

**ALABAMA
MUSEUM of
Natural History**

Bulletin

Bulletin 27

November 30, 2009

Plain Pots: A Study of Late Woodland Pottery in Central Alabama

By Jason Mann and Richard Krause

Discovery and Excavation of the Moundville Earth Lodge

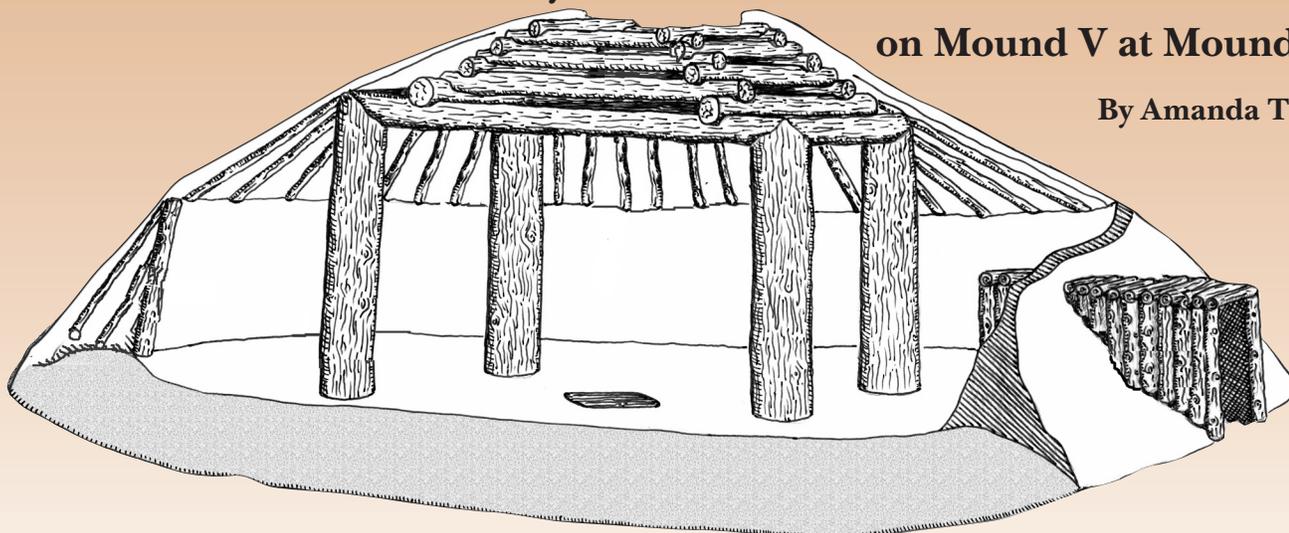
By Vernon James Knight

**Analysis of Daub from Mound V, Moundville: Its Role as an
Architectural Indicator**

By Jeffery L. Sherard

**Analysis of Wood Charcoal from an Earth Lodge
on Mound V at Moundville**

By Amanda Tickner



BULLETIN
ALABAMA MUSEUM OF NATURAL HISTORY

The scientific publication of the Alabama Museum of Natural History. Dr. Philip Harris, Editor.

BULLETIN ALABAMA MUSEUM OF NATURAL HISTORY is published by the Alabama Museum of Natural History, a unit of The University of Alabama. The BULLETIN succeeds its predecessor, the MUSEUM PAPERS, which was terminated in 1961 upon the transfer of the Museum to the University from its parent organization, the Geological Survey of Alabama.

The BULLETIN is devoted primarily to scholarship and research concerning the natural history of Alabama and the Southeast. It appears twice yearly in consecutively numbered issues.

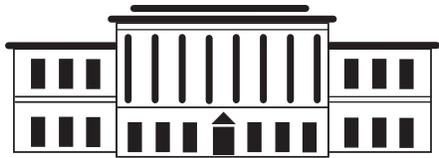
Communication concerning manuscripts, style, and editorial policy should be addressed to: Editor, BULLETIN ALABAMA MUSEUM OF NATURAL HISTORY, The University of Alabama, Box 870345, Tuscaloosa, Alabama 35487-0345; telephone (205) 348-1831 or emailed to pharris@bama.ua.edu. Prospective authors should examine the Notice to Authors inside the back cover.

Orders and requests for general information should be addressed to BULLETIN ALABAMA MUSEUM OF NATURAL HISTORY, at the above address or emailed to museum.bulletin@bama.ua.edu. Yearly subscriptions (two issues) are \$30.00 for individuals, \$50.00 for corporations and institutions. Numbers may be purchased individually. Payment should accompany orders and subscriptions and checks should be made out to "The University of Alabama." Library exchanges should be handled through: Exchange Librarian, The University of Alabama, Box 870266, Tuscaloosa, Alabama 35487-0340.

When citing this publication, authors are requested to use the following abbreviation: **Bull. Alabama Mus. Nat. Hist.**

ISSN: 0196-1039

Copyright 2009 by The Alabama Museum of Natural History



ALABAMA
MUSEUM of
Natural History

Bulletin

Bulletin 27

November 30, 2009

Plain Pots: A Study of Late Woodland Pottery
in Central Alabama

By Jason Mann and Richard Krause

Discovery and Excavation of the Moundville Earth Lodge

By Vernon James Knight

Analysis of Daub from Mound V, Moundville: Its Role as
an Architectural Indicator

By Jeffery L. Sherard

Analysis of Wood Charcoal from an Earth Lodge
on Mound V at Moundville

By Amanda Tickner

Plain Pots: A Study of Late Woodland Pottery in Central Alabama

Jason Mann
Instructor of Anthropology
Department of Anthropology
Troy University Archaeological Research Center
32 MSCX
Troy University
Troy, Alabama, 36082
670-3957

and

Richard Krause
Archaeologist Emeritus
Department of Anthropology
The University of Alabama

ABSTRACT

It is common archaeological practice to seriate ceramic samples by referencing frequency variations in attributes of decoration and temper. Since the majority of Central Alabama's Late Woodland wares are undecorated and sand tempered they have resisted attempts to seriate them. As a consequence previously introduced developmental distinctions have been intuitively delineated making them difficult to replicate and quantify. By focusing upon frequency variations in the consequences of vessel body, mouth, rim, and lip construction we attempt to clarify and quantify the previously introduced developmental distinctions rendering them amenable to test by virtue of independently derived carbon 14 and thermoluminescent determinations.

INTRODUCTION

Previous Work

A minimally adequate discussion of Central Alabama's Late Woodland stage manifestations must address three issues. The first is the nature and extent of David Chase's pioneering work. The second is the fact that most of the pottery is a tall, high round-shouldered, conical-bottomed, sand tempered, plain ware. The third is the lack of a robust ceramic seriation. For clarity we shall discuss each separately.

In his multi-decade career David Chase excavated, analyzed and described his archaeological discoveries in a systematic manner. In positing phases he first described

the attributes of the unit's material culture. Then, using his intimate knowledge of the region's ceramic complexes and his extensive survey experience, he specified the proposed phase's temporal and spatial boundaries. Lastly, he described what he considered to be the origins, growth, external relationships, and ultimately the decline of the phase being considered. For example, when he described the results of his excavations at the Hickory Bend Site, a palisaded Late Woodland stage town, Chase proposed an archaeological taxon he termed the Hope Hull phase. He included a ceramic trait list and explained in a sub-sec-

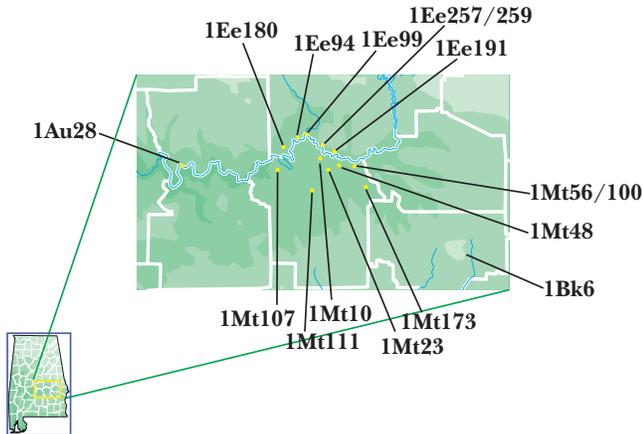


Figure 1. Sites used by David Chase in defining the Dead River, Hope Hull, Autauga, and Union Springs phases

tion of his report that the Hope Hull people maintained extra-cultural relationships with representatives of the Autauga phase, another taxon he had recently proposed. He took as evidence for this relationship the fact that typical Hope Hull and typical Autauga phase potteries were found together in some sites. Thus, he concluded that the Autauga and Hope Hull phases were, in effect, culturally different but temporally overlapping manifestations of a Late Woodland pattern of social, economic and political development (Chase 1979).

Chase used a similar approach to define virtually all of the Late Woodland phases in Central Alabama (Walthall 1980). He labeled them the Hope Hull, Dead River, Autauga, Union Springs (Fig. 1), Henderson, White Oak, and Calloway phases (Burke 1933, 1934; Chase 1967, 1968a, 1968b, 1968c, 1979, 1998 nd.a, nd.b, nd.c; Cottier 1982; Dickens 1971; Futato 1973; Jenkins 1981; Jeter 1977; Mann 2001; Nance 1974, 1976; Nielsen 1976; Sheldon et. al 2002; Wazelkov 1979). All were created by referencing ceramic types. In this respect Chase was following a firmly established precedent. Each of Chase's phases is accompanied by a trait list, but to avoid redundancy we will not restate them. Instead, we shall focus upon the inter-phase relationships he envisioned.

In an unpublished manuscript titled *Terminal Woodland in Central Alabama: a Hypothetical Demise of a Tradition*, Chase explored the relationships he saw among the phases he had created. In the paper's abstract he states,

Sometime after the 8th century AD two cultural entities: the Hope Hull and the Autauga phases emerged as the dominant residents. These writings deal with the evidence of activities of these last bearers of a long tradition sustained by hunting and gathering food in season. It is a story of interaction, competition, and final fate of these two peoples as accurately as available evidence can determine it. (nd.a.1)

This paper is Chase's best discussion of social development in the late period of the Woodland stage in Central Alabama. In short, he detailed his understanding of each phase's culture history. To paraphrase his argument, the Calloway phase became the Dead River phase circa AD 700- 800. The Dead River phase then became the Hope Hull phase and later the Union Springs phase (Fig. 2). In other words Chase posited what Rouse (1960) called a genetic relationship among the Calloway, Dead River, Hope Hull and Union Springs phases. He further contended that around AD 900, along the Alabama River west of Montgomery, the formerly separate peoples of the White Oak and Henderson phases joined forces to produce the Autauga phase. The bearers of the Autauga phase, he contended, then moved into Hope Hull territory forcing the Hope Hull inhabitants southward. After this southward removal, the former Hope Hull peoples became the authors of the Union Springs phase (Figures 1 and 2). Lastly, at the terminus of the Woodland stage, Autauga phase peoples were either absorbed into or expelled by the arrival of a food-producing folk representing the Mississippian Stage (nd.a).

The bulk of Chase's interpretations were based upon the pottery types he defined. For example he argued that...

