occur due to materials in the area in which radiography is being conducted, an extended triggering cable to initiate X-ray output can be used.

Among the major criteria for film (detector) selection, are required resolution, convenience of usage, and economy. Certain "trade-offs," however, often have to be made. For example, while wet processed film provides the highest quality radiograph and is moderate in cost, processing requires a darkroom and is time consuming. On the other hand, Polaroid film, while high in cost, requires no darkroom and can be processed quickly and conveniently.

Due to the nature of the pulsed radiation system, a phosphor intensifying screen is usually used with the selected film in order to reduce the number of pulsed radiation required to produce a suitable image on the film. The film and screen are "sandwiched" in a casette which provides the required film-screen contact. Once exposed, the film can be developed in any commercially available processor.

The Faxitron

Where artifact or object of interest can be easily obtained and/or carried to the laboratory, a second type of X-ray equipment can be used. Although physically larger and heavier than the portable unit, the self-contained Faxitron X-ray system will fit on a laboratory bench top occupying only 4 square feet of surface area. The Faxitron operates from any conventional 115/230, 50/60 Hz, AC voltage source. The sample compartment in which the object of interest is placed contains integral shielding for radiation safety. All operating controls are readily accessible. Unlike the X-ray source used in the portable system, the Faxitron utilizes a thermionic emission electron source which is oil-cooled to produce X-rays. When the high voltage is turned on, X-rays are produced continuously until the voltage is turned off.

A unique option of this equipment is the automatic exposure control which simplifies operation of the unit to the point of being analogous to the operation of a copying machine. When the object to be radiographed is placed over a sensor in the X-ray cabinet, one merely turns the voltage to an indicated dose rate and awaits his radiograph. As with the portable Fexitron, the system contains all shielding required by state and federal regulations.

An extremely useful Faxitron option is fluoroscopy. Fluoroscopy permits direct viewing of a specimen while it is subjected to penetrating radiation. Operating principles are similar to those of the fluoroscopes once used to size shoes to one's feet. The specimen of interest is placed on a phosphor screen inside the Faxitron cabinet which emits light when struck with radiation. Beneath the screen is a mirror which reflects the image through a magnifying lens. The magnified image is viewed through a small lead glass window built into the door of the sample compartment. The window screens the operator from harmful radiation and is interlocked so that should the window be broken, X-rays will not be produced. Fluoroscopy does not offer the resolution and fine detail of film. However, it often enables preliminary examination of the interior of an object of interest.

Archeological Applications

Time and circumstances do not permit us to list and describe here the archeological parameters to which X-ray radiography applies. There are, however, five applications areas which will be of interest to all. These are radiographs of cores, balks, interiors of encrusted artifacts, ceramic motifs, and structural features of buildings.

Survey cores. Increasingly, archeologists are turning to cores as a means of determining horizontal and vertical loci of archeological sites. Several coring units currently used by archeologists have been adopted from shallow and deep water oceanographic applications. Of significance here is the fact that the core barrel can be radiographed, and its contents often clearly reveal such important items as ceramics, seeds, bone, and other items of significance to the investigating archeologist (Schneider n.d.). Radiographs of PVC, aluminum, or steel core barrels and their contents are easily taken. Interpretation, however, can pose difficulties. Differences in densities between soil medium and the specimen of archeological interest often yield in a radiograph irregularities which only a trained eye could see. The value, however, of cores and corresponding radiographs should not be lightly taken as these permit rapid evaluation of a site, its contents, and its extent.

Excavation Balks. Archeologists are both pro and con the use of balks in excavating archeological sites. But, in any event, balks are needed, often used, and do provide stratigraphic information. Balks are also time capsules and contain a great deal of information easily missed by the excavating archeologist. Radiographs of balks can reveal not only differences in stratigraphy but contents as well. Most likely, ceramics will appear on a radiography of a balk. Similarly, nails and other heavy density materials are discernable. While experimenting with various "cocktails," we have discovered that balk profiles can in fact be enriched and, when radiographed, can yield depositional history of sites not discernable to the researcher's unaided eye.

Interiors of encrusted artifacts. A major application for X-ray radiography lies in the examination of metallic objects which have been severely oxidized. Radiographs of unknown "clumps" of materials can be extraordinarily revealing. Panpipes from Joe Caldwell's recent Dade County, Georgia excavations clearly came to life through radiography. The panpipes were in a condition such that, should they have been dissected by scalpel and pick, their shape and form would never have been known. Radiographs, as we have noted, form a film image based upon densities of objects, and the radiographs of Caldwell's panpipes showed not only their form but their copper-silver laminated construction as well.

Marine conditions are often considered as adverse to the preservation of metallic specimens. Consider, for example, a file or chisel abandoned in a lake or pond. One would expect "rust" to set in altering the intrinsic nature of the specimen. Such alterations are ideally suited to X-ray radiography. We have radiographed dozens of specimens retrieved from the Modern Greece, a ship which lies in coastal North Carolina waters. Most of the artifacts recovered from this ship are parcels of spoons, forks, knives, and tools of various trades. Preservation by electrolysis is difficult at best and is dependent upon separation of each item from its encapsulated container initially. There are many oxidized parcels which can not be broken down into their components; however, radiographs of the parcels sharply reveal their contents. Consider an apparent conglomerate of rust measuring 8 inches long and 1.5 inches wide. While it obviously represents the remains of a valued object (or objects), the researcher is initially faced with the problem of identification before he can proceed with specimen analysis. Dissection of the conglomerate is dependent upon prior knowledge of its contents. Such data can be gleaned by a radiograph of the specimen. The radiograph would show both the nature of the items of interest as well as the conditions of their preservation. Rust appears as shadows in the medium, and the outlines of the specimen can easily be detected.

Designs inscribed on ceramics. Archeologists are often faced with the difficult problem of identifying pottery types and tracing their origins. For recordation as well as research, pottery samples are normally photographed as a matter of course. The time expended in setting up a series of ceramics for photography is long and the resulting photographs are often not rewarding.

Many ceramic types, however, can be quickly and easily radiographed on a 1:1 ratio. The radiographs enable both motif and inscription examination as well as identification of temper and often the nature of the ceramic matrix.

Construction of whole pots can also be revealed through radiographs or fluoroscopy, or both. We have noted flaws in construction which led to destruction of pottery objects upon initial firing or later usage. In most cases, the lands and grooves are clearly identifiable;and, when saturated with heavy density liquids, the coiled construction of pottery can be brought out on film.

Of interest here is the identification of stamp "flaws" on sherds. Regardless of the impression medium, the stampmaker in every case left his own "trace in memory" while constructing an accepted design. Archeologists have long been aware of the fact that Henry Ford's notion of the "production line" had a historical precedent in North America; however, tracing the movement of pottery from one place to another has posed real problems. While not the solid solution, radiographs can indeed aid in the identification of "flaws" on sherds. Design mistakes--if we can call them such--can be revealed through radiography thereby enabling the interested researcher an opportunity to study the nature of ceramic elemental design, origin of manufacture, and spatial and temporal distribution. Design enhancement can be made by dusting the ceramic specimen with 300-mesh lead.

Structural features of buildings. Identification of the construction of buildings has particular relevance to the archeology of extant historic structures. Here is an applications area which has been little explored. Corner joists, nails, lathing strips, and other construction features are indicative of the periods of construction of many buildings. Such items also suggest the purpose of a building and reflect the kinds of activities which occurred inside a given structure.

In most instances, examination of historic structures is imperative. Most often a historic structure is torn apart during the course of analysis by architectural historians. Consider a 17th century building which has undergone, during the course of its life, renovations to provide facilities for multifamily dwelling and a townhouse. Should one wish to evaluate the periods of corresponding renovation--walls, window frames, floors, and other construction features would have to be revealed. Normally, the drama of activity within a historic building is revealed by peeling its history away. Radiographs of the significant time-capsule building construction features, however, can be quite revealing. Nails, joist construction, and lathing strips have their own temporal parameters, and these can be revealed non-destructively through radiography. We have discovered that the Fexitron can be an extremely useful tool in determining a given structure's history. When properly surveyed, a building can be "analyzed" by X-ray radiography in half the time normally required for review by architectural historians.

Film Selection

We have discovered that Polaroid film can be used in most archeological applications. The advantages of Polaroid film include sensitivity and the rapidity of film processing. However, there are other areas of applications of X-ray radiography which do require greater detail. Among these are tracing the physical changes in skeletal populations due to shifts from an animal to vegetarian diet. The so-called "Harris lines" in long bones of young persons are often indicative of such a change in diet and can clearly be documented on the more sensitive wet industrial film. One must be aware of the differences between a positive and a negative image, however; and experience in every case is the teacher.

Summary

X-ray radiography is a very useful tool for archeology. Its potential, however, has to be developed by the practicing archeologist. While physically "harmful." X-rays are contained or compartmentalized by modern-day X-ray systems. Proper personnel monitoring equipment insures the X-ray system operator that his exposure rate is not overdue.

X-ray radiography is an inexpensive solution to the examination of archeological specimens of interest. Whether a balk, core, artifact, or structural feature of a building, radiographs offer rapid evaluation of the subject matter at hand.[1]

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[1]Our thanks go to the Hewlett-Packard Company for use of their established as well as experimental equipment. Funds for the production of the present paper were provided by the Department of Cultural Resources, Division of Archives and History, Archaeology Section; and to this department we owe our gratitude. North Carolina is an innovative state; the Archaeology Section responds accordingly.

Semisubterranean Structures and Their Spatial Distribution at the Marksville Site (16Av-1)

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In the spring of 1935 Dache Reeves, an Army captain stationed in central Louisiana, took a series of aerial photographs of the Marksville site. The photographs showed a variety of cultural features which were unrecognizable on the ground. The negatives were presented to Frank Setzler and deposited in the U. S. National Museum along with Setzler's notes and artifacts from the Marksville excavations.

In the winter of 1969 the author examined one of the Reeves' photographs in the possession of Robert S. Neitzel. Over fifty light gray circular discolorations and five gray curvilinear stains were observed on the photograph. Comparison with Fowke's (1928) site map showed that the light gray circular discolorations corresponded to his "lodge sites" while the linear features marked the former location of earthen embankments similar to the one which surrounds the Marksville mound group. Examination of aerial photographs taken by the U. S. Department of Agriculture in 1941, 1951, and 1962 showed that many of the features observed on the Reeves photograph had been destroyed or damaged in the intervening years by cultivation. The "lodge site" discolorations were characterized by a circular or oval outline, a light gray color which contrasted sharply with the surrounding fields, and a dark gray to black interior. The cultural features were distinguished from naturally occurring pimple mounds by their size, shape, distribution, and regular outline. Subsequent examination has shown that the light gray discoloration is due to the reduction of the surrounding earthen embankment by cultivation while the dark interior is the product of the accumulation of organic debris and increased moisture content in the center of the depression (Figure 1).

In 1927 Fowke recorded two mound enclosures (Enclosure A and B), one circular earthen embankment, and eight circular depressions which he labeled lodge sites. Several of the structures had been damaged by cultivation or erosion, and in the case of Lodge Site 8 the surrounding earthen embankment had been completely obliterated by cultivation. A detailed analysis of the aerial photographs showed at least seventy-four circular depressions, the mound enclosures mentioned by Fowke, and three previously unrecorded earthen embankments. In addition, the circular depressions were clustered into four identifiable groups. The linear arrangement of the features north of Enclosure A suggests a planned axis or avenue. Two of the four clusters are associated with circular earthworks (Fig. 2).

An aerial reconnaissance conducted in the spring of 1970 showed that much of the area had been urbanized since Reeves first photographed the site in 1935. The open areas were no longer cultivated, and many of the old fields were either

Figure 1. Aerial Photograph of the Marksville Site Taken by Reeves in 1935.