Hope Hull has strong ceramic ties with the precedent Dead River phase. So similar are most of these traits that there was left little doubt that Dead River was a true and direct ancestor...At site 1Mt48 where the total transition was stratigraphically represented, the classic utility ware of Hope Hull - Adams Plain, emerged but lacked certain attributes... Tooling marks in the neck area, a hallmark of the plain utility ware of Dead River (Kilby Plain) do occur on these 'earlier' forms of Adams Plain rim sherds inviting the need for a type-variety system application (nd.a.20).

This quote both exemplifies Chase's reasoning and highlights the major problem faced by previous and current researchers, namely that the ceramic materials are not readily seriated using traditional means of type formation.

The Conundrum of Abundant Plainness

Many have noted the predominance of sand-tempered plain pottery from Central Alabama's Late Woodland manifestations (Burke 1933, 1934; Chase 1967; 1968a, 1968b, 1968c, 1979, 1998 nd.a, nd.b, nd.c; Cottier 1982; Dickens 1971; Futato 1973; Jenkins 1981; Jeter 1977; Mann 2001; Nance 1974, 1976; Nielsen 1976; Sheldon et. al 2002; Wazelkov 1979). Referring to the laboratory analysis of a Phase II testing program at the Madison Park Site, Gums et. al. explain that of the 37,359 sherds found only 280, i.e., .007 %, were decorated (2001:26). They expressed their concern for the "ceramic" character of Central Alabama's Late Woodland materials by noting that the:

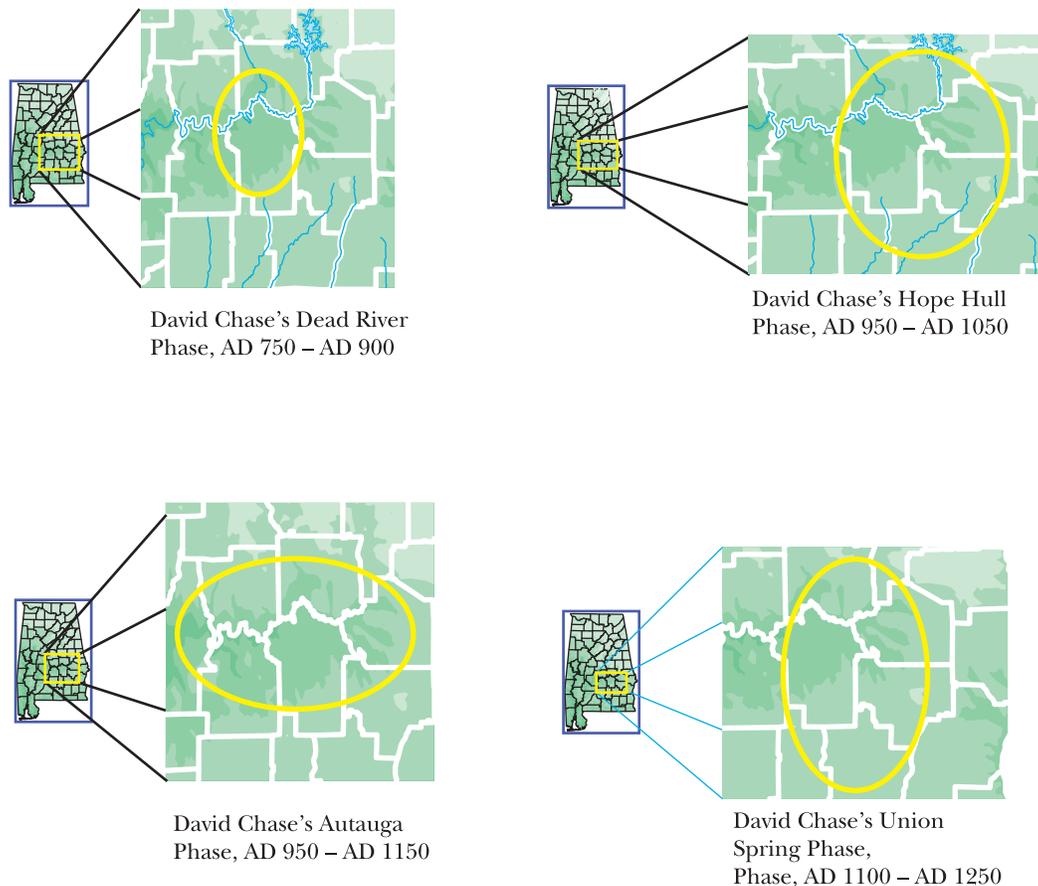


Figure 2: Four phases defined by David Chase. A, Dead River (AD 750-900); B, Hope Hull (AD 950-1050); C, Autauga (AD 950-1150); and D, Union Springs (AD 1100-1250).

Definitions and discussions of the ceramic sequence for the Late Woodland period in Central Alabama is, after decades of study, still relatively ambiguous. Probably the best explanation for this confusion is the lack of variety in decorations and temper types, with sand-tempered plain pottery dominating all the Late Woodland assemblages in Central Alabama (2001: 27).

For most analysts there was in fact so little variation in decoration, surface treatment and temper that they could not use the ceramic samples at hand for temporal delimitation and/or phase identification. They rightly assumed that a ceramic seriation based on the frequency distribution of tempering practices, modes of surface treatment or techniques of decoration would be impossible.

David Chase was the only archaeologist who seriously attempted to seriate these materials. He did it by turning his attention to the evidence he saw for differences in manufacturing techniques. He used subtle differences in the techniques of rim and lip formation to create historical types for the region's plain wares. Those, however, who are not thoroughly familiar with the evidence that different techniques of manufacture may exhibit have

not been able to replicate Chase's results. To be fair, it should be noted that Chase did not describe the differences he saw with unequivocal clarity and precision. To make matters worse, some of the attributes that he chose as significant for type formation were not mutually exclusive. The lip formative technique that produced a flat lip and that used to form a round lip could, for instance, be found on the same vessel. This made attempts to identify fragmentary specimens problematical even for those very familiar with his thinking and work. Chase was aware of these difficulties. He considered them to be sorting problems, that given specimens of adequate size, could be resolved through qualitative analysis and the acquisition of independently derived dates for the taxonomic units he had created. He may have been overly optimistic.

Mikell and Turley (2001:123-124), and Meeks and Spry (1999) were both able to acquire radiocarbon dates for associations with plain pottery, but were unable to place their manifestations in Chase's Dead River or Hope Hull phases with any degree of confidence. These analysts were, however, attempting to replicate Chase's results without using the ceramic attributes he used to achieve them. This much is at least implied when they attributed

their lack of confidence to the absence of “diagnostic” attributes, i.e., contrasts in temper, morphology and decoration. The lesson here is that you must use Chase’s approach if you seek to replicate or refute his results, and this must be done before those results are tested against independently derived radiometric determinations. Differently put, you cannot use radiometric determinations alone to make sense of Chase’s taxonomic practices.

It is counterproductive to evaluate Chase’s results by referencing the “diagnostic” attributes exhibited by the minority wares found in Central Alabama’s Late Woodland stage sites. Some have made regrettably painful errors by referencing the few decorated or blatantly “diagnostic” sherds. Chase, for example, noted on several occasions that Autauga, Hope Hull, and Dead River phase manifestations may be found in the same place. Hence although a sand-tempered ware with fingernail punctations may be a marker-type for the Autauga phase a site bearing such may not be unequivocally identified as purely Autauga. Yet several sites in Central Alabama have been treated as such because of the presence of a few sand-tempered pottery fragments bearing fingernail punctations (Waselkov 1979).

It should also be noted that the presence of “diagnostic” ceramic types at geographically separate locations does not imply simultaneity of manufacture or use. One may posit approximate simultaneity of manufacture and use if the sites are in close geographical proximity. Nevertheless, as the geographical distance between them grows, the probability of approximate simultaneity diminishes. A dated “diagnostic” type at one site cannot, without extreme caution and a solid bridging argument, be used to date a geographically distant analogue. Positing simultaneity of action at a distance is not an acceptable practice in physics or in archaeology.

We hope that the foregoing has served to sketch the contours of the ceramic conundrum that confronts those who would seriate Central Alabama’s Late Woodland pottery. If traditional standards are used to form types, then a single type dominates Central Alabama’s Late Woodland ceramic assemblages, and a single type excludes a frequency seriation. If non-traditional standards are applied in type formation, then Central Alabama’s ceramic types will not be comparable with those used elsewhere, thus muddying the already opaque waters of the region’s culture history. Both approaches seem to engender undesirable consequences. There may, however, be a middle ground that would avoid the adverse consequences of either and would build upon Chase’s pioneering work. As David Chase’s work seems to indicate, it may be more productive to examine the variation that seemingly like things express than to re-classify them. If this variation is temporally sensitive, it may perhaps be used to conduct a frequency seriation.

A Proposed Solution

Remember that Chase used attributes of manufacture to ground his taxonomic efforts, even if these attributes might have been the properties of a single traditional pottery type. We propose, therefore to first define and then to seriate the frequency of these attributes rather than re-define and seriate the redefined types. Differently stated we seek to express the developmental state of a previously defined type by referencing variability in its attributes at different points in time. It is this variability that we shall attempt to seriate and correlate with independently derived dates. If this approach works, then anthropological questions about Central Alabama’s Late Woodland occupations can be answered with far greater clarity and precision than is now possible. If it doesn’t work, then massive amounts of plain pottery will remain the unwanted step-child of Southeastern Archaeology. Our attempt to assemble and evaluate an adequate multi-site sample of Central Alabama’s Late Woodland ceramics will be the next issue.

Sampling Procedures

At the outset it was obvious that we needed a multi-site sample of Central Alabama’s Late Woodland ceramics for our attribute frequency seriation. Ideally this sample should include specimens from at least one site in each of Chase’s six phases. We were forced by the availability of excavated collections to limit our sample to four of the six. Well provenanced specimens were available from the three phases that Chase derived by various routes from the Calloway phase and the phase he derived from the union of the White Oak and Henderson phases. Differently put, we were forced to restrict our sample to ceramics from the Dead River, Hope Hull, Union Springs, and Autauga phases. Our sample was, however, comprised of specimens from two Dead River components, four Hope Hull components, one Union Springs component and four Autauga components. Our selection of specimens and the problems entailed therein will be detailed later.

To begin our study, we examined several thousand surface collected and other non-provenanced ceramics from Late Woodland sites in the Montgomery area. A cursory inspection of these specimens revealed several common, obvious, and noteworthy attributes of vessel shape, size and construction. The first attribute was the predominance of a plain ware; i.e., the lack of any and all surface modifications that could by any stretch of the imagination be called decorative. The second was the virtually uniform use of sand as a temper. The third was a slightly overlapped, flattened coil, or multiple strap technique of body and rim construction. The fourth was the predominance of a tall, high round-shouldered, conoidal-bottomed vessel with constricted mouth and out-flaring rim. The fifth was the predominance of large vessels. We identified these five attributes as both necessary and

sufficient for identifying ceramic fragments that were to be candidates for admission to the class we labeled the “Focal Form vessel”. The Focal Form was based upon the analysis of reconstructed whole pots, and by assuming radial symmetry, on half, third or quarter vessel fragments. Since we wanted to identify smaller fragments as belonging to the Focal Form, we asked if the metricized variables of mouth diameter, lip diameter, shoulder diameter, and vessel height might be systematically related. If so the magnitude of one might be used to predict the magnitude of several, if not all of the others. If a reasonably adequate relationship could be demonstrated, the five attributes of our Focal Form vessel could be used to sort and count Focal Form sherds. The results of sorted and counted Focal Form sherds could subsequently be used to seriate the ceramics accompanying Late Woodland features or components and convert Focal Form sherds into quantified estimates of the size and shape of Focal Form pots. If successful, our approach might also be used to estimate the dimensions of mouth diameter, lip diameter, shoulder diameter, and vessel height in Non-Focal Form pots.