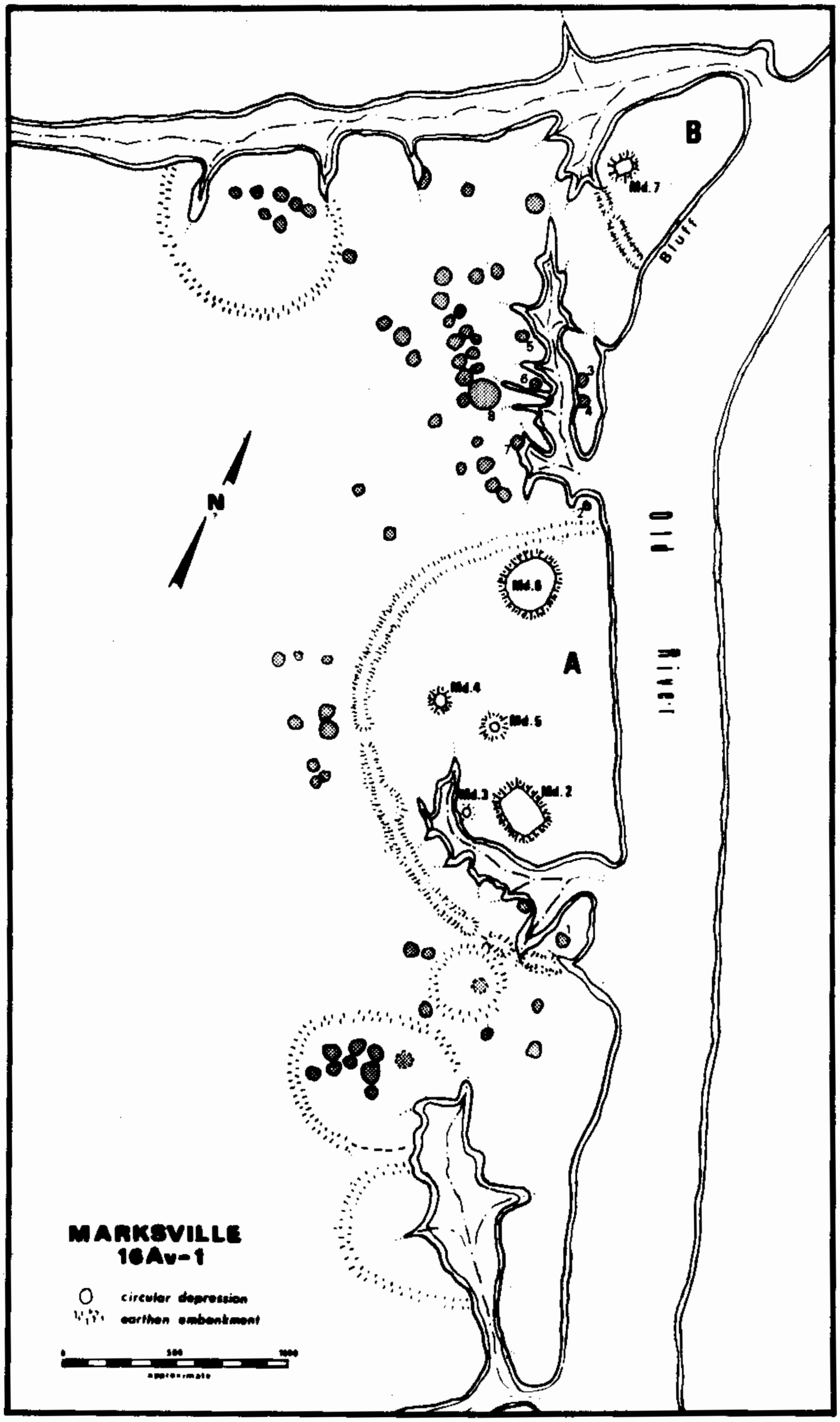

Figure 2. The Marksville Site.

abandoned or used for pasture. With the exception of Enclosure A, the circular embankment south of the main enclosure, and Lodge Site 8, no prehistoric cultural features were observed from the air. Black and white, color, black and white infrared, and color infrared failed to show any trace of the structures.

Fortunately, the ground reconnaissance showed that fragments of three circular depressions (Fowke's Lodge Sites 3, 4, and 6) and a portion of the southern embankment were still preserved. The existing features were all located in wooded areas, and their preservation is undoubtedly related to the inability of the plow to reach these areas. The three circular depressions had been previously recorded and described by Fowke (1927); but, unfortunately, they had been severely damaged by erosion since they were first reported. The remaining structures were mapped using a contour interval of one-half foot; and Site 6, the better preserved of the group, was selected for excavation.

Of particular importance to this study are the small circular depressions described by Fowke (1928) under the collective label of "lodge sites." They are described as "a small embankment, usually circular or nearly so, though sometimes rectangular, perhaps square, with a break or passageway at some point in the wall"(Fowke 1928: 433). Concerning their function, Fowke (1928: 433) offers the following hypothesis:

> Each marks the site of a dwelling for a single family; of a communal house which serves as a home for several families; of a council house; of an edifice for the performance of religious rites or ceremonies; or of any other sort of building of a somewhat permanent nature which might be needed or desired.

Concerning building form and construction methods he states:

> Usually the embankment is formed by excavating a trench varying with the purpose for which it is intended and piling the earth around the margin. It may (the earthen embankment) form a reinforcement for posts or palisades, which make the walls; or it may be piled against the bottom of a slighter structure as a protection against wind or surface water from heavy rainfall (Fowke 1928: 433).

In view of the fact that Fowke did not test or excavate any of the structures his hypothesis remained untested.

When the site was first visited in 1927, eight depressions were still visible on the surface. Fowke (1928: 433-434) provided measurements on the maximum width, interior diameter, diameter from crest to crest, and height of the wall. Of the eight sites, only one is situated inside of Enclosure A while the remainder are located in a loosely defined cluster 600-800 feet north of the main enclosure. Fowke reported that several of the structures had been damaged by cultivation or erosion; and, in the case of Site 8, the earthen embankment had been completely obliterated by cultivation.

Previous Work

In the course of the various excavations at the Marksville site, two semisubterranean structures were excavated, and a circular embankment was tested. The published reports on the excavations are brief, but they do provide a basis for comparison. Although construction details and overall morphology of the structures vary, the published descriptions show that semisubterranean structures with large central fireplaces form an integral component of the Marksville site.

House A. House A is an unusual rectangular semisubterranean structure that was uncovered by Setzler (1934: 38) in his village excavations inside of Enclosure A. Although it is difficult to determine the exact provenience of the "village excavation unit" the 1935 aerial photographs show a large rectangular disturbed area approximately 250 feet southeast of Mound 6. The structure was accidentally discovered during the excavations, and it apparently had no surface expression to indicate its position. Fowke (1928) does not mention any circular depressions or embankments in this area.

Published descriptions of House A are brief and lack many desirable details. All published descriptions agree that the structure was semisubterranean and contained a large central pit. Ford (1936: 230) writes:

> It was small, square in shape, and sunken slightly beneath the old surface of the ground. In the middle of the floor was a square pit with postholes in the corners that extended six feet below the floor of the structure.

The excavation plan of the structure, on exhibit in the Marksville Museum, confirms that the structure is actually rectangular, measuring 26.5 feet in length with a maximum width of 20.5 feet (Figure 3). The floor was irregular, varying from less than one foot on the north to three feet on the south. A series of postholes lined the inside of the north and south walls of the structure. An irregularly shaped burned clay fireplace containing charred wood was found inside of the west wall. No passage or entrance was detected in the excavations. Ford makes no mention of any wattle or daub fragments in his brief report.

The most unusual feature of House A is a large rectangular pit that occupied the central portion of the structure. The central pit is 14.5 feet long, 9 feet wide, and extends 6 feet below the floor of the structure. A single large posthole was located in each of its four corners. The walls were slightly irregular, and the floor of the pit was covered with burned logs and charred cane fragments. A great quantity of ceramics were found on the house floor, but the collection includes ceramic varieties covering virtually the entire temporal span of the Marksville Period. In his ceramic analysis of the Marksville collection, Toth (1974: 55) noted that the ceramics found within House A are similar to the village ceramics found above and around the structure. He concludes that

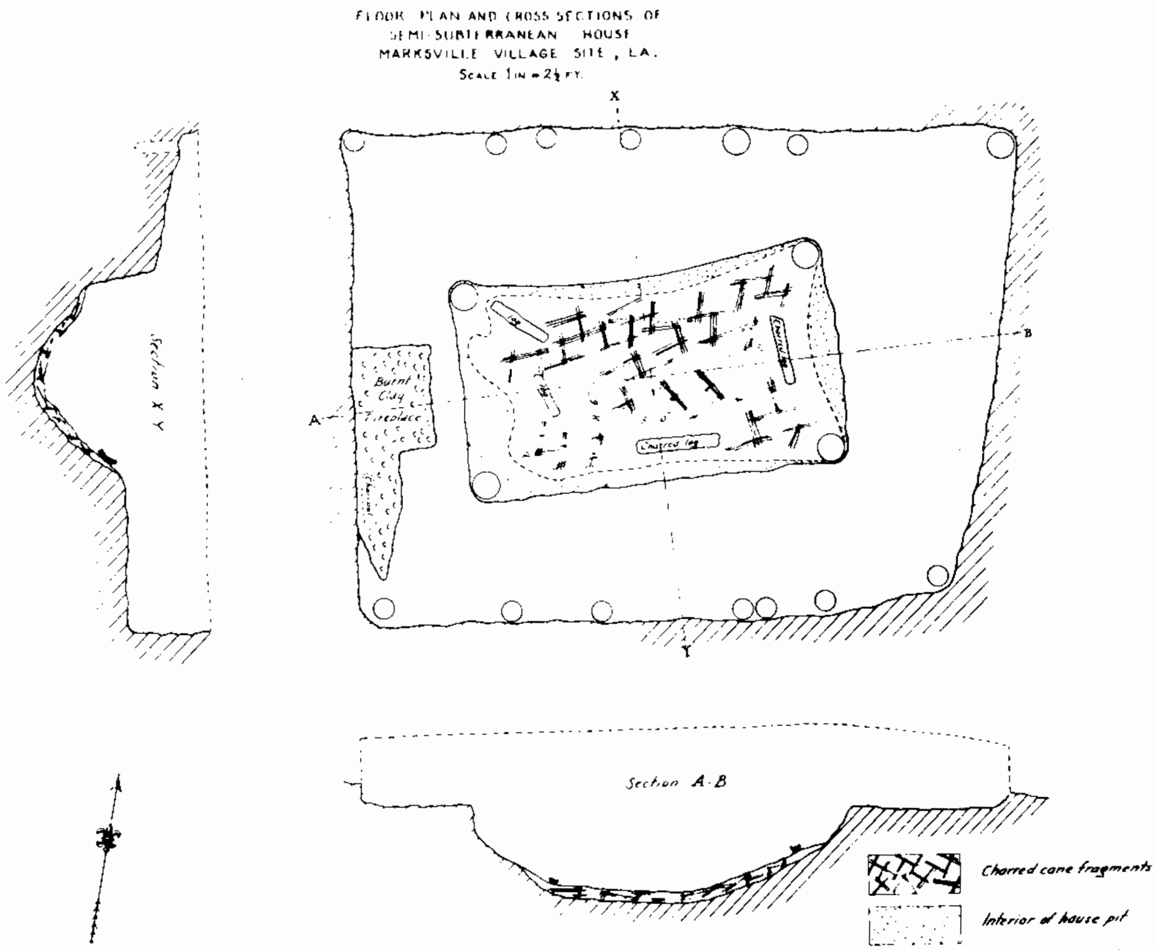

Figure 3. House A, Marksville Site.

the ceramics represent a deposit of mixed site midden that filled the house depression rather than the refuse accumulated by the occupants of the structure. While it is not possible to accurately place the construction of House A within a specific Marksville phase, the ceramics do indicate that the structure was abandoned during the Marksville Period and does not represent a reuse of the site by a later cultural group. The most reasonable guess is that House A predates or is contemporary with the construction of the burial mounds at the site (Toth 1974: 115).

House B. A second structure, recorded as House B, was found during the WPA excavations conducted by Neitzel and Doran. This small rectangular pit house, located on the west flank of Mound 2, measured 10 feet long and 8 feet wide. The center of House B contained a depression flanked by a single posthole at each end (Vescelius 1957: 418). Charred wood was found in the central depression. With the exception of a rough outline published by Vescelius (1957: 418) there are no known scale drawings or photographs of the structure available for study.

Circular depression. As part of the WPA excavations, Neitzel tested a circular depression, ringed by an embankment, approximately 350 feet southeast of Mound 2 (Vescelius 1957: 418). Judging from Vescelius' description and provenience data in the LSU catalog Neitzel probably excavated the depression shown on the 1935 aerial photograph east of Mound 2. Ten squares, ten feet on a side, were cut into the feature to an average depth of only six inches. One square was taken down to fifteen inches and another to nine inches (Toth 1974: 63). Neitzel made a collection of potsherds, but he did not locate any postholes or a central firepit. Judging from the 1970 excavations at Fowke's Site 6, a central depression may not have been discernible at the six inch level. Neitzel (1970, personal communication) has indicated that this feature should be reexamined in light of the discoveries at Site 6.

Excavations

In 1970 partial excavation of Fowke's Lodge Site 6 showed that the interior of the circular depression was occupied by a shallow semisubterranean structure with a deep central firepit. The entire structure was surrounded by a semicircular earthen embankment which may have served as the base for a retaining wall or palisade (Figures 4 and 5).

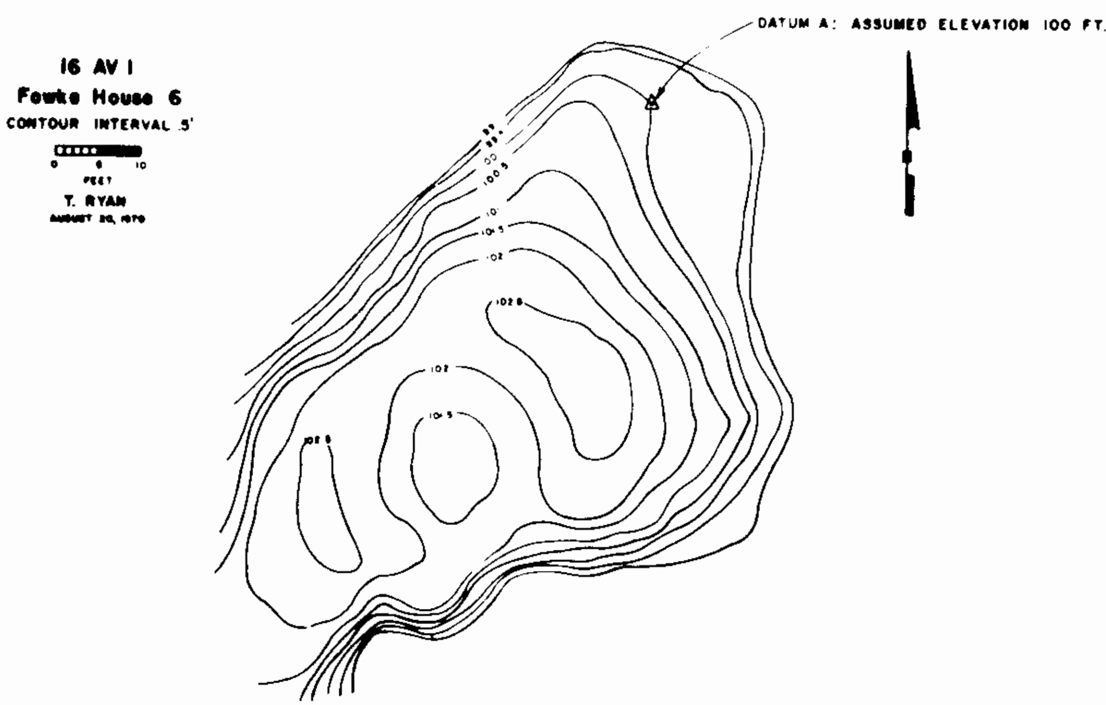

Figure 4. Fowke House 6.

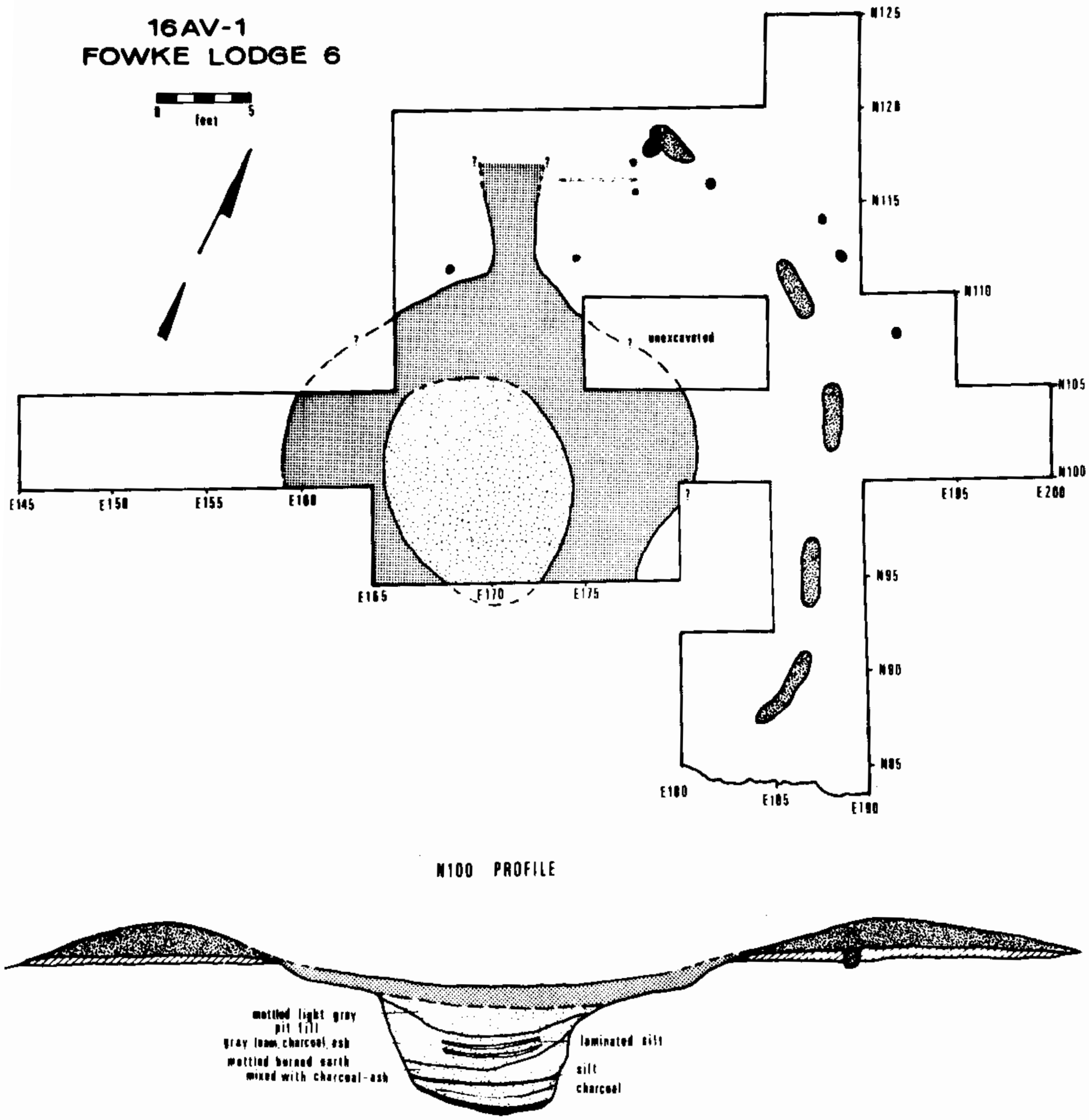

Figure 5. Plan and Profile of Fowke's Lodge Site 6 Based on 1970 Excavations.

The excavations showed that the floor was situated approximately .7 foot beneath the original ground surface. The outline of the floor was difficult to trace due to slumping caused by the horizontal movement of ground water and extensive lateral erosion on the southern flank of the site. The overall outline suggested an irregular rectangle or, possibly, an oval plan; but the exact configuration needs to be substantiated by further excavations. Entrance was provided by a narrow semisubterranean passageway which faced the northern break in the embankment. Following the abandonment of the structure, the floor filled with a dull pink clay which probably accumulated as slope wash from the adjacent earthen embankment. The semisubterranean floor enclosed approximately 325 square feet of useable living space. In contrast to Houses A and B, which served as garbage receptacles following their abandonment, Lodge Site 6 was almost totally void of any cultural debris. The handfull of undecorated worn sherds found in the fill of the embankment represent a secondary deposit and are not contemporary with the structure.

In the center of the subterranean floor a large circular firepit approximately 11 feet wide and 7 feet deep was uncovered. The pit profile showed a complex sequence of charcoal, burned earth, and ash. The bottom of the pit was covered by a uniform 2 inch thick layer of charcoal. The charcoal zone was, in turn, covered by a layer of mottled burned earth which contained small lumps of baked clay, dispersed charcoal fragments, and small concentrations of ash. The lower portion of this deposit, in contact with the underlying charcoal, was slightly baked indicating that the fire was still burning or at least warm when the filling of the pit began. The burned layer contained a lens of fine water deposited silt which showed evidence of internal stratification.

This deposit was followed by 2.5 feet of light gray sandy loam which contained two distinct lenses of well laminated silt. The gray loam contained a high ash content and numerous dispersed fragments of charcoal. The remainder of the pit was filled with a gray sandy loam which contained scattered charcoal fragments. Charcoal from this feature has been submitted to the radiocarbon laboratory at Louisiana State University.

The N100 profile showed that, in an undisturbed condition, subsoil consists of a uniform mottled yellow-brown clay loam with numerous manganese nodules. The nodules continued in an unbroken band across the feature fill indicating that the nodules were formed after the abandonment of the structure. A thin horizontal layer of light gray silt was deposited directly over the subsoil. The gray silt was encountered directly beneath the earthen embankment and may represent the original ground surface rather than an artificial accumulation (Fig. 5).

Directly beneath the western edge of the embankment a series of narrow slot trenches were encountered. The slot trenches formed an arc around the structure and generally followed the strike of the earthen embankment. The short trenches originated on or within the gray silt layer and extended down into the subsoil. The fill was a uniform silty gray loam which contained small amounts of burned earth and a small quantity of charcoal. The slot trenches may have served as the basal support for a wall or palisade although no clearly defined postholes were recognized during the excavations. Several scattered postholes were found on the northeast side of the embankment, but no definite pattern could be distinguished from their distribution.

Interpretation

Although the available data from Marksville are scanty, some general observations and comparisons are warranted at this time. All three of the excavated Marksville structures are semisubterranean and contain a deep central pit with evidence of burning. The pits ranged in depth from 6 to 7 feet. The accumulation of standing water in a south Louisiana pit house would become a major hazard following even a moderate summer shower. Even if the structures had been roofed or otherwise protected from the elements the horizontal movement of ground water on the Avoyelles Prairie would have made life miserable if not impossible for the aboriginal inhabitants. The laminated silt lenses indicate that the structure was flooded on at least three separate occasions. In view of the moist climate and prevailing ground water conditions, the Marksville structures were probably utilized for only a short period of time before they were filled and abandoned. A detailed granularmetric analysis of the sediments may provide data on the season and the length of time each structure was occupied.

The total lack of any artifacts commonly associated with domestic activities further strengthens a non-residential hypothesis. The handfull of artifacts found at Lodge Site 6 were all incorporated into the fill of the earthen embankment and do not represent the remains of primary <u>in situ</u> activities. It should also be noted that in all three of the excavated structures small domestic hearths and storage pits were absent.

The use of internal floor space also suggests a non-residential function for the Marksville structures. Of the total floor space of House A, approximately 28% was occupied by the central firepit. This percentage is quite high when compared to later Mississippian houses where the central fire basin occupied only a small portion of the total area. On the Duck River, Nash (1968) excavated a series of Mississippian Period residential mounds which are morphologically very similar to the circular depressions at Marksville. At one of the sites, Nash excavated a square house which enclosed roughly 440 square feet of floor area. Of this total less than 1% was occupied by the central fire basin. This figure seems to be representative of most residential structures of this period.