Sample Selection

Since we suspected that our Focal Form vessel was typical of Late Woodland stage ceramics in Central Alabama, we assembled datable and provenanced samples from sites identified as belonging to Chase’s Late Woodland phases. In doing so, we assessed the availability of specimens from previously excavated features in components identified as belonging to Chase’s Dead River, Hope Hull, Union Springs and Autauga phases. We construed a feature as any artifact whose makers and users did not intend to move it. Common examples would be pits, house floors, burials, and middens. This construal allowed us to assume that the ceramic specimens a feature contained post dated its construction and was contemporaneous with its last use.

In the two decades between 1965 and 1985, David Chase excavated a number of ceramic-containing features in components identified as belonging to the Dead River, Hope Hull, Union Springs, and Autauga phases (Chase 1968a, 1968b, 1969, 1979, 1990, 1998 nd.a-c). The artifact collections and field notes from Chase’s excavations were curated in one of two places, the archaeology laboratories at the University of Alabama at Birmingham (UAB) or the Auburn University at Montgomery (AUM). Unfortunately, the collections did not fair well in curation. Some had been moved several times. Notes were either scattered or unavailable. The paper bags or cardboard boxes that contained some of the artifacts had deteriorated or suffered water damage. David Chase did, however, label each pottery sherd with a provenance designation. Dr. Craig Sheldon at AUM and Ms. Karen Hollingsworth at UAB kept detailed inventories of the collections, so those

Table 1: Features Included in this Study * It should be noted here that sites 1Mt10, 1Ee94 and 1Mt100 are stratigraphically multi-component. As a consequence we will subsequently designate separate components with a capital letter in parentheses. Site 1MT10 has three components 1Mt10 (A), 1Mt10 (B) and 1Mt10 (C). 1Ee94 has two components 1Ee94 (A) and 1Ee94 (B) and 1Mt100 has two components 1Mt100 (A) and 1Mt100 (B).

Site Feature	Designation	General Description
1Ee94 *	B-shell area	Pit with Shell
1Ee180	Feature 5	Pit
1Ee180	Feature 4	Pit
1Mt100 *	Feature 39/37	Pit with Dog Burial
1Mt100 *	Feature 50	Pit
1Au28	Feature 7	Pit
1Mt107	Shell Layer	Shell Layer
1Mt111	Feature 15	Pit
1Mt111	Feature 16	Pit
1Ee257/259	Feature 2	Pit
1Mt173	Feature 6	Pit
1Mt23	Feature 2	Pit
1Mt23	Feature 1	Pit
1Mt10 *	Feature 6	Pit and Slough
1Ee191	Feature 2138	Midden Lens
1Ee191	Feature 1836	Pit

precautions made it possible to reassemble the ceramic content of various features with confidence.

Once the ceramics from each feature were assembled and inspected they seemed very similar in character to the large non-provenanced sample previously examined. We then chose as a sample for our study the ceramic contents of those features with the greatest number of specimens and the best documentation. The feature contents thus selected came from the following sites: 1Au28, 1Mt10, 1Mt23, 1Mt173, 1Mt100, 1Mt107, 1Mt111, 1Ee191, 1Ee180, 1Ee94, and 1Ee257/259 (Figure 1). The features themselves are described by one of the several designations found in Table 1.

CERAMIC ANALYSIS

The Focal Form Vessel

Ceramic fragments from each feature in the study were examined and the evidence for surface treatment, decoration, and tempering noted. Total vessel counts were also made for each feature and the different types of vessels present were counted and tabulated. During analysis, it was apparent that the majority of the vessels in the sample belonged to our Focal Form type. We thus decided to give them a detailed and reasonably rigorous examination. To further this end, we devised a series of

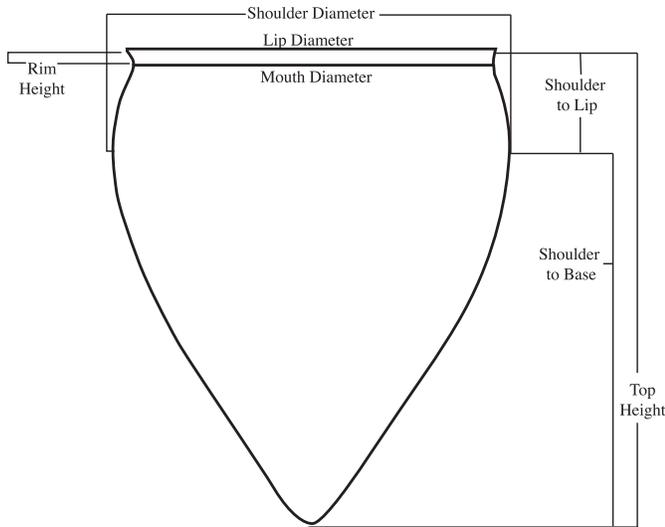


Figure 3: Morphological Landmarks for Focal Form Vessels.

morphological landmarks designed to orient us as we measured specimens of varying size (Figure 3).

All Focal Form vessels were radially symmetrical and all had top-to-bottom asymmetry making them relatively easy to divide into eight systematically related parts as follows: (1) lip (the fabricated junction of exterior with interior surface); (2) body (all non-lip vessel parts); (3) shoulder (the maximum circumference of the body); (4) base (the minimum circumference of the body, usually a point); (5) lower body (all portions below the shoulder); (6) upper body (all portions above the shoulder); (7) mouth (the minimal circumference of the upper body); and (8) rim (the portion of a vessel between lip and mouth). For more detailed and precisely stated definitions, see Krause (1995: 311).

We used the morphological landmarks introduced above to guide us as we measured whole and half vessels. The measurements we took detailed vessel height, rim height and thickness, shoulder height and thickness, upper body height and thickness, lower body height and thickness, bottom thickness, rim diameter, mouth diameter and thickness, and shoulder diameter. The same array of measurements was also taken on all vessel fragments large enough to unequivocally specify their vessel specific provenance. In sum, we suspected that since the Focal Form vessels dominated our sample, a detailed comparison of landmark measurements might yield the kind of frequency data that would permit a seriation. Then, too, our sample contained both plain and decorated Focal Form vessels and we suspected variations in the frequency of decorated Focal Form vessels might constitute a significant data set. Finally, we suspected that since the Focal Form vessel dominated our sample, its frequency *vis a vis* the frequency of Non-Focal Form vessels might also be significant.

The Attributes of Focal Form Vessels

Although the ceramics from each feature were separately analyzed, we pooled the data obtained from our measurements and observations in an attempt to quantify our construal of the sample's attributes. With respect to temper, this move produced data on a sample of 5,080 specimens. Eighty two and one half percent of the specimens were sand tempered, 11.4% were grit, mica, or mica-schist tempered and 5.6% were shell, fiber, grog or "trash" tempered. None of the Focal Form vessels were shell, fiber, grog or "trash" tempered, but there did seem to be potentially significant variation in the percentage of sand to grit, mica, or mica-schist tempered vessels.

Since the kind of aplastic added to the clay body in its paste state may alter the properties of the raw material from which ceramics are produced, it is frequently assumed that this temper may be temporally and/or culturally significant. We therefore decided to assess the prospective temporal significance to variations in temper type among our Focal Form vessels. To do this we first separated the available specimens into two groups, those derived from Chase's early phases and those from his late phases. By applying a chi-square test for homogeneity to the two groups, it was possible to determine if there was a relationship between this early/late dichotomy and temper type. At the alpha level of .05, the null hypothesis for this test claimed no disparity between differing tempers from two points in time. After conducting the test, it was clear that the null hypothesis could be rejected ($\chi^2 = 19.076$, $p < .001$, $df = 1$). In fact, the disparity was clear. During the early time period (AD 700-900) Focal Form vessels were all sand-tempered, whereas during the later time period (AD 900-1100) Focal Form vessels may have been sand, grit, mica, or mica schist tempered (Figure 4).

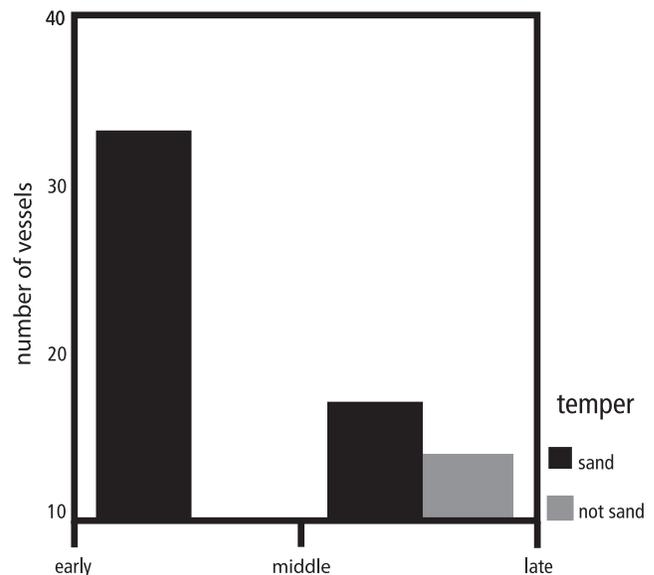


Figure 4: Focal Form Tempers Relative to Time.