On the other hand, the submound sweat house excavated at the Peachtree Mound site in North Carolina (Setzler and Jennings 1941) showed a much higher ratio. The interior of the structure enclosed approximately 400 square feet; of this total, 34% was covered by burned earth and charcoal. This figure compares very favorably with the 28% figure computed for House A at Marksville. In light of the lack of domestic artifacts, the presence of a large central firepit, and the high hearth/floor ratio, it is not unreasonable to propose that the Marksville structures functioned as direct fire sweat houses where exposure to the fire was used to induce sweating. The use of the steam bath for both religious and medical purposes by historic Southeastern tribes is well documented.

While I am not prepared, at this time, to propose that all of the structures observed on the aerial photographs functioned as sweat houses, the excavation of Lodge Site 6 and the data from Houses A and B suggest that the Marksville structures did not function as residential units. Admittedly, much of the evidence is indirect and needs to be substantiated by further excavation, but the sweat house hypothesis is not inconsistent with the non-secular nature of the Marksville mound group. Although the photographs show the internal morphology of the site, which can be broken down into discrete spatial units, the functional interrelationships between and among the mounds, earthworks, and subterranean structures awaits future investigation.

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A Tchefuncte House

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University of New Orleans

Excavations by the University of New Orleans Summer Field School have concentrated on the detailed and random testing of two Tchefuncte shellmiddens located 2.5 and 3.5 kilometers from the present southeastern shoreline of Lake Ponchartrain in the impounded marsh areas of eastern Orleans Parish (Figure 1). The seasons of 1972 and 1973 centered on Big Oak Island, the larger of the two sites. Excavations on Little Oak were carried out in 1974. Big Oak is a crescent-shaped shellmidden having almost 8000 square meters of exposed surface above the marsh and lying next to a relict distributary channel of an earlier stage of the Mississippi River (Figure 2).

Big Oak Island was one of the sites used by Ford and Quimby (1945) in their definition of the Tchefuncte culture, the Lower Mississippi Valley phase of the Early Woodland Period.

Our investigations revealed that Big Oak is a deep multi-component site with up to four meters of stratigraphy. The lowest component is located well beneath the artificially lowered and maintained water table at about sea level minus two meters. This component is also beneath the shellmidden and is characterized by a matrix of waterlogged, aoxic muck devoid of molluscan refuse. The artifactual material is a rich and abundant pure Tchefuncte series. A date of 2470 ± 65 radiocarbon years B.P. or 520 B.C. (UGa-640) was obtained from carbon from this muck zone. This is believed to represent the earliest Tchefuncte date that has yet been found.

The muck is overlain by a virtually sterile waterworked shell beach composed of the small brackish water clam, *Rangia cuneata*. At places this beach reaches 1.5 meters in thickness. Over the shell beach is a second Tchefuncte component in a matrix of thick discontinuous lenses of *Rangia* interspersed with thin strata of crushed shell and silt. The general appearance of this zone is that of intensive shell harvesting followed by periods of disuse. As all the strata of this zone are discontinuous, the activity loci seem to shift all over the surface of the site. The artifact content of this zone is meager with a paucity of sherds of which over 95% are plain. Two radiocarbon dates have been taken from this zone--2220 ± 200 radiocarbon years B.P. or 270 B.C. from Rangia shells (Crane and Griffin 1958) and 2185 ± 70 radiocarbon years B.P. or 235 B.C. on charcoal (UGa-642).

The highest component of the midden is distinctive only due to the ceramics it contains. A thin scattering of Marksville materials and a number of highly disturbed burials are located in the top 30 centimeters. A single sample of mixed charcoal and shells produced two dates taken from the different materials. The shell dated 2160 ± 115 radiocarbon years B.P. or

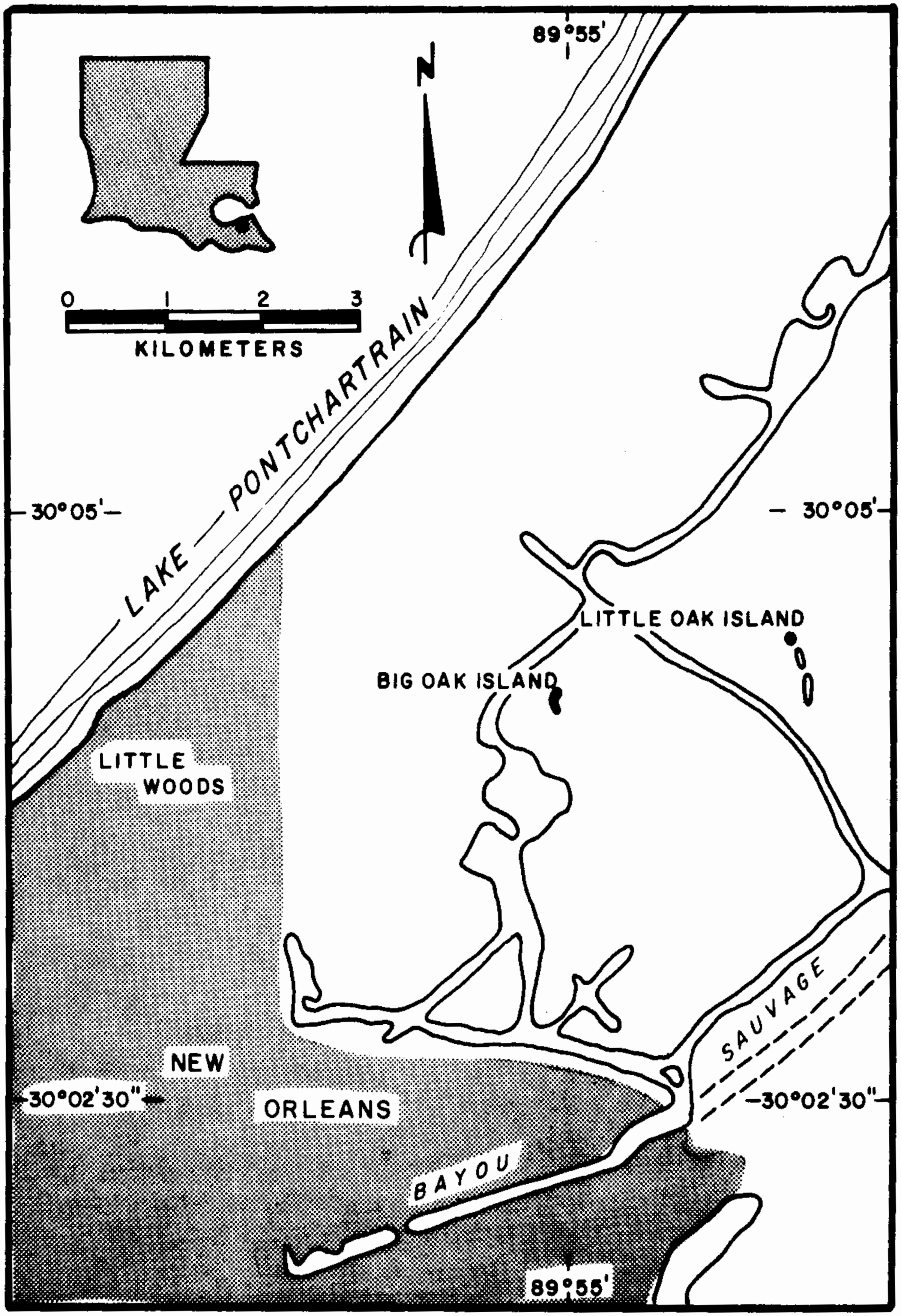

89°55'
N
0
1
2
3
KILOMETERS
LAKE
PONTCHARTRAIN
30°05'
30°05'
LITTLE OAK ISLAND
BIG OAK ISLAND
LITTLE
WOODS
NEW
ORLEANS
30°02'30"
30°02'30"
SAUVAGE
BAYOU
89°55'

FIGURE 1

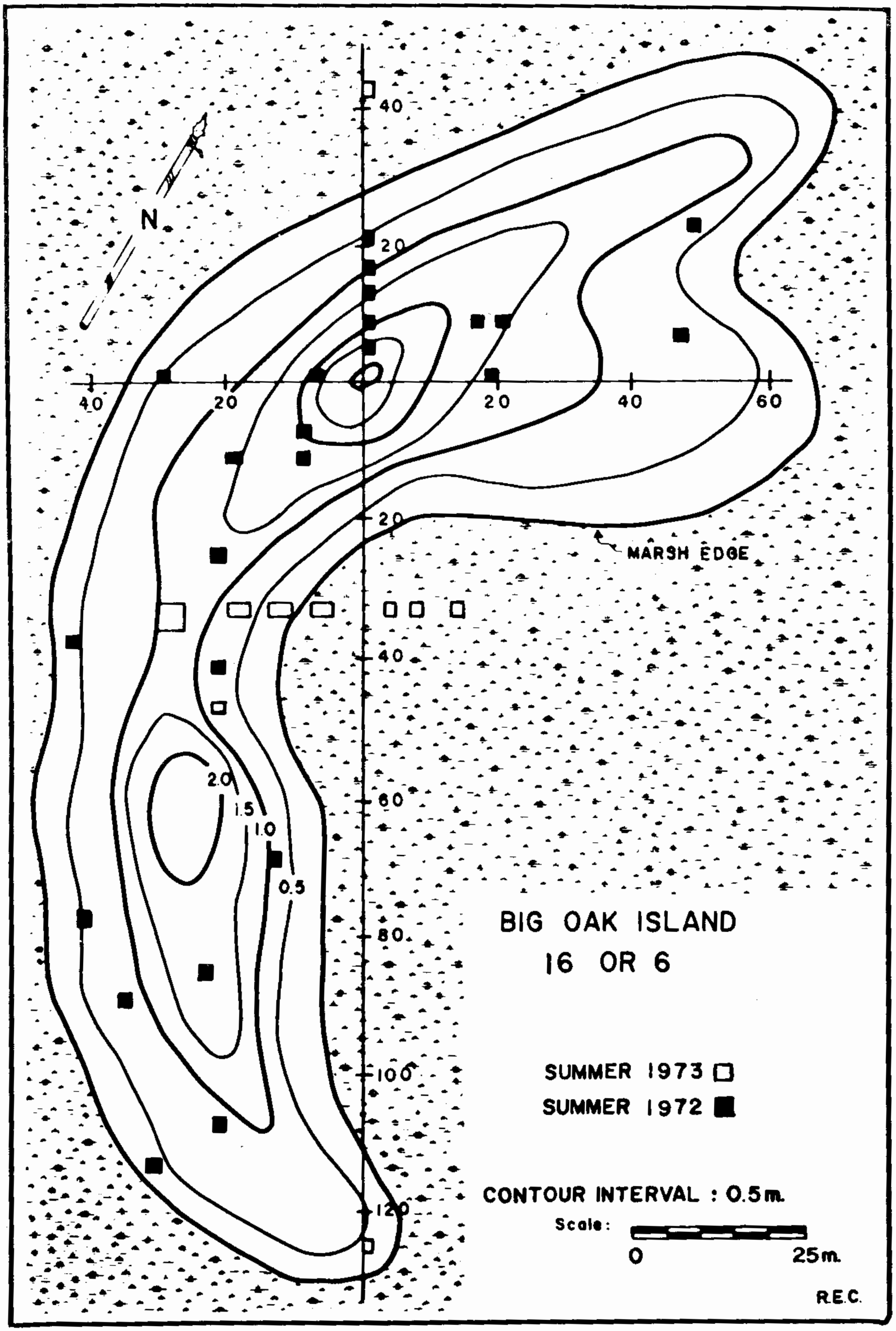

N
40
20
20
40
20
20
40
60
MARSH EDGE
40
60
2.0
1.5
1.0
0.5
80
100
120
BIG OAK ISLAND
16 OR 6
SUMMER 1973
SUMMER 1972
CONTOUR INTERVAL : 0.5m.
Scale:
0
25m.
R.E.C.