Table 2: Non-Focal Form Vessels

Restricted Bowl	Straight Sided Bowl	Warped Bowl	Hemispherical Focal	Plate	Jar	Effigy	Composite	Esoteric-Non-Effigy
50	33	12	4	10	9	0	2	3
14.4%	9.5%	3.5%	1.1%	2.9%	2.6%	0.0%	0.6%	0.8%

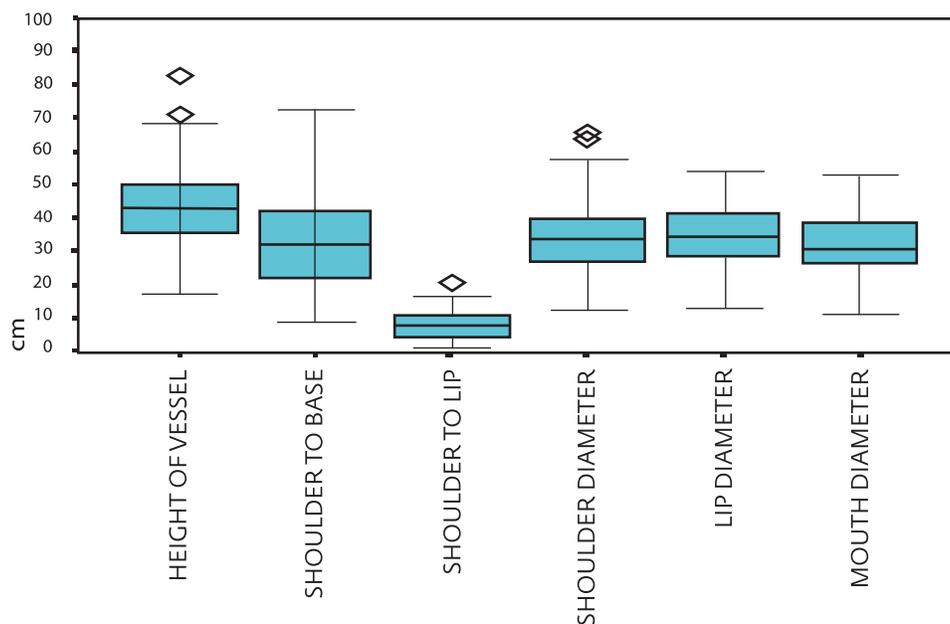
Although there certainly was a significant early to late difference in the kind of temper used to construct Focal Form vessels, the discernible patterning to temper use in between was by no means clear enough to use it in phase delineation. It was for this reason we decided to follow the lead of Chase and others who have argued that Central Alabama's Late Woodland ceramics express a long term development in grit tempering (Burke 1933, 1934; Chase 1968a, 1968b, 1969, 1979, 1990, 1998nd.a, 1998nd.b, 1998nd.c; Cottier 1982; Dickens 1971; Futato 1973; Jenkins 1981; Jeter 1977; Mann 2001; Nielsen 1976; Nance 1974, 1976; Sheldon et. al. 2002; Waselkov 1979). We presume that by grit these scholars mean any ground stone included as an aplastic. Since sand, mica, or mica-schist can all be construed as forms of ground stone, we decided to combine the sherds bearing them with those tempered with ground granitic rock into a silicate tempered group that constituted 93% of the overall ceramic sample.

With respect to the frequency of our Focal Form vessel type, the pooled data indicated that it constituted 65% of the sample. The 35% of the sample that was not of Focal Form type may be described as composed of restricted bowls, straight-sided bowls, warped bowls, hemispherical bowls, plates, globular jars, composite and the esoteric bowl-like forms indicated in Table 2.

Since the frequency of these forms seemed to duplicate the temper type distribution, we decided to exclude them from our seriation attempts. Then, too, since the frequency of decorated Focal Form vessels also duplicated this pattern, we decided to focus our attention on variations in Focal Form morphology.

Quantifying the Attributes of Focal Form Vessels

The pooled sample contained 53 Focal Form vessels complete enough to measure for height. These ranged from 17.5cm to 71cm with a mean of 44.6cm. When placed in the context of all other measurable vessels, the 17.5cm tall vessel and the 71cm tall example clearly stood out as extreme outliers. We thus decided to calculate a weighted mean. Once the outliers were eliminated the range of vessel height was 36 to 50 cm and the weighted mean was 43.0 +/- 7cm. The lip diameter for 110 measurable specimens ranged from 14 to 55cm with a mean of 34.3 +/- 7.6cm. The mouth diameter from 110 measurable specimens ranged from 12 to 55cm with a mean of 30.03 +/- 7.5cm. The shoulder diameter from 72 measurable specimens ranged from 13 to 59cm with a mean of 34.41 +/- 6.8cm (Figure 5). Thus given our sample the average vessel was roughly 10cm taller than wide. The shoulder

**Figure 5. Mean and Standard Deviation for Measured Vessel Parts.**

was 4cm wider than the mouth. The lip was approximately 1 cm larger than the shoulder and 5cm larger than the mouth.

Differently put the average Focal Form vessel was 6.9% taller than wide with a shoulder 8.7% larger than the mouth and the lip 8.5% larger than the mouth. The lip and shoulder on the typical Focal Form vessel were of roughly the same diameter with the lip being only 1.6% larger than the shoulder. With respect to shoulder position we stipulated that to be considered high the maximum diameter of the vessel must occur above the vessel's mid-point, i.e., more the 50% of the vessel's body must lay below the shoulder. In our measurable sample 81.4% of the vessel's body lay below a shoulder that was invariably rounded. Differently stated, the Focal Form vessel was always taller than broad, with a high round shoulder, a lip positioned directly over the shoulder or slightly beyond, and with a mouth always smaller than the lip.

We may now rephrase these metricized observations as necessary and sufficient conditions, i.e., significant, for admitting candidates to our class of all Focal Form vessels. A successful candidate for inclusion in the set of all Focal Form vessels must: (1) be silicate tempered; (2) be constructed of overlapped flattened coils or straps; (3) be between 16 and 72cm tall; (4) have a lip diameter between 21 and 52cm; (5) have a mouth diameter between 19 and 50cm; (6) have a shoulder diameter between 19 and 55cm.; (7) be 5 to 7% taller than wide; (8) be 7 to 9% wider at the shoulder than at the mouth; (9) have no more than a 2% difference between lip and mouth diameters; (10) have a round shoulder; (11) have from 70 to 90% of the vessel body below the shoulder and (12) have a conoidal bottom. It should be noted here that all of these conditions must be met given bottom to top reconstructable $\frac{1}{4}$ $\frac{1}{3}$ $\frac{1}{2}$ or whole vessels. It would, however, seem reasonable to admit the bottom or top $\frac{1}{2}$, $\frac{1}{4}$ or $\frac{1}{3}$ of reconstructable vessels and smaller fragments to the class if by measurement or controlled projection above shoulder fragments met significant 1, 2, 4, 5, 6, 8 9 and 10 or below shoulder fragments met significant 1, 2, 6, 7, 11 and 12.

Inferring Vessel Size and Shape from Fragments

Since many sherds would not include all, or even most, of the morphological landmarks found on the top or bottom $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$ of Focal Form vessels, we decided to see if selected landmarks on our larger and more complete specimens expressed the kind of relationship that in mathematical terms might be considered linear. Such a relationship, we reasoned, might allow the analyst to systematically infer vessel size and shape from sherds bearing a single metricizable landmark. The first step in such an inquiry would require a determination of just which

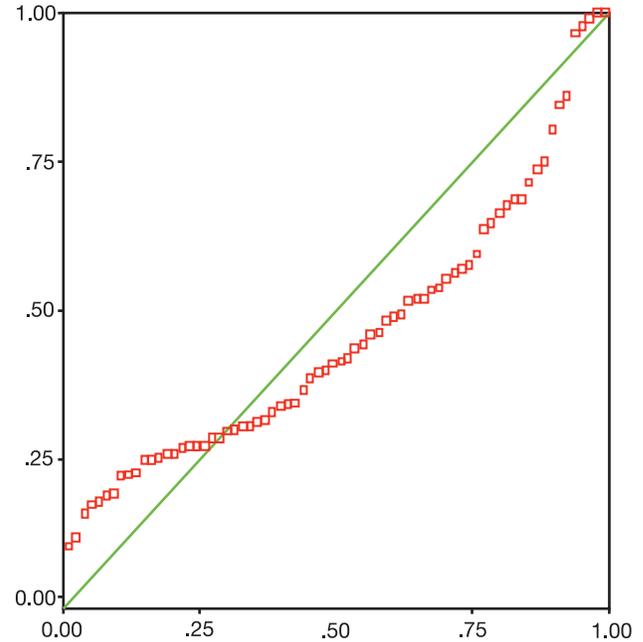


Figure 6: Linear Regression of Shoulder Diameter as Predicted by Mouth Diameter.

parts of a vessel might be the most sensitive indicators of inter-landmark relationships.

We began this quest by asking if the mouth and shoulder diameters were correlated. We stated the null hypothesis for this claim as follows. At the alpha level of .05 there will be no correlation between the diameter of the shoulder and the diameter of the mouth. The simplest statistical test for a correlation allowed us to reject the null hypothesis ($r = .930$, $p < .001$). This was clearly a step in the desired direction. Since we had reason to believe that the mouth and shoulder diameters were correlated, we decided to apply a linear regression to test the proposition that the two were proportionally related. We identified the mouth diameter as the independent variable and the shoulder diameter as the dependent variable for the regression. The null hypothesis, that there was a disproportionate relationship between mouth and shoulder diameter, was rejected by the regression ($F = 223.178$, $p < .001$). The standardized coefficient of Beta also indicated that this test rejected the null hypothesis ($B = .930$, $p < .001$, $t = 14.939$). The formula derived from this regression may be stated as $Y = .932X + 5.293$. When tested using vessel number eight from the data set, the value for a mouth diameter of 31cm was placed in the equation as $X = 31$, the resultant value of the formula was 34.185. This value was remarkably close to the true value of vessel number eight's shoulder diameter of 34.0cm. The regression curve clearly indicated that it would be reasonable for an archaeologist to find only the shoulder of a Focal Form vessel and be able to determine within the alpha level of .05 the diameter of its mouth (Figure 6).

We applied the same procedure to the mouth and

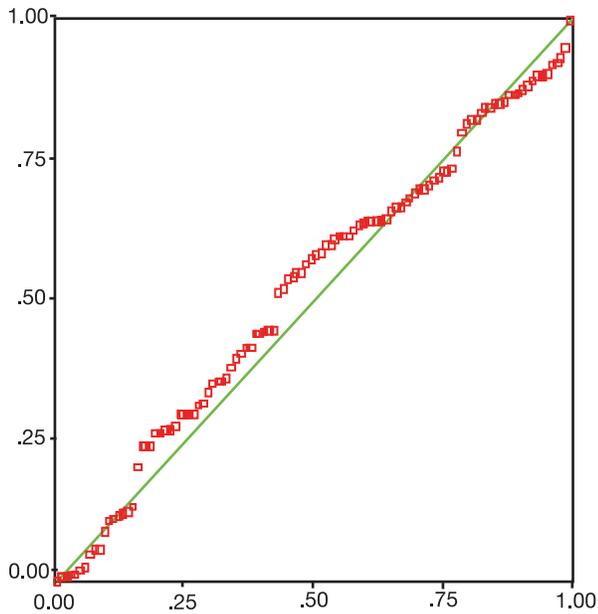


Figure 7: Linear Regression of Mouth Diameter as Predicted by Lip Diameter.

lip diameters of our sample's Focal Form vessels. In this case we identified the lip diameter as the independent variable (X) and the mouth diameter as the dependent variable (Y). A linear regression yielded the following: $R = .991$, $p = .000$, $Y = .013 + .947X$, $N = 110$ (Figure 7). The formula for this relationship would therefore be $Y = .947X + .013$. When applied to a vessel with a lip diameter of 34.5cm, the formula generated a mouth diameter of 33.6cm, which was very close to the measured diameter of 33.2cm. We, therefore, suggest that given a fragment from which a lip diameter may be determined, either by direct measurement or by carefully controlled projection, the formula will come close enough to predicting the mouth diameter to proceed with a reasonable degree of confidence.

When we ran the same set of statistical tests on the relationship between lip diameter and shoulder diameter we achieved the following results: $R = .952$, $p = .000$, $Y = .042 + 1.064X$, $N = 70$ and $X = \text{Lip Diameter}$ (Figure 8). When applied to a vessel with a lip diameter of 34.5cm and a shoulder diameter of 36.7cm. Again we suspect that an analyst may use the formula to generate a reasonable estimate of shoulder diameter from a directly measured or carefully projected lip diameter.

One of the hallmarks of the Focal Form vessel is its length to width ratio. It would be ideal if an archaeologist could reasonably determine the height of the vessel when only the shoulder of the vessel was measurable. To determine if the shoulder diameter of a vessel could be reliably used to predict vessel height we conducted a simple linear regression with the vessel shoulder as the independent variable and the vessel height as the dependent

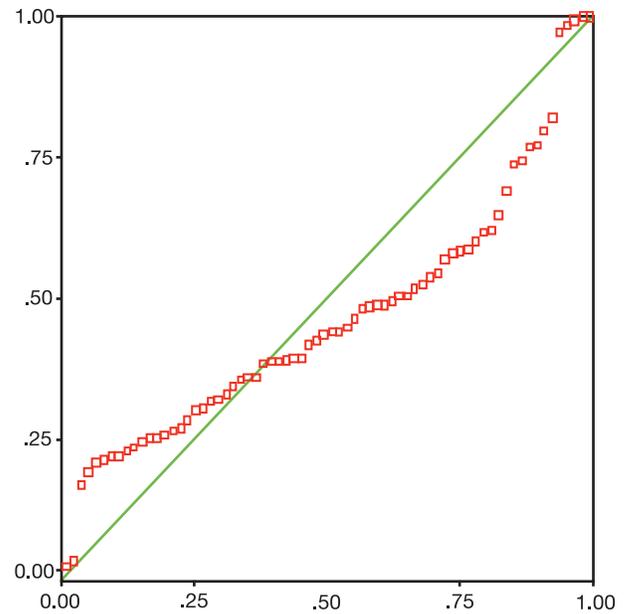


Figure 8: Linear Regression of Shoulder Diameter as Predicted by Lip Diameter.

variable. The null hypothesis for this regression, namely that the shoulder diameter was an unreliable predictor of vessel height was rejected ($F = 20.332$, $p < .001$). An examination of the standardized coefficient of Beta also indicated a rejection of the null hypothesis ($B = .701$, $p < .001$, $t = 4.509$). The formula derived from this regression may be stated as $Y = 1.27X + .853$ (Figure 9). When this equation was tested using the measured shoulder value of 34.4cm the height of the vessel predicted by the formula was 43.7cm. The measured height of the vessel in ques-

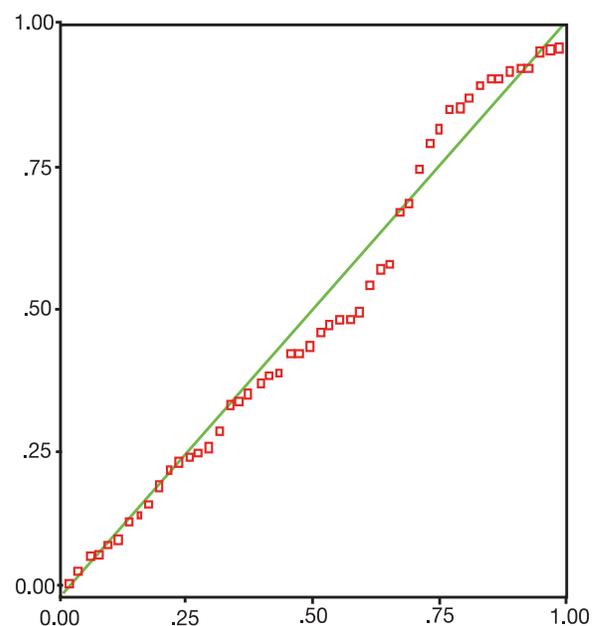


Figure 9: Linear Regression of Vessel Height as Predicted by Shoulder Diameter.

tion was 43.0cm. Once again the formula derived from the regression yielded a result remarkably close to that obtained by direct measurement. We thus feel confident that an analyst measuring shoulder diameter either directly or by controlled projection might use the formula to produce a reasonable estimate of vessel height.

In sum, the results of our statistical tests strongly suggest that for vessels of our Focal Form type: (1) the lip diameter may be used to predict the shoulder diameter, (2) the mouth diameter may be used to predict the lip diameter, (3) the shoulder diameter may be used to predict the mouth diameter and (4) the shoulder diameter may be used to predict vessel height. Further, since these predictions apply to specimens created over a span of at least five centuries we suspect that they reflect the rule dependent performance criteria expected of a culturally significant tradition of and for the manufacture of ceramic vessels. They seem to us at least to be evidence supporting Chase's claim for cultural continuity among his Dead River, Hope Hull, Autauga and Union Springs phases.

Temporalizing the Ceramic Data Set

After our pooled sample's attributes had been described and metricized and significant for admission to the set of all Focal Form vessels specified, we re-segregated the data set by feature and placed each feature into one of four temporal categories: earliest, early, late and latest. These categories were based on the claims advanced by David Chase and others about the place each feature occupied in the sequence of features identified as belonging to the late period of the Woodland stage. We also categorized several previously unassigned features by the occurrence of traditionally identified "marker" types, thus creating a quasi-serial order for the materials at hand. Positions within a quasi-serial order are, however, relative and may shift with the addition of new data or modifications in the criteria used to rank them. We, therefore, wanted to enhance the refutability of our claims by transforming our quasi-serial order into a strict serial order. To accomplish this aim we first assessed the radiometric determinations available for the late period of Alabama's Woodland stage materials, noting that they could be accommodated by the 600 year span between AD800 and 1400 (Futato 1977). We then divided this 600-year span into four 150 year segments giving us from early to late AD 800 to 950, 950 to 1100, 1100 to 1250 and 1250 to 1400. We completed the transformation by assigning each feature to one and only one of these 4 units. The specimens from 1Ee94 (A), 1Mt107 and 1Mt 10 (A) which represent Chase's Dead River phase were assigned to the AD 800 to 950 time span. The specimens from 1Mt 100 (A), 1Ee 94 (B), and 1Mt173 of Chase's Hope Hull phase were assigned to the interval between AD 950 and 1100. The ceramics from, 1Au28, 1Mt10 (B), 1Ee 191, 1Mt23, 1Mt111, and 1Ee257, components identified as part of

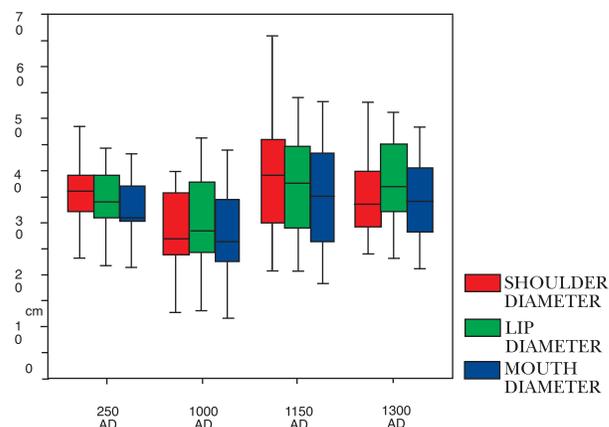


Figure 10: Focal Form Landmark Mean and Standard Deviation.

Chase's Autauga phase were assigned to the years between AD 1000 and 1250, and those from 1Mt23, 1Mt100 (B) and 1Mt 10 (C) of Chase's Union Springs phase to the interval between AD 1250 and 1400.

The 34 Focal Form vessels from features assigned to the AD 800 to 950 time span ranged in shoulder diameter from 23 to 48.5 cm with a mean of 36.5 +/- 3.5 cm, in lip diameter from 21 to 45 cm with a mean of 34.5 +/- 3.5 cm, and in mouth diameter from 21.5 to 42 cm with a mean of 33.15 +/- 3.5 cm (Figure 10). The non-Focal Form vessels that completed the ceramic inventory included restricted bowls, straight sided bowls and hemispherical bowls. The proportions of each may be read from Table 3.

The 48 vessels assigned to the AD 950 to 1100 time span ranged in shoulder diameter from 12.5 to 42cm with a mean of 28.2 +/- 4.5cm, and in lip diameter from 13 to 40cm with a mean of 26 +/- 6.8cm. They ranged in mouth diameter from 12 to 36.5cm with a mean of 25 +/- 6.3cm. (Figure 10). The non-Focal Form vessels that accompany them included restricted bowls, straight sided bowls, warped bowls and esoteric non-effigy forms (Table 3).

With respect to the means of the two groups of Focal Form vessels, a student t-test of paired means yielded a score of -18.5 for shoulder diameter, -12.7 for lip diameter and -13.1 for mouth diameter, all three indicating a statistically significant difference between them.

The 130 Focal Form vessels from features assigned to the AD 1100 to 1250 time span varied in shoulder diameter from 21 to 66cm with a mean of 40.1 +/- 2.5cm. They ranged in lip diameter from 20.5 to 54cm with a mean of 38 +/- 6.5cm and in mouth diameter from 19 to 54cm with a mean of 36.8 +/- 4.5cm. (Figure 10) The non-Focal Form ceramics that accompanied them included restricted bowls, straight sided bowls, warped bowls, hemispherical bowls, plates, jars, and composite forms (Table 3).

A student t-test of paired means for Focal Form vessels

Table 3: Focal and Non Focal Form Vessels

AD 800-950.									
Focal Form	Restricted Bowl	Straight Sided Bowl	Warped Bowl	Hemispherical Bowl	Plate Focal	Jar	Effigy	Composite	Esoteric-Non-Effigy
34	3	8	0	2	0	0	0	0	0
72.3%	6.4%	17%	0%	4.3%	0%	0%	0%	0%	0%
AD 950-1100									
Focal Form	Restricted Bowl	Straight Sided Bowl	Warped Bowl	Hemispherical Bowl	Plate	Jar	Effigy	Composite Focal	Esoteric-Non-Effigy
48	6	6	1	0	0	0	0	0	3
75%	9.4%	9.4%	1.6%	0%	0%	0%	0%	0%	4.6%
AD 1100-1250									
Focal Form	Restricted Bowl	Straight Sided Bowl	Warped Bowl	Hemispherical Bowl	Plate	Jar	Effigy	Composite Focal	Esoteric-Non-Effigy
130	39	19	11	2	8	8	0	2	0
59.4%	17.8%	8.7%	5.0%	0.9%	3.7%	3.7%	0%	0.9%	0%
AD 1250-1400									
Focal Form	Restricted Bowl	Straight Sided Bowl	Warped Bowl	Hemispherical Bowl	Plate	Jar	Effigy	Composite Focal	Esoteric-Non-Effigy
18	2	0	0	0	2	1	0	0	0
78.3%	8.7%	0%	0%	0%	8.7%	4.3%	0%	0%	0%

from the AD 950 to 1100 and AD 1100 to 1250 groups yielded scores of -28.9 for shoulders, -15.6 for lips and -17.6 for mouths, all three indicating a statistically significant difference between them.

The 18 Focal Form vessels assigned to the AD 1250 to 1400 interval ranged in shoulder diameter from 24 to 54cm with a mean of 35 +/- 5cm. They ranged in lip diameter from 22.5 to 51.5cm with a mean of 37 +/- 7.5cm, and in mouth diameter from 22 to 48.5cm with a mean of 36.1 +/- 5cm (Figure 10).