FIGURE 2

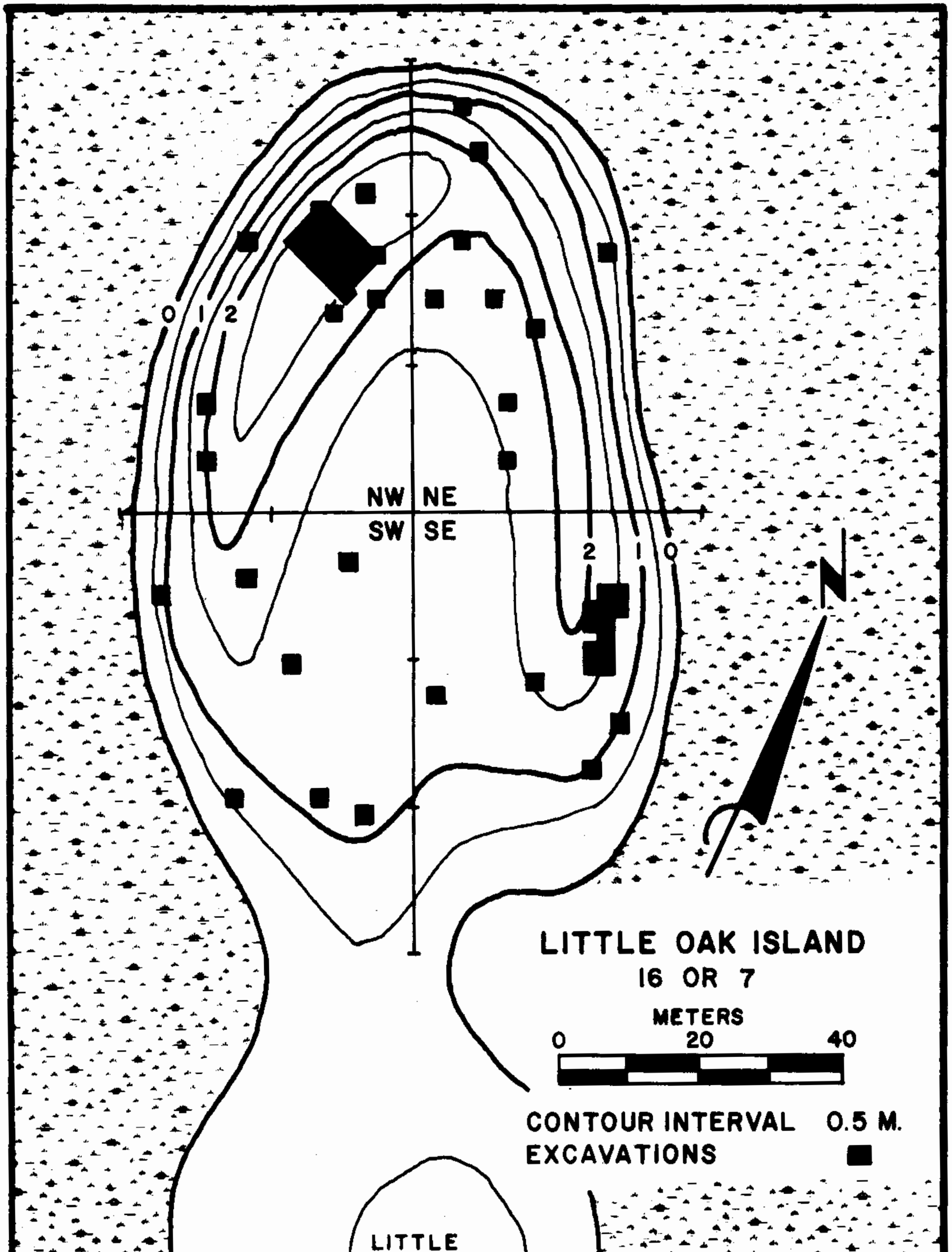

LITTLE OAK ISLAND
16 OR 7
METERS
0
20
40
CONTOUR INTERVAL 0.5 M.
EXCAVATIONS
NW
NE
SW
SE
0
1
2
2
1
0
N
LITTLE
PINE
ISLAND

FIGURE 3

210 B.C. (UGa-641a), and the charcoal gave a date of 2045 ± 105 radiocarbon years B.P. or 95 B.C. (UGa-641b). Although these two dates fall within one sigma of each other and could be averaged, I am inclined to prefer the charcoal dates and thereby maintain discrete temporal difference between the Tchefuncte and Marksville materials. Presently the later Marksville date is still the earliest date for Marksville in Louisiana.

In the course of two seasons during which forty-two 2 m by 2 m units were excavated, approximately 6500 artifacts were taken from all levels.

The 1974 field season was spent in the excavation of Little Oak Island, a shell ring located about 2 kilometers east of Big Oak. Little Oak was mentioned in Ford and Quimby (1945), but it was not excavated. Our investigations indicate that the only similarities that exist between these two sites are: 1) the content of Tchefuncte ceramics; 2) association with Rangia clam, and 3) similar latitude. Little Oak is located on an exposed dune of the Pine Island Beach Trend, a sand spit initially formed as a barrier island by action of the Gulf of Mexico about 2000-3500 B.C. (Saucier 1963: 52). Subsequent alluviation of the Mississippi River in the formation of the Cocodrie Delta between 2600 and 1600 B.C. and the later St. Bernard Delta between 850 and 250 B.C. has buried most of this beach leaving only a very few high spots (Saucier 1963: 54-72). With the cessation of active alluviation, the deltaic remnants with which both of the Oak Island sites are associated are undergoing active subsidence. The basal cultural strata of Big Oak Island occur at two meters below sea level, and borings indicate that the sand of the old Pine Island beach trend are four meters below sea level at that site.

The exposed dune on which Little Oak Island is situated is an interconnected series of three sand islands with a total length of about 480 meters and a maximum width of about 100 meters. The site is restricted to the northernmost of these islands, an oval 110 meters by 70 meters with the long axis oriented 25°30' west of north. A base line was established along this axis, and all excavation units were tied to a benchmark established at the center of the island (Figure 3).

Physiographically, the site is characterized by a shell ring of 20 to 30 meters in width conforming to the outside dimensions of the island. The ring is composed of valves of the Rangia clam and reaches a maximum elevation of about 2 meters above the marsh. The space within the ring is a sterile, gray to gray-white sand totally devoid of cultural material. The sand reaches a maximum elevation of about one meter.

A research design was formulated to maximize the potential statistical treatment of the data as well as assuring that an adequate data base from the total site was obtained. The site was divided into quadrants and gridded into 2 m by 2 m units of which there were 1650. Thirty-six units, 12 from each quadrant, were selected utilizing a random numbers table, and excavation was undertaken in rank order of selection. The random units make up a 2.18% sample of the potential universe.

The analysis of the total site assemblage is nowhere near completion, but a few general statements can be made prior to the discussion of the specific excavation units about which this paper is concerned. The shell ring appears to be a natural shell beach devoid of in situ cultural material. Two radiocarbon dates were taken from a location 30 cm into the shell matrix. A sample of carbonized twigs produced a date of 2740 ± 85 radiocarbon years B.P. or 790 B.C. (UGa-835). A sample of Rangia valves produced a date of 3400 ± 65 radiocarbon years B.P. or 1450 B.C. (UGa-834). The charcoal date falls within the estimated dating of the building of a series of shell beaches on the present shore line of Lake Pontchartrain at the maximum deterioration of the Cocdrie Deltaic lobe between 2600 and 2800 years ago (Saucier 1963: 64).

The human occupation was located in a layer of fine humus varying in thickness up to 40 cm and covering about 75% of the shell ring and located in the southeast, northeast, and northwest quadrants. Flexed and bundle burials were located intrusive into the shell in the southwest quadrant where the humus habitation zone was virtually non-existent.

The humus zone itself contained very few shells, but there was a high concentration of various other faunal food remains. These include whitetail deer, muskrat, raccoon, and opossum as the predominant mammals; fish represented included gar, bowfin, and catfish. Alligator was common as well as turtle from five different genera. Bird remains were almost non-existent; a few long bones were recovered. Scattered odd bits and pieces of human bone occur heavily throughout the occupation zone of the site in the same contexts as the food remains. These are in addition to the formal burials in the southwest quadrant. Scattered human remains in Tchefuncte midden contexts are reported for several other sites in the Pontchartrain Basin including Big Oak Island, the Tchefuncte Mounds, and the Little Woods sites (Ford and Quimby 1945; Shenkel and Gibson 1974). These scattered pieces of human bone suggest cannibalism but could be the result of sloppy bundle burial preparation which, in itself, does not discount cannibalism.

All earlier descriptions of the coastal variant of the Tchefuncte Culture depict a heavy reliance on shellfish collecting as the primary resource. This may well be the case, for many of the reported sites are extremely good examples of typical shellmiddens; however, the basal component of Big Oak Island and the occupation of Little Oak Island have no evidence that any shell collecting occurred. The reasons for this are, as yet, unclear; but it is assumed for the present that wild plant food collecting and possibly some horticulture were the primary subsistence activities. The possibility of horticulture is evidenced by the presence of squash seeds in the Tchefuncte level of the Mortor Shell Mound on Weeks Island (Neuman 1973). Hopefully, more data on the subsistence of both Big Oak and Little Oak will be available with the competion of the pollen and coarse fraction analyses.

The primary purpose of this paper is not to elucidate the various problems that exist in our understanding of the Tchefuncte Culture but to present a bit of substantive new data that was uncovered during the excavation of Little Oak Island.

Early in the season, a dense compacted humus floor was uncovered in one of the random units in the southeast quadrant of the site. The removal of this floor revealed a pattern of postmolds approximately 8-10 cm in diameter running diagonally through the unit. These postmolds appear as humus filled circular holes in the cemented calcareous mass of shell. That unit team was then diverted from the continuance of the excavation of the random sample and directed to the stripping of adjacent units in an attempt to trace out the floor and postmold pattern. In all, 12 units were excavated, and all patterning was lost (Figure 4). It would seem that the walls, if indeed the posts were used as wall or roof supports, underwent continual repair as the posts are so densely packed that if they were in place simultaneously there would be no room for people.

The stratigraphy of the house units was relatively uniform, having 5-10 cm of loose humus on the top, a compacted humus (10-20 cm in thickness) of the same color comprising the floor. This overlies a solid cemented calcareous mass of shell which characterizes most of the surface of the natural shell deposition. It is probable that the shell became cemented after the human occupation of the site as several of the burials in the southwest quadrant are within a cemented context. As this matrix was difficult to excavate with steel tools, it is presumed that the Indians would not have been able to accomplish the placement of posts and burials in it.

Though a distinct house pattern is not observable in the postmold pattern as exposed in these 12 contiguous units, we can at this time tentatively forward a hypothetical pattern based on the floor and post pattern as observed in the total site. Floors, posts, and dense artifact concentrations were found in all units located on the crest of the shell ridge in the southeast, northeast, and northwest quadrants. A continuous shed-like structure conforming to the ridge does not seem unreasonable. This pattern would be similar to that found in northern South America as described by Chagnon for the Yanomamo (Chagnon 1974: 259). The possibility of this kind of house pattern for the shell ring sites throughout the Southeast may be worth investigation.