Only restricted bowls, plates and a jar accompanied Focal Form vessels (Table 3). A student t-test of paired means between the AD 1100 to 1250 and 1250 to 1400 groups of Focal Form vessels yielded scores of -17.6, -26.1 and -20.1, all three indicating a statistically significant difference. In sum, the statistically significant differences in shoulder, lip and mouth diameters among the Focal Form vessels in our four groups, although not definitive, were encouraging.

A Focal Form Vessel Seriation

As we proceeded it became obvious that David Chase would identify our Focal Form vessel as his type Adams Plain. Further, it is generally believed that Adams Plain vessels with elaborately constructed rims and especially high shoulders are later than those with lower shoulders and less elaborate rims. Some have speculated that the larger Adams Plain vessels are later than their smaller counterparts and that variation in temper and surface

treatment increased from early to late. The evidentiary basis for these claims was, however, unquantified. It was for this reason that we decided to analyze statistically our observations about each feature and their respective Focal Form vessels. We used the SPSS 9.0 program to regress our Focal Form vessels' landmark measurements, nominal and ordinal attributes by designated temporal unit. Each variable was also plotted for frequency occurrence within its temporal category. Lastly, all of the variables were regressed together by their temporal category and plotted together so that change among them, if present, could be visualized (Figure 11).

The results of this regression indicate that vessel height, the distance from shoulder to base, the shoulder diameter, the lip diameter and the mouth diameter of Focal Form vessels declined from AD 850 to 1000, and then increased from AD 1000 to 1150. These variables remained relatively stable until about AD 1200 then all declined again from AD 1200 to 1300. Differently phrased, Focal Form vessels became smaller from Chase's Dead River phase to his Hope Hull phase, then began to increase in size from Chase's Autauga phase to his Union Springs phase during which time they again declined. As might be expected, the ratio generated by dividing the distance between the Focal Form's shoulder and base by the distance between its shoulder and lip expressed a similar trajectory. On the other hand, the height of the Focal Form's rim increased gradually from AD 850 to 1150, then increased more dramatically from AD 1150 to 1300 at

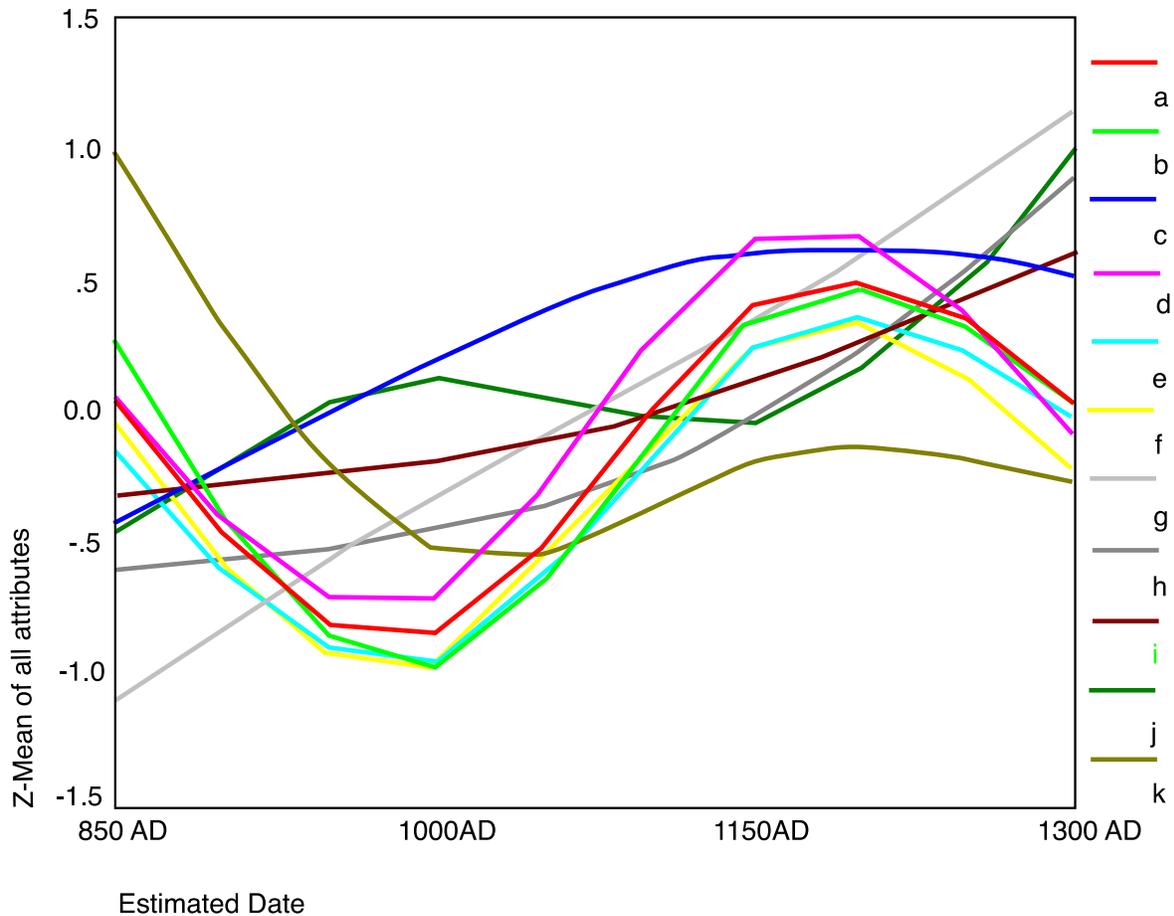


Figure 11: Focal Form Vessel Seriation.

the same time as the number of straps used to create the rim increased steadily from early to late. However, the distance between the shoulder and lip on Focal Form vessels increased from AD 850 to 1150, and then began a gentle decline to AD 1300. The proportion of sand tempered to grit and mica/ schist tempered Focal Form vessels increased from about AD 850 to 1100, then declined from AD 1100 to 1150, after which it increased rather dramatically to AD 1300. Finally, the number of different surface treatments increased gradually from AD 850 to 1300.

THE RADIOMETRIC EVIDENCE

To this point we have merely explicated the ceramic attributes David Chase used to create his sequence of Late Woodland phases and have used his criteria to rephrase his suggested temporal order. We shall now, however, consider this rephrasing to be a series of hypotheses that we wish to test by an independently derived set of radiometric measures. We had two radiometric measures available to us for this task, namely those based on the

Table 4: Results of Radiocarbon Determinations.

Site	Feature	Sample	Material	Conventional Radiocarbon Age (BP.)	2-sigma calibrated result and (intercept)
1Ee180	F-5	Beta 152993	Shell	2720 ± 70	BC 1010 (840) 790
1Mt100	F39/37	Beta 152994	Shell	930±60	AD 1000 (900) 1240 (850) (810)
1Mt100	F39/37	Beta 152995	Bone	780±60	AD 1160 (1260) 1300
1Ee94	Pit	Beta 152996	Shell	3140±70	BC 1530 (1410) 1260
1Ee94	Pit	Beta 152997	Shell	3000±60	BC 1400 (1260) 1030

Table 5: Results of Thermoluminescence Determinations.

UW lab #	Sherd #	Site	Feature	Context	Average Age (AD)
UW635	JM8	1Ee94		Pottery dump	1003±118
UW636	JM3	1Mt10	6	Pit/slough	802±152
UW637	JM1	1Ee191	2138	Midden	1230±194
UW638	JM9	1Ee94		Pottery dump	843±110
UW639	JM10	1Mt10	6	Pit/slough	1431±75
UW640	JM2	1Ee191	1836	Pit	1188±94
UW641	JM5	1Mt23	2	Pit	1314±76
UW642	JM7	1Mt100	39/37	Burial	1390±103
UW643	JM6	1Mt107		Shell layer	893±191
UW644	JM4	1MT173	6	Pit	1081±106

radioactive decay of carbon 14 and those based on the thermoluminescence of baked clay. Under ideal conditions, radiocarbon dating would be the best and most cost effective chronometric test. Radiocarbon determinations may be run on any organic material including animal bone, shell, charred or preserved wood and charred nuts some or all of them available from the Late Woodland features excavated by Chase. Chase unfortunately did not directly label these specimens with a provenance designation. Instead they seem to have been lotted and stored in paper bags with a provenience notation on the bag rather than on the specimens themselves. Although this is a fairly common curatorial practice, the extended shelf life of the specimens in question and indications of re-bagging made us uncomfortable. We suspected, for instance, that organic specimens from separate features or perhaps even separate strata may have been combined during the re-bagging. Our discomfort was heightened by the fact that the inventories of organic specimens were in some cases non-existent and in many cases incomplete. It was for these reasons that we decided to conduct a trial run on organic samples from three of what appeared to be the best documented features.

Radiocarbon Dates

Two organic samples from each of two features and a third from a feature with well dated ceramics were sent to Beta-Analytic for radiocarbon testing. We hoped by this procedure to assess the adequacy of our samples for radiocarbon determinations. Unfortunately, the five radiocarbon determinations provided a worst case scenario. Three of them placed the features from which they presumably were drawn in a pre-ceramic time span. The remaining duo of dates from a single feature placed it somewhere between AD 900 and 1260 (Table 4). Given these results we decided to try dating the ceramics themselves via thermoluminescence determinations.

Thermoluminescence Dates

In principle, a thermoluminescence determination, TL for short, dates the artifact itself. To be more precise, however, TL dates the last time the object was subjected to an extremely high temperature. If we assume that a pottery fragment was hottest when the pot from which it was broken was fired, then TL dates the final act in the manufacturing process. Thus, in principle, TL dating would be ideal. There is, however, the risk that a sherd was heated to its highest temperature long after the pot from which it was broken was made and used. This risk should, however, be minimal viz a viz the sample we submitted. None of the submitted sherds exhibited the warping and/or faux glazing that post production exposure to a high temperature might produce.

We selected ten Focal Form pot sherds from eight features for TL analysis. All of them were from well documented features and were large enough to provide three or more landmark measurements. These sherds were sent to Dr. James Feathers at the University of Washington Thermoluminescence Laboratory. Four soil samples were also gathered and sent to Dr. Feathers to test for natural radiation exposure in the Central Alabama region. Dr. Feathers' original intent was to provide us with relative dates for the specimens submitted. However, as he conducted his analysis he developed a method that would generate standard calendrical estimates with a curve of error similar to those of conventional radiocarbon dates (Table 5).

During the conduct of our analysis we assigned features from sites 1Mt10 component (A), 1Mt107 and 1Ee94 component (A) to David Chase's Dead River phase and suggested an AD 800 to 950 time span for this taxon. The three TL dates for specimens from these components were AD 802 +/- 152, AD 843 +/- 110 and AD 893 +/- 191. Averaging these determinations gives a mean of AD 846 with a range of from AD 802 to 893. Including the two sigma span for each determination would extend this range from AD 787 to 1084. In light of this evidence, we have revised our previous estimate from AD 800 to 950 to AD 800 to 1050.

We assigned the Focal Form specimens from 1Mt100 (A), 1Ee 94 (B), and 1Mt173 to Chase's Hope Hull phase for which we proposed a time span of from AD 950 to 1100. The two radiocarbon determinations run on organics from 1Mt100 component (A) yielded dates of AD 1020 +/- 60 and AD 1170 +/- 60 with a mean of AD 1145 and a range of AD 960 to 1230. The TL determination on a ceramic specimen from 1Ee94 component (B) yielded a date of 1003 +/- 113 and the TL determination on a sherd from 1Mt173 a date of AD1081 +/- 106. The mean date expressed by TL determinations was therefore AD 1041 with a range of AD 1003 to 1081. Including the two sigma span for these determinations would extend the range from AD 890 to 1187. We thus revised our estimated time span for the Hope Hull phase to AD 900 to 1200.

The ceramics from 1Au28, 1Mt10 component (B), 1Ee 191, 1Mt23, 1Mt111, and 1Ee257 were identified as part of Chase's Autauga phase estimated at between AD 1000 and 1250. Two Focal Form vessel fragments from 1Ee191 yielded TL dates of AD 1188 +/- 94 and AD 1230 +/- 194. The mean for the pair would be AD 1209 with a two sigma range for the two from AD 1094 to 1424 allowing us to retain our original estimate of AD 1000 to 1200.

The ceramics from 1Mt23, 1Mt100 (B) and 1Mt10(C) were assigned to Chase's Union Springs phase estimated at between AD 1250 and 1400. Three Focal Form fragments were submitted for TL determinations, one from each component. The fragment from 1Mt23 yielded a determination of AD 1314 +/- 76, the fragment from 1Mt100 (B) returned a determination of AD1390 +/- 103 and the sherd from 1Mt10(C) yielded a date of AD1431 +/- 75. The mean date expressed by the three TL determinations was AD 1378 with a range of from AD 1238 to 1506. In response to this evidence, we revised our estimates for the early edge of the Union Springs phase from AD1250 to AD1200. In sum, the radiocarbon and TL determinations by no means conflict with our age estimates based upon the frequency seriation of the metricized morphological variables integral to our Focal Form vessel type. We thus feel reasonably confident in proposing the following for the formation of phases and multi-phase integration of Central Alabama's Late Woodland artifact complexes.

TAXONOMIC PROPOSALS

Synthetic Taxa

Central Alabama's populations classified as Woodland co-existed with those termed Mississippian. Previously used taxonomic schemes have identified Woodland and Mississippian as cultural historical periods, yet technically speaking periods are strict serial orders. If both content and time are referenced in defining them, contrasting representations may not overlap in time and co-occur in space. This is why we considered the Woodland and Mississippian manifestations in our study area to be stages

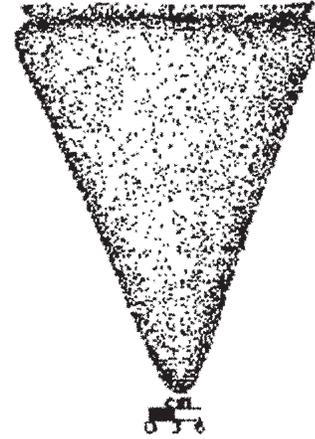


Figure 12: Typical Dead River Focal Form Vessel.

following Willey and Phillips (1958). Stages may be construed as parts of a quasi-serial order. Thus, if both time and content are referenced in defining them, an overlap in time and co-occurrence in space is possible. Recent research (Jenkins and Krause 1986) has demonstrated that an overlap in time and co-occurrence in space is not only possible but expectable for many of Alabama's early Mississippian and Late Woodland manifestations.

Classificatory Taxa

Following David Chase's lead, and until data requiring revisions are forthcoming we propose a sequence of four "ceramic phases". We will retain David Chase's Dead River, Hope Hall, Autauga and Union Springs names for them, but with the proviso that they are not Willey and Phillips' phases. To identify them as Willey and Phillips' (1958) phases would require data detailing settlement type and size, domestic architecture, burial practices and mortuary ritualism, stone and bone tool technologies and subsistence practices. Our Dead River, Hope Hall, Autauga and Union Springs phases are the ceramic equivalents of the Willey and Phillips phase. Nevertheless, it is our intent to identify each of these as a valid unit within the ceramic equivalent of the Willey and Phillips' phase-tradition-horizon system.

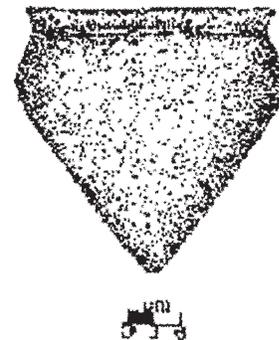


Figure 13: Typical Hope Hull Focal Form Vessel.

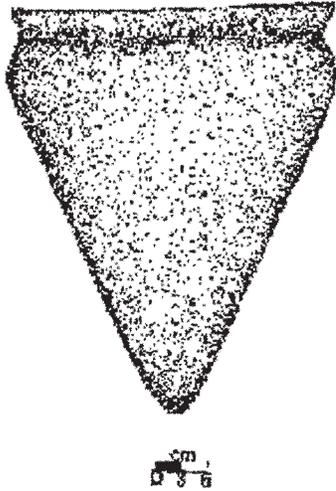


Figure 14: Typical Autauga Focal Form Vessel.

The Dead River Ceramic Phase

In keeping with the logic of the Willey and Phillips' system, our "ceramic phases" are to be ceramic content heavy and space-time restricted taxonomic units. Our Dead River ceramic phase for instance lies near the junction of the Coosa and Tallapoosa rivers. It is oriented north-south and east-west, with an eastern boundary near the mouth of Uphabee Creek, and a western boundary near Prattville, Alabama. Its northern boundary lies near Wetumpka and its southern near Pine Level Alabama.

We have restricted the temporal limits of our Dead River ceramic phase to the years between AD 800 and 1050. The ceramic content of this phase includes all overlapped flattened coil or strap built sand tempered Focal Form vessels that constitute over 70% of a given sample and that:

- 1→Range in shoulder diameter from 23 to 48.5cm with a mean of 36.5 +/- 3.5cm.
- 2→Range in lip diameter from 21 to 45cm with a mean of 34.5 +/- 3.5cm.
- 3→Range in mouth diameter from 21.5 to 42cm with a mean of 33.15 +/- 3.5cm (Figure 12).

The ceramic content of the Dead River ceramic phase also includes restricted, straight-sided and hemispherical bowls but these forms should not exceed 30% of a given sample.

The Hope Hull Ceramic Phase

Our Hope Hull ceramic phase has the same spatial spread as its Dead River predecessor (Figure 16), but is restricted to the years between AD 900 and 1200. Its content includes all overlapped flattened coil or strap built Focal Form vessels that constitute, like their earlier counterparts in the Dead River ceramic phase, over 70% of the ceramic sample and:

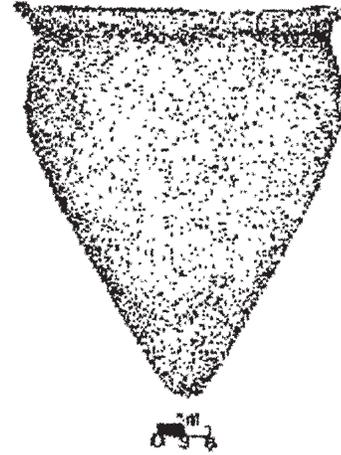


Figure 15: Typical Union Springs Focal Form Vessel.

- 1→Range in shoulder diameter from 12.5 to 42cm with a mean of 28.2 +/- 4.5cm.
- 2→Range in lip diameter from 13 to 40cm with a mean of 26 +/- 6.8cm.
- 3→Range in mouth diameter from 12 to 36.5cm with a mean of 25 +/- 6.3cm (Figure 13).

The non-Focal Form vessels that accompany this phase may include restricted bowls, straight sided bowls, warped bowls and esoteric non-effigy forms, but these should constitute less than 30% of the ceramic sample.

The Autauga Ceramic Phase

Our Autauga ceramic phase is also centered on the junction of the Coosa and Tallapoosa rivers and is oriented north-south, east-west. Its northern boundary lies near the town of Clanton and its southern boundary near Troy, Alabama. Its eastern border parallels the Georgia-Alabama line and its western boundary lies near the town of Orrville, Alabama (Figure 16). We have restricted its temporal range to the years between AD 1000 and 1200. Its content should be marked by a majority of overlapped flattened coil or strap built Focal Form vessels. These, however, should be accompanied by a greater number and diversity of non-Focal Form types than in the preceding Dead River and Hope Hull phases. The non-Focal Form vessels may constitute up to 40% of a given ceramic sample and should include restricted bowls, straight sided bowls, warped bowls, hemispherical bowls, plates, jars and composite forms. Then, too, the Focal Form vessels from components assigned to the Autauga ceramic phase should be larger than their Dead River and Hope Hull predecessors, and:

Central Alabama multiple phase overlap, circa AD 1150

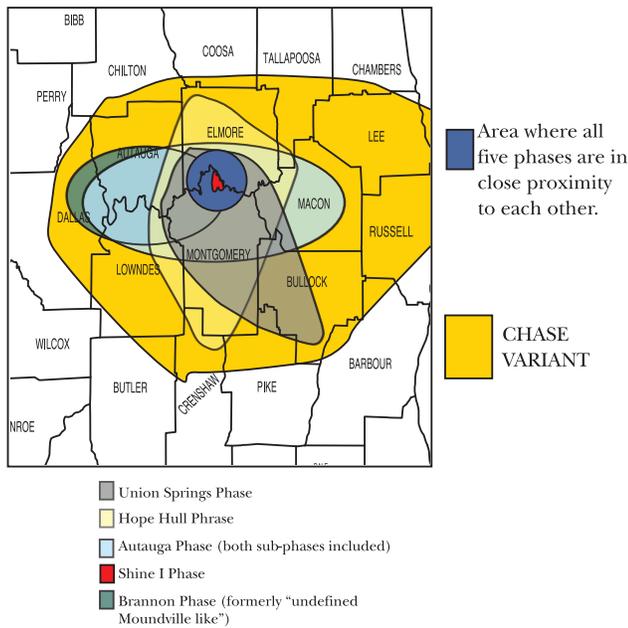


Figure 16: Central Alabama Ceramic Phase Distribution.

- 1→Range in shoulder diameter from 21 to 66cm with a mean of 40.1 +/- 2.5cm.
- 2→Range in lip diameter from 20.5 to 54cm with a mean of 38 +/- 6.5cm.
- 3→Range in mouth diameter from 19 to 54cm with a mean of 36.8 +/- 4.5cm (Figure 14).

The Union Springs Ceramic Phase

Our Union Springs ceramic phase is oriented northwest to southeast rather than north to south or east to west. It is centered on Line Creek between Montgomery and Macon County, Alabama. Its northeast border lies near the town of Notasulga, Alabama and its southeast near the Barbour-Bullock County line. Its northwest border lies near the town of Prattville, Alabama and its southwest near the town of Troy (Figure 16). We have restricted its temporal span to the years between AD 1200 and 1450. Our Union Springs phase should have a significantly higher Focal Form vessel content and a significantly lower non-Focal Form content than the preceding Autauga phase. Three-fourths or slightly more of any Union Springs ceramic assemblage should be of Focal Form type with no more than one-fourth composed of non-Focal Form vessels. The non-Focal Form vessels should include restricted bowls, plates and jars. The Focal Form vessels in a Union Springs component should:

- 1→Range in shoulder diameter from 24 to 54cm with a mean of 35 +/- 5cm.
- 2→Range in lip diameter from 22.5 to 51.5cm with a mean of 37 +/- 7.5cm

- 3→Range in mouth diameter from 22 to 48.5cm with a mean of 36.1 +/- 5cm (Figure 15).