The material recovered from these twelve contiguous units does allow for several suppositions about aspects of the Tchefuncte Culture that have not yet been formally forwarded. The total excavated area equals 48 square meters or about enough space for five people using Naroll's population/area formula (1962: 589). The floor is only 10-20 cm thick and is not indicative of an occupation of great length. The multiplicity of postmolds, however, does indicate an occupation of either a prolonged and/or repetitive nature. Recovered from this thin compacted earth floor in these 12 units were a total of 8647 artifacts of which 8498 were ceramic sherds. These figures do

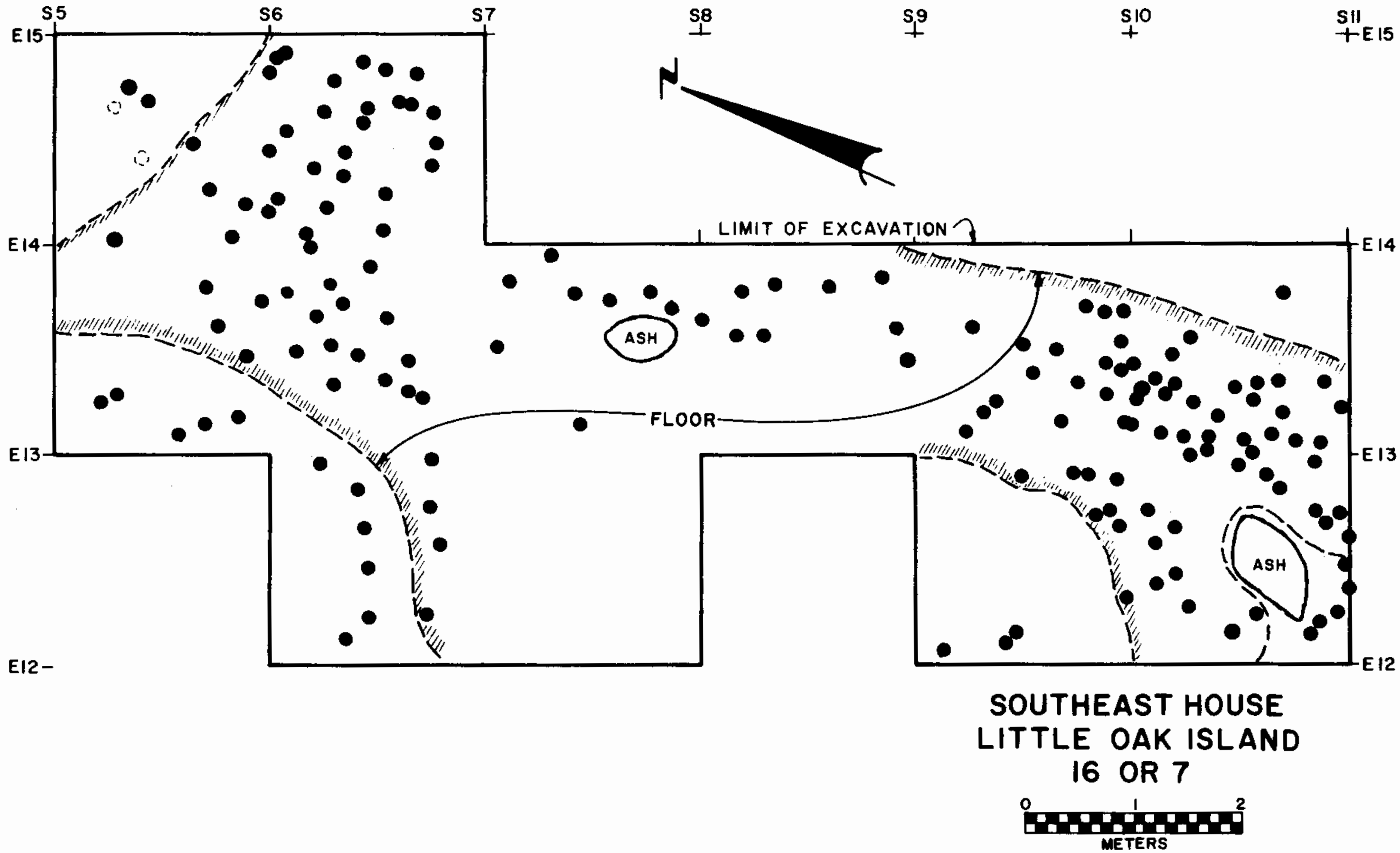

S5
S6
S7
S8
S9
S10
S11
E15
E14
E13
E12
N
LIMIT OF EXCAVATION
ASH
FLOOR
ASH
SOUTHEAST HOUSE
LITTLE OAK ISLAND
16 OR 7
0
1
2
METERS

FIGURE 4

not include about a kilogram of sherds that were smaller than a little fingernail.

This compares interestingly with the roughly contemporaneous Deptford house described by Milanich (1973). The Deptford house on Cumberland Island off the Georgia Coast was a small oval covering some 66 square meters with well defined differential use areas and containing a total of 484 artifacts of which 467 were potsherds.

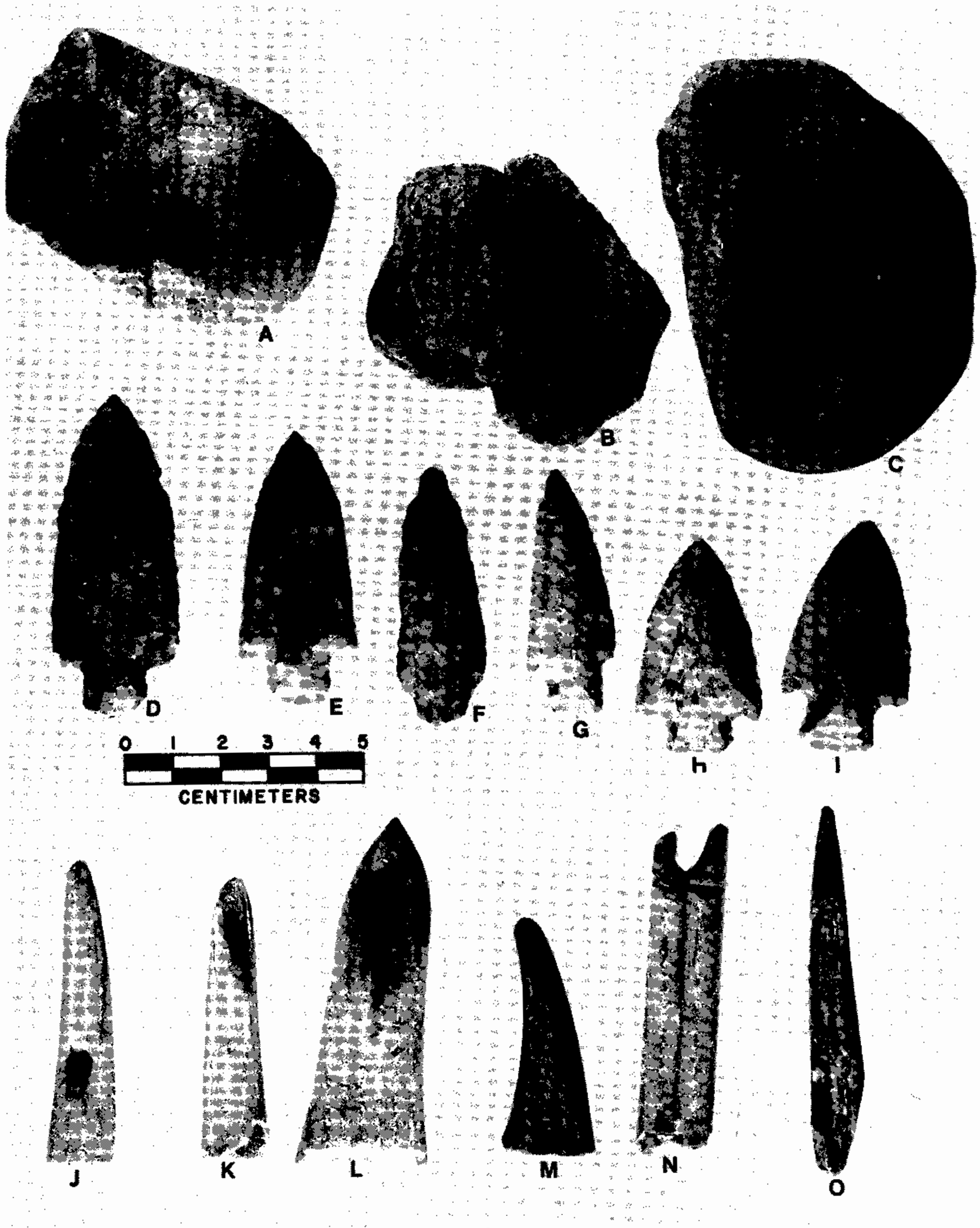
The non-ceramic assemblage from the house units is basically Archaic in nature and is quite typical of the Pontchartrain variant of Tchefuncte. Some of the more interesting examples of these are illustrated in Figures 5 and 6, and the distribution is tabulated in Table 1.

Of these non-ceramic artifacts, few stand out as being particularly significant. They conform to the previously described artifacts for the Tchefuncte and are, in general, typical of a late Archaic Lower Mississippi assemblage minus the Poverty Point elaboration (Ford and Webb 1956). The projectile points from the house tend toward the smaller end of the size continuum for the point types defined. Most of the chipped assemblage is manufactured from the tan chert which is available in several streams that flow into the Pontchartrain Basin from the Pleistocene Terrace to the north of the lake--a distance of 30 to 50 kilometers from the site. Our Gary point and two point fragments were manufactured from ortho-quartz which could have been obtained from either Arkansas or northern Alabama (Snowden, personal communication). A quartz crystal (Figure 6g), one of three found during the Oak Island research, has the same source area.

Of particular interest here is the quality of the non-ceramic assemblage, in particular those items generally thought to be male specific--28 stone points or fragments and 25 bone points or fragments, pipes, fish hooks, flaking tools, and a plummet. We strongly suspect that since there are such a wide variety of stone projectile points represented in this restricted area that the typological differences they represent may well be a factor of function as opposed to intercultural relationship.

The ceramic remains of the house site are incredible in their abundance. Of the 6314 sherds of Tchefuncte Plain, 987 were rims. Three-hundred-fifty-four rims were large enough to determine vessel size and morphology. Three vessel shapes were in evidence--open bowls, neckless jars, and slightly shouldered jars. Four size categories were created based on internal rim diameter; small was 4-10 cm, medium was 11-20 cm, large was 21-29 cm, and extra-large was over 30 cm. Over 80% of the rims came from the medium to large category while just over 50% were from open bowls (Table 3). It is estimated that the plain ceramics alone represent from 300 to 500 vessels.

There were 2184 sherds of ceramics other than Tchefuncte Plain. Sandy tempered materials numbered 178 sherds of which 13 sherds were Alexander Incised and two sherds were Alexander Pinched. The remaining 2006 sherds include every major Tchefuncte



<u>Figure</u> <u>5</u>. a, Partially chipped, ground chopper; b, pumice with medial ware, abrader; c, stone abrader; d,e, Palmillas points ("e" is from Big Oak Island); f, Gary point; g, Kent point; h,i, Ellis points; j, antler toggle point; k, l, bone points; m, antler tip; n, bone preform; o, bone bi-pointed tool, flaker or punch.

TABLE 1

NON-CERAMIC ARTIFACTS
SOUTHEAST HOUSE, LITTLE OAK ISLAND

ITEM	S5 E13	S5 E14	S6 E12	S6 E13	S6 E14	S7 E12	S7 E13	S8 E13	S9 E12	S9 E13	S10 E12	S10 E13	TOTAL
ANTLER													
Base								2				2	4
Tip	1	2										5	8
Tip Perforated			1										1
Tip Socketed			1			1							2
Toggle Point							1						1
BEAR CLAW					1								1
BONE													
Awls				2			1					1	4
Beads	2			1									3
Blanks		1				3		3	1			3	11
Fishhooks	1			1									2
Flakers	1	1											2
Fleshers		1	1	1	1		1						5
Projectile Points		3	1				3	3	1	2		1	14
Projectile Points (fragments)	2	1		3	1	1	1	2				2	13
PIPE FRAGMENTS	2	1		3	3		2	1				2	14
PUMA CLAWS							1						1

ITEM	S5 E13	S5 E14	S6 E12	S6 E13	S6 E14	S7 E12	S7 E13	S8 E13	S9 E12	S9 E13	S10 E12	S10 E13	TOTAL
SHELL	1							1		3	1		6
STONE													
CHIPPED													
Burin								2					2
Chopper				1									1
Drill		1	1										2
Flake	1	1		1	1	2	2	2		1		6	17
Projectile Points (see note)													
Ellis							1					1	2
Gary	1				1					2			4
Kent		1		1				1				1	4
Macon	1		1							2		1	5
Motley				1									1
Palmillas										1			1
Pontchartrain		1					1						2
Projectile Point Fragments		1	3	2	1	1		2		1	1	1	13
Worked Flint		1											1

NOTE:

Ellis, (Suhm, Krieger and Jelks 1954: 420)

Gary, (Suhm, Krieger and Jelks 1954: 430)

Kent, (Suhm, Krieger and Jelks 1954: 432)

Macon, (Ford and Webb 1956: 54)

Motley, (Ford, Phillips and Haag 1955: 129-30)

Palmillas, (Webb 1969: 50)

Pontchartrain, (Gagliano 1964: 62)

ITEM	S5 E13	S5 E14	S6 E12	S6 E13	S6 E14	S7 E12	S7 E13	S8 E13	S9 E12	S9 E13	S10 E12	S10 E13	TOTAL
STONE													
GROUND													
Barweight Fragment											1		1
Bead										1			1
Chopper											1		1
Hematite Slabs			2							1			3
Pebble (Worked)								1					1
Plummet				1		2							3
MISC. STONE													
Iron Stone	1					1	2			1	1		6
Pebble		1			1							1	3
Pumice							4	1				1	6
Quartz Crystal										1			1
Sandstone	3	2		1			1		1	1		1	10

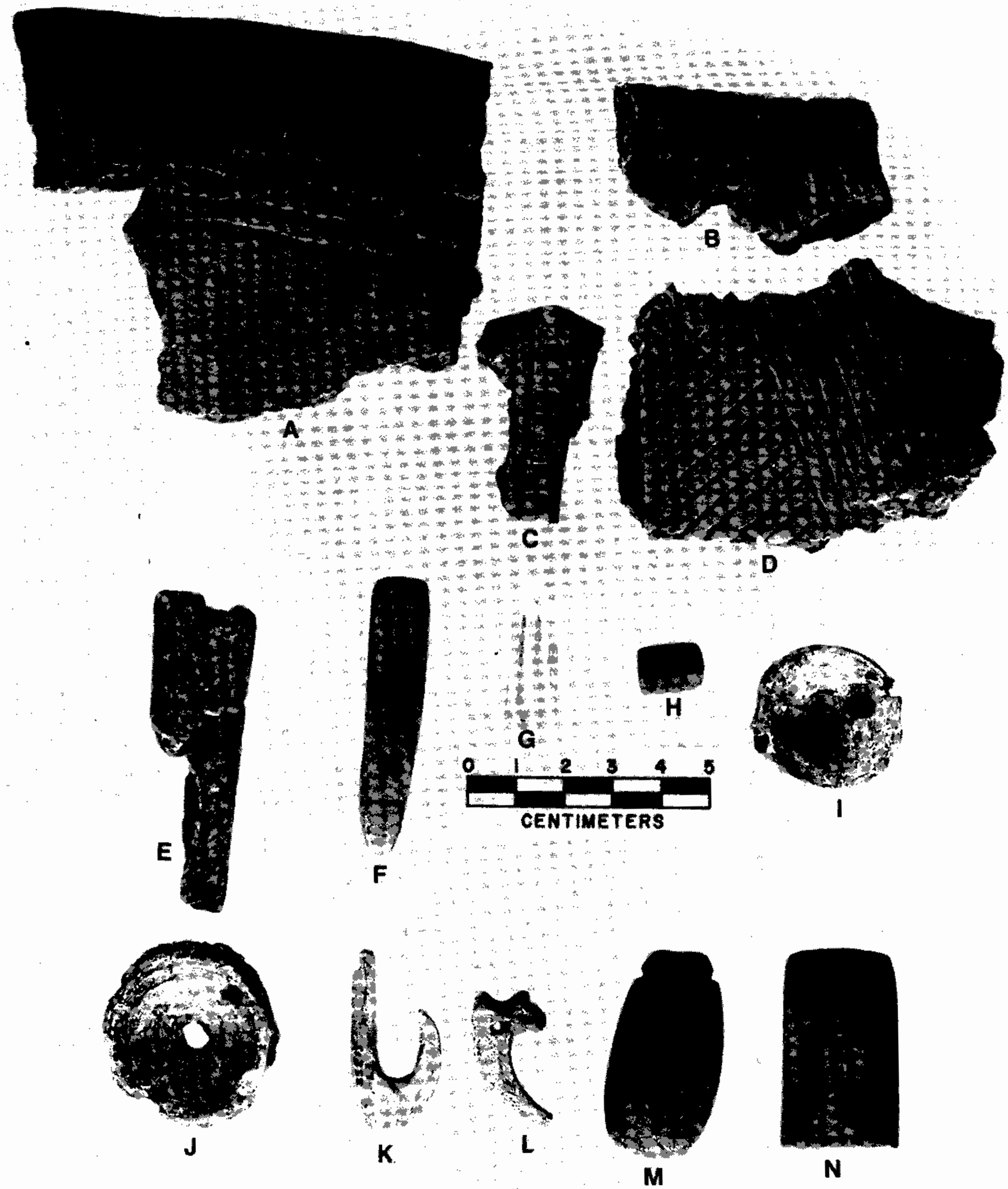


Figure 6. a, unidentified linear punctate with fiber inclusions; b-d, Lake Borgne Incised, castellated rim; e, pipe fragment with flat stem; f, fired ceramic coil; g, quartz crystal; h, stone bead; i,j, perforated fish vertebra; k, bone fish hook; l, perforated puma claw; m, stone plummet; n, fragmentary bar weight.

Table 2. Ceramics, Southeast House, Little Oak Island

unit--	S5E13	S5E14	S6E12	S6E13	S6E14	S7E12	S7E13	S8E13	S9E12	S9E13	S10E12	S10E13	TOTAL
Tchefuncte Plain	976	575	389	628	761	427	312	771	218	264	525	468	6314
%	73.1	83.0	72.3	75.2	82.4	73.0	65.3	74.2	71.9	77.6	76.5	63.1	74.3
Tchefuncte Incised													
-var. Tchefuncte	87	20	16	28	20	13	26	26	12	7	14	32	301
-var. Pontchartrain	31	3	0	6	9	12	7	32	8	12	21	38	199
-var. Marksville	16	3	0	0	0	1	1	0	0	1	1	7	27
-subvar. Big Oak	8	7	2	8	14	0	8	3	2	0	5	11	68
total-	142	30	38	42	43	26	42	61	22	20	41	88	595
%	10.6	4.3	7.1	5.0	4.7	4.4	8.8	5.9	7.3	5.9	6.0	11.9	7.0
Tchefuncte Stamped													
-var. Big Oak	125	42	53	95	43	42	57	86	29	30	16	28	646
-var. Vermillion	56	38	31	54	38	31	18	30	14	10	61	76	457
-var. Gentilly	1	0	4	0	0	6	5	30	1	5	4	4	60
-var. Orleans	9	0	6	1	14	26	5	3	8	2	25	68	167
total-	191	80	94	150	95	105	85	149	52	47	106	176	1330
%	14.3	11.5	17.5	18.0	10.3	18.0	17.8	14.3	17.1	13.8	15.4	23.7	15.6
Punctated Ware													
Lake Borgne	7	5	2	6	6	1	5	3	4	2	6	3	50
Tammany Punctated	6	2	2	2	2	3	8	2	1	1	0	0	28
Orleans Punctated	0	0	0	1	0	0	0	2	0	0	0	0	3
total-	13	7	4	9	8	4	13	7	5	3	6	3	81
%	1.0	1.0	0.7	1.0	0.8	0.7	2.7	0.7	1.7	0.9	0.9	0.4	1.0
Alexander													
Plain	11	0	9	7	17	20	25	39	6	4	4	7	152
Alexander Incised	1	1	4	0	0	1	0	5	0	1	0	0	13
Alexander Pinched	0	0	0	0	0	0	1	0	0	0	1	0	2
Unident. Sandy Paste	1	0	0	0	0	2	0	7	0	1	0	0	7
total-	13	1	13	7	17	23	26	52	6	6	8	7	178
%	0.8	0.1	2.4	1.0	1.8	3.9	5.4	4.9	2.0	1.8	1.2	0.9	2.1
Grand Total	835	693	538	1335	924	585	478	1039	303	340	686	742	8498

type that has been heretofore described plus a few varieties that await description. This material, about 25% of the total ceramic assemblage, represents at least 175 more vessels (Figures 6a-d, 7).

In addition to the three common vessel forms, sherds from two complex vessels were also uncovered. One of these was decorated in a fine Lake Borgne Incised with a notched rim. Figure 6b-d show the three sherds of this vessel which appears to be castellated with the corners appliqued to the surface of the vessel. The second form was a deep cazuela with a series of finger notches around the shoulder.

From this mass of data, a clearer picture of the culture of the Lower Mississippi River of over 2000 years ago can be drawn--if liberally spiced with a few broad assumptions.

Turning first to the ceramics, we note that in the Historic period, women were the manufacturers of this item (Swanton 1946: 549). Further, most of the Southeast was matrilineal in the early Historic period (Swanton 1946: 654). Gibson (1974: 102) asserts that an assumption of matrilocality is justified for the Poverty Point site based on the non-random distribution of the varieties and types of ceramic Poverty Point objects. In this,

TABLE THREE: Ceramic Remains

Total number of plain sherds (vessel and rims)

6403--sherds

Total number of rims

987 rims

Vessel Morphology

	Open Bowls	Neckless Jar	Slight Shoulder Jar	Total	Percentage
X-Large 30 cm. +	14	2	5	21	6.0%
Large 21-29 cm.	86	37	20	143	40.4%
Medium 11-20 cm.	70	54	23	147	41.5%
Small 4-10 cm.	20	17	6	43	12.1%
TOTAL	190	110	54	354	
PERCENTAGE	53.7	31.1	15.2		

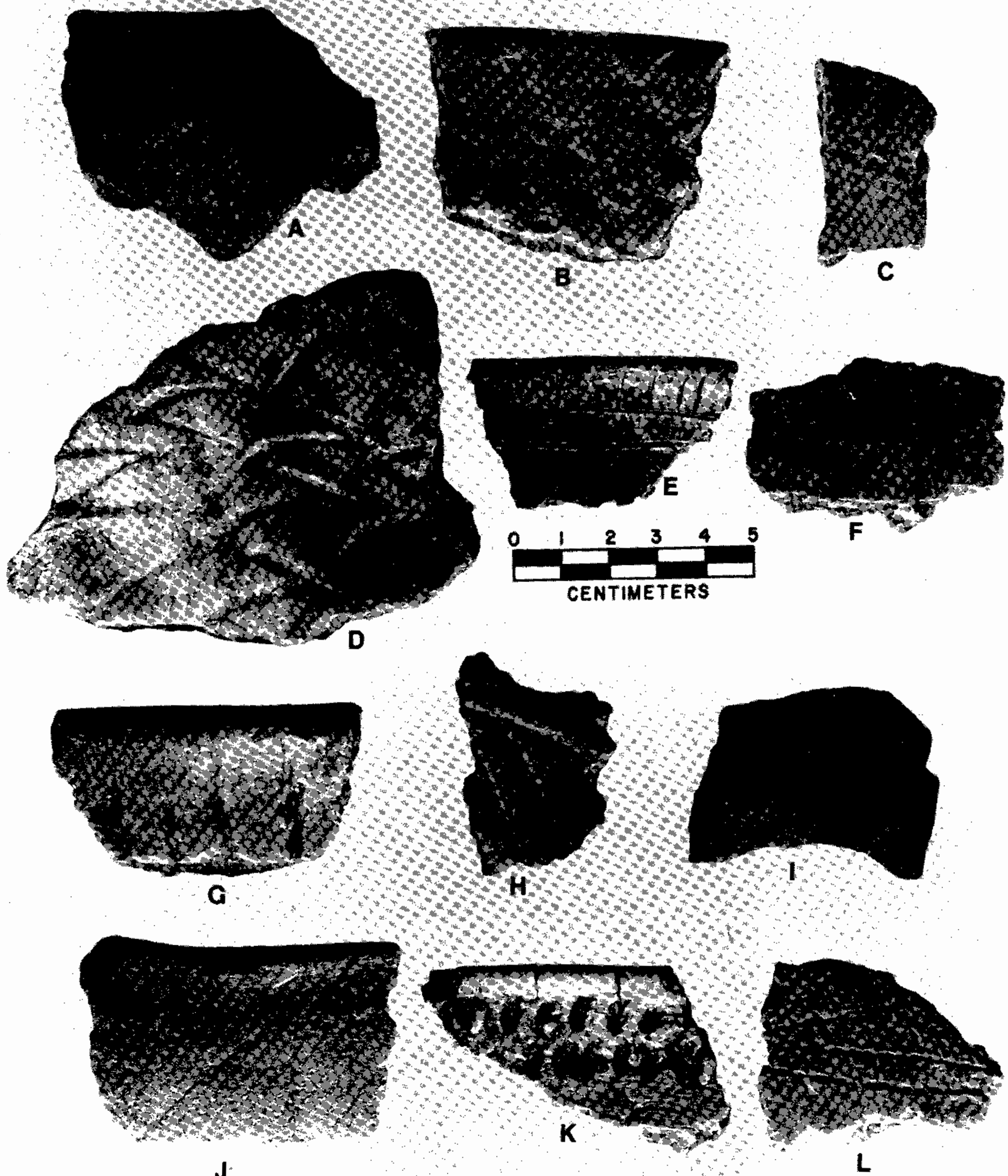


Figure 7. a, Tchefuncte Stamped, var. Vermillion; b, Tchefuncte Stamped, var. Big Oak; c, Tchefuncte Stamped, var. Orleans; d, Tchefuncte Stamped, var. Gentilly; e, Tchefuncte Incised, var. Tchefuncte; f, Tchefuncte Incised, sub-var. Big Oak; g, Tchefuncte Incised, var. Pontchartrain; h, Tchefuncte Incised, var. Marksville; i, unidentified punctate, sandy paste; j, Alexander Incised; k, Tammany Punctate; l, Lake Borgne Incised.

he follows the methodological lead of Longacre (1964) and Hill (1966) in which they demonstrate matrilocality in Pueblo contexts based on ceramic type distributions. If we assume that females are responsible for ceramic production, as was the case both earlier and later in the Southeast, and if we further assume that there was a degree of technical and design continuity between mothers and daughters, the wide representation of all ceramic types in this extremely restricted area of 48 square meters would argue for a number of non-related females living together which translates into viralocality with possible polygyny.

The presence of sand tempered pottery and quartz materials could be interpreted as either long distance trade in goods of the goods coming with or being made by "foreign" wives. Given this possibility, the Tchefuncte could be regarded as a series of small, exogamous, virilocal bands or tribal segments. We would estimate that the standing population of any such group to be somewhere between 25 and 50 persons. This ethnic series of wife trading groups is spread out on a spatial continuum stretching from the Sabine River to northern Alabama and from the Mississippi Delta to Arkansas.

We can, at this time, suggest possible relationships between the two sites, Big Oak and Little Oak islands. A date of 2165 ± 70 radiocarbon years B.P. or 215 B.C. (UGa-881) was obtained from a sample taken from the floor of the Little Oak house. This corresponds almost exactly with the massive shell harvesting Tchefuncte activities that were occurring on Big Oak Island. Within this time frame, the contemporaneous aspects of the two sites displayed some striking differences. Of the few Tchefuncte ceramics that occurred at Big Oak, only 3.2% were decorated as opposed to the 25% decorated at the Little Oak house. A common artifact at Big Oak was a Busycon shell gouge or adze. None of these were found at Little Oak. On Big Oak, there was a large quantity of the remains of freshwater drum fish; there were none on Little Oak.

Given areal and temporal proximity for the two sites, it is suggested that they represent two entirely different aspects of the Tchefuncte adaptation. Little Oak is a small village, occupied by an entire social unit. The artifact concentration, living floor, and artifact variety argue for a wide range of activities. The contemporaneous occupation at Big Oak Island is characterized by a paucity of artifacts, especially ceramics. However, it does have two meters of culturally accumulated shellfish remains. Big Oak Island should then be interpreted as a collection station where men gathered and processed the clams for transport back to the village.

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Abstracts of Papers Received and Not Published in This Bulletin.

Cofitachique and the Catawba Nation: Perspectives and Problems

Steven G. Baker

The Indian province of Cofitachique was focused about the lower Wateree and upper Santee River valleys of South Carolina's Upper Coastal Plain. In the 16th and 17th centuries Cofitachique served as the seat of centralized authority in a very large political structure which extended from the Carolina coast into the Piedmont and from Savannah to the Peedee River. This structure resembled Elman Service's general model of "chiefdom" and embraced and drew tribute from peoples inhabiting a number of other provinces which constituted smaller local chiefdoms. When projected for the early 16th century, an ethnohistorical reconstruction of the greater chiefdom's territory closely conforms to an archaeological subarea of the South Appalachian Mississippian Province, as defined by the distribution of Savannah and Pee Dee pottery types. The province of Cofitachique was situated within the centroid of this archaeological subarea.

The Catawbas of the Piedmont served as the population nucleus of the Catawba Nation and had once been a local chiefdom within the structure of the greater chiefdom. In the early 18th century, the remnant Cofitachiques (Congarees and Santees) immigrated to this nucleus from their old territories in the Coastal Plain. It is hypothesized that the historic Catawba Nation emerged from a recrystallization of the old member elements of the greater chiefdom of Cofitachique about the nucleus provided by the smaller Catawba chiefdom. The center of regional authority clearly shifted at about the same time the old chiefdom's leading peoples immigrated to the Catawbas. The peoples of the Catawba Nation were subsequently all called Usherys, a term which had once referred to the peoples of Cofitachique. A form of distinctive regional authority suggestive of that once manifested in the chieftain of Cofitachique was thereafter displayed by chieftains of the Catawba Nation. Ideally, it should be possible to detect centralization of authority in archaeological study of the historic Catawba Nation, just as it has been for the greater chiefdom.

Archaeological Investigations of the Early Archaic Horizons at the Rose Island Site--Season II.

Jefferson Chapman

A second season of excavations at Rose Island (40 MR 44), Monroe County, Tennessee, has uncovered over 2100 square feet of stratified Early Archaic occupation areas. Preliminary analysis demonstrates the presence of a distinct LeCroy type horizon, St. Albans type horizons, a Kirk type horizon, and an earlier (Palmer?) type horizon. Over 1500 artifacts were recovered and 150 features recorded adding considerably more data to that presented at earlier meetings. The assemblage associated with bifurcate base projectile points and presumed Fall hunting and gathering activities will be described, and radiocarbon determinations from both later and earlier horizons will be presented.

Archeomagnetic Dating

Robert L. DuBois

Archeomagnetism uses magnetic measurements made on specimens collected from kilns, hearths, fired floors and walls from archeological sites as a basis for dating. Since the method was developed for the southwestern United States some ten years ago, the techniques of collecting and processing the samples have undergone a series of modifications. The scope of the present archeomagnetic program, including the present procedures used in obtaining and processing the samples will be discussed.

The collection technique involves a careful carving of small columns of baked material, approximately 3 cm in diameter and 3 cm high, from the undisturbed archeological feature. A mold, oriented with regards to vertical, is placed over each column of baked clay, and the space inside the mold is filled with plaster to completely encase the specimen as a small cube. A reading of magnetic direction is taken along one edge of the cube. Eight to ten individually oriented specimens are collected from each feature after checking the area for moment and magnetic anomalies, which constitutes a single sample for age determination.

Magnetic measurements are made in the laboratory using a sensitive spinner magnetometer on the plaster-covered specimens. The direction of the remanent magnetism in each specimen is determined, and a mean direction is calculated for each set of specimens which is then used to establish a preliminary archeomagnetic pole position. Once a series of magnetic stability tests have been performed on the sample and a final pole position has been obtained, the sample is dated by comparing the resulting pole position with a master polar data representational curve which has been previously established by working with samples of a known age. The present precision of the AM method for the southwestern United States suggests that the dates for most of the features may have limits of error in the range of $\pm$ 10 to $\pm$ 40 years at the 95% confidence level.

Some of the limitations of the archeomagnetic dating technique will also be discussed--including the effects of secular variation of the earth's magnetic field on the development of the master polar data representational curve, as well as the effects of "lightning strikes" or other contaminations on the processing of samples. The present solutions to these problems will be explained. Finally, the applicability of the archeomagnetic dating technique in the Southeast will be discussed based on preliminary data gathered this past summer.

Paleo-Indians in the Mississippi River Delta

Sherwood M. Gagliano and Jon L. Gibson

Archeological sites located on old stream scars, beach ridges, and salt domes in southwestern Louisiana have provided keys to the interpretation of river courses and associated features of the Mississippi River Delta formed during the interval of 10,000-12,000 years B.P. Occupation pattern and site stratigraphy indicate that Paleo-Indian peoples were utilizing an active deltaic landscape that was previously believed to be Mid-Wisconsin in age. Most of the features with which the sites are associated are on the surface of the Prairie Terrace, a slightly elevated terrace lying inland from the presently active wetlands of the deltaic coast.

Meander belts of the old delta can be traced to shoal areas on the continental shelf where radiocarbon dates from core samples support the interpretation. These shoals represent deltaic lobes which have been subsided and downwarped considerably since deposition. Preserved on the terrace surface is a sequence of morphological features which include point pars, abandoned channels, natural levess, crevasse splays, and crevasse distributaries. In low areas, former backswamp drainage nets have become entrenched, and flat terrain represents floodbasin lakes, swamps, and marshes. A huge overflow swamp laced with crevasse channels was a prominant part of the Paleo-Indian delta landscape. Mastodon and mammoth remains have been found in clay facies deposited in the swamp.

The Avery Island site, located on an uplifted salt dome within the old deltaic plain, reveals a stratified sequence containing artifacts and fossil vertebrates. Three Paleo-Indian artifact traditions have been identified at Avery Island, which from oldest to youngest are: 1) projectile point tradition--fluted and plano projectile points, cores with prepared striking platforms, unifacial scrapers with graver spurs; 2) bipolar tradition--bipolar chipping (pieces esquillees), burins, utilized cores with bladelets; 3) edge-retouched tradition--steep end-chipped pebbles with graver spurs. To date, only the projectile point tradition has been related to depositional features of the delta.

Geomorphic relationships suggest that sea level was at about its present level when these courses and associated features of the Mississippi Delta were active. For this reason, the proposed interpretation is incompatable with most presently accepted sea level curves.

The Rise and Decline of Poverty Point

Jon L. Gibson

Poverty Point was the first complex socio-political system of chiefdom type to develop in the Lower Mississippi Valley of North America. Its pristine emergence seems related to the interaction of two principal adaptive mechanisms, exchange and warfare, among population aggregates living in circumscribed segmented environments. Its collapse appears to have been caused by increasing floodplain orientation brought on by population pressure and heightened power accumulation by chiefdom leaders.

Oligocene Fossils as Possible "Ritual" Objects at 9 Bur 8 or the Waring Site.

Gordon M. Midgette

At 9 Bur 8, a number of fossils were excavated that have subsequently proven to be probable "ritual" objects belonging to one or more of the site occupations. This paper examines the excavated artifacts and geological context of similar fossils from local workshops. The presence of Oligocene fossils in the area has not been previously reported leading to a revision of previously identified geological formations. Both archaeological and geological associations demonstrate the need for closer cooperation between geological and archaeological survey workers.

Preliminary Report on an Arkansas Dalton Cemetery.

Dan F. Morse

This is probably the only valid Paleolithic cemetery found anywhere; the site, therefore, is of obvious importance. A total of 146 Dalton points ranging up to 19 cm long were found together with another 300 lithic tools including end scrapers, preforms, adzes, and other tools. Although no skeletal material was recovered, the tools were distributed in groups indicating that at least 12 extended graves were present. The shallow site occupied the summit of a sand dune near Jonesboro, Arkansas. At the least, the find indicated that our traditional ideas of band behavior in a rich environment need revision.

Excavations at the Spanish Mount Shell Midden, Edisto Island, South Carolina--June-July 1973.

Donald R. Sutherland

A report on the results of five weeks of excavation on a Late Archaic-Early Woodland shell midden at Edisto Island on the South Carolina coast. New radiocarbon dates, detailed information on food remains, and some suggestions regarding the sequence of early ceramics in the area are presented.

Aerial Photography in Archaeological Site Location: An Upper-Central Tombigbee Valley Application.

Michael D. Walls

This paper is a discussion of a research methodology developed for the utilization of Color IR aerial imagery in the location of archaeological sites in a southeastern riverine environment. The research area was the Tombigbee River bottomland in Lowndes and Monroe counties, Mississippi. The research--funded by Marshall Space Flight Center, NASA, and jointly conducted by the Department of Forestry and the Department of Anthropology, Mississippi State University--was conducted in the spring and summer of 1974.

The paper consists of four parts. They are:

I. Introduction and Background

II. Research Techniques

III. Research Methodology and Application

IV. Discussion of Results of Application