Integrative Taxon

In 1971 Donald Lehmer (1971: 32) proposed a modification of the Willey and Phillips system by introducing the variant, which he described as “a unique and reasonably uniform expression of a cultural tradition which has a greater order of magnitude than a phase and is distinguished from other variants of the same tradition by its geographic distribution, age and/or cultural content.” Krause (1977: 10) explicated Lehmer’s use of variant and recast it as “a mid-range taxon which has less content, greater time span and greater spatial spread than a phase, but less time span than a tradition and less spatial spread than a horizon.” Thus construed, the variant fit securely within the paradigmatic logic of the Willey and Phillips’ system. Jenkins and Krause (1986) subsequently used it to integrate phases proposed for the Tombigbee watershed in northeast Mississippi and northwest Alabama.

The Chase Ceramic Variant

Despite minor oscillations in size, our Focal Form Vessel retained its integrity for more than five centuries and was manufactured and used in a broader expanse of space than could be reasonably assigned to a single ceramic phase. Throughout the length and breadth of its spread our Focal Form vessel was constructed of silicate tempered, overlapped and flattened coils, or straps,

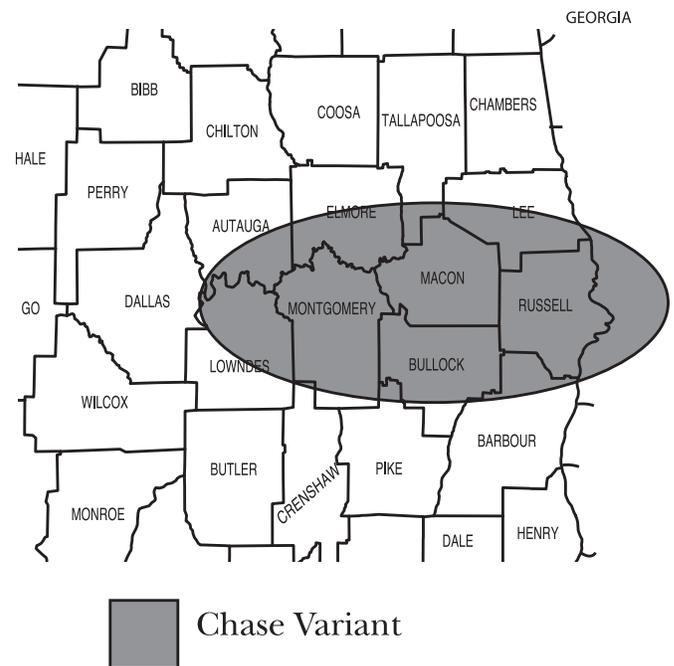


Figure 17: The Geographic Range of the Chase Ceramic Variant.

of clay shaped to produce relatively stable lip to mouth to shoulder to height ratios. We shall identify it as the ceramic equivalent of the Jenkins and Krause (1986) variant and use it to integrate the ceramic phases previously introduced. We shall call it the Chase variant in honor of the scholar who first described and systematically analyzed the vessels it represents. It should be noted that we consider the Chase Ceramic variant a combination space and time integrator leaving aside for future work the question of its role as an indicator of cultural continuity. In sum, our taxonomic proposals consist of *two stages*, Woodland and Mississippian, *four ceramic phases*, the Dead River, Hope Hull, Autauga and Union Springs phases, integrated in time and space through the production of Focal Form vessels indicative of *the Chase Ceramic Variant* (Figure 16). A few of the broader implications of our analysis and taxonomic proposals will be the next issue addressed.

It should be stressed that the Focal Form vessel lies at the core of our Chase variant. We have argued that its continued production and use integrates the Dead River, Hope Hull, Autauga and Union Springs phases. There are, however, several additional Central Alabama phases not included in our analysis that are characterized by the production and use of Focal Form vessels. With a modicum of additional laboratory research, two of them, namely the Calloway and Averett phases, could be included in the Chase variant. With additional field and laboratory work the Henderson and White Oak phases may also be viable candidates for Chase variant standing. Then too, Focal Form vessels have been reported for 1Ee8 (Brooms 1980) and the Sellers (Jenkins, personal communication) manifestation making them potential candidates for membership in the Chase variant. The spatial spread of this potentially expanded Chase Ceramic variant is illustrated in Figure 17.

THE ROLE OF THE FOCAL FORM VESSEL IN THE PREHISTORY OF CENTRAL ALABAMA

Two salient features mark the production of Central Alabama's Focal Form vessels: a five century persistence of manufacturing technique and, despite size oscillations, a proportional lip to mouth to shoulder to height consistency. Both continue despite a three century overlap with far different Mississippian stage techniques of ceramic production and decoration. With respect to the issue of stability in morphology and technique of manufacture, there is a South African analog that is accompanied by ethnographic evidence (Krause 1985). South Africa's Bantu speaking Iron Age inhabitants manufactured vessels with near identical morphologies and used the same technique in their production for almost a millennium (Krause 1984: 700–702). In this case the vessels were

used for the production and storage of the millet beer that was essential to daily social life and a vital element of periodic episodes of hospitality that served to maintain and/or enhance a host's position within his community (Krause 1972). We are not suggesting that Central Alabama's Focal Form vessels were used in beer production. Rather, we see their persistence as an integral part of a widespread and durable Native American form of hospitality, i.e., status maintenance and/or enhancement through the practice of feasting and honoring by gift-giving. In other words, we suspect that Focal Form vessels were containers for cooking and distributing the food used in both the secular and ritualized displays of supra-domestic group hospitality that was integral to the Native American practice of honoring by gift-giving. There is no evidence for the ritualized use of Focal Form vessels prior to AD 1000 but we may assume their use in secular displays of hospitality for the duration of the Dead River phase.

Evidence for the ritualized use of Focal Form vessels, especially those we have identified as outliers (i.e., extra-large 60cm or taller examples) can be derived from the late Dead River phase Hunter Station (Mt99) site and the Hope Hull phase Jenkins (Mt48), Hickory Bend (Mt100), and Doughnut Mound (Ee99) sites. At the late Dead River phase Hunter Station site Focal Form vessel fragments had been deposited in a high river bank midden. At the Hope Hull phase Jenkins, Hickory Bend and Doughnut Mound sites both extra-large and standard sized vessel fragments had been deposited in high river bank middens beside earthen mounds. In all four cases the number, size and depositional distribution of Focal Form sherds suggested intentional breakage and collective deposit. Although these examples are drawn from the 10th to 12th centuries of the five hundred year duration of Focal Form vessel production, they are instructive. If, as we suspect, they reflect a ritualized intensification of community identity then their overlap with the Mississippian stage authors of the Brannon phase can arguably be seen as evidence of an initial resistance to a maize based lifestyle.

The continued sympatric existence of Central Alabama's Late Woodland and Mississippian stage inhabitants is documented by the Fusihatchee (1Ee191) site excavations. At Fusihatchee Focal Form vessels were found on four Mississippian style house floors with Mississippian style sub floor flexed burials and Mississippian style incised pottery (Sheldon et. al., 2002; Chase nd.a; Dickens 1971). One of these house ruins, structure 3, was "double-dated" using both radiocarbon and TL determinations. Radiocarbon results placed the structure at AD 1040 to 1290 with an intercept date of AD 1220. The TL determination run on a Focal Form sherd from the floor of the house yielded a range from AD 1036 to 1424 with a mean date of AD 1230. Thus there is sufficient agreement between radiocarbon and TL determinations to claim that

this house floor and the Focal Form vessels upon it were contemporaneous. Obviously the Woodland stage folk of Central Alabama's Hope Hull, Union Springs and Autauga phases resisted incorporation into a cultivator based lifestyle. Their resistance may have had predictable consequences.

Suggestions for Future Research

Many southeastern prehistorians have noted the abundance of the southeastern forests and the progressively intense integration of natural plant and animal foods into the region's Archaic and Woodland stage economies (see Caldwell 1958). For millennia southeastern hunting and harvesting populations seem to have been in dynamic equilibrium with the region's natural food supply. To be sure, technological innovations may, for time to time, have increased the natural foods available. As a consequence, human populations may have grown until a new balance was struck. Nevertheless, people still moved to food with the rhythm and range of such movement determined by the distribution and behavior of plants and animals. Under such circumstances, the introduction of maize would render it an oddity. That maize could be grown or tended may have been understood, but full-scale cultivation would have threatened established and successful subsistence practices by requiring a narrowing of the range of natural resource use and greater residential stability than most Central Alabama groups had achieved prior to about AD 1100.

By AD 1100 food producing Mississippian populations had settled the Tombigbee, Black Warrior and south-central portion of the Chattahoochee watersheds, in the process either absorbing or displacing the resident hunters and harvesters. Thus we might expect the advent of cultivators at and around the junction of the Coosa and Tallapoosa Rivers to produce a similar range of effects. Those hunters and harvesters in the areas of greatest population density who resisted immediate expulsion or absorption faced a narrower range of intensive resource use. They could temporarily redress the resulting disruption by using second-line resources, i.e. small mammals, rodents, reptiles, birds, fish and insects, or could seek a longer term solution by extending the range of their hunting and harvesting grounds. This latter solution would in its turn disrupt the balance between population and natural resources in a broader area, putting pressure on neighboring groups to either extend their territory or narrow their range of intense natural resource use. Such pressure should encourage inter-group competition and conflict. It should be reflected in our domain of inquiry by an increase in Hope Hull settlement size, evidence for conflict between Hope Hull and adjacent populations, an increased Hope Hull dependence on second line resources and an increased use of maize as a supplement to the harvesting sector of the Hope Hull economy. An increased use of maize may,

for instance, be reflected in an 11th to 13th century increase in the size of Focal Form vessels.

More research is needed if our suggestions are to be properly assessed. For example we need solid evidence with respect to the number and size of Hope Hull and Autauga phase settlements. We hope that our study of Focal Form vessel dimensions and the formulae we have produced for estimating these dimensions from fragmentary specimens will aid efforts to obtain this evidence. While the headless skeletons at the Hunter Station site, the fortifications at Hickory Bend and reports of maize use in the area as early as the 11th century (Dickens 1971) are provocative, we need additional and carefully controlled evidence for conflict (or the lack thereof) from sites with Hope Hull and Autauga components. We need carefully collected and quantified faunal and floral samples from Hope Hull and Autauga site, samples that will allow us to assess the use of second line resources. And we need evidence detailing the use of maize from both Hope Hull and Autauga phase sites, evidence derived from charred plant remains or obtained by the extraction of phytoliths or lipids from Hope Hull and Autauga phase pottery. In sum, we hope our suggestions will be used to orient future research. Such research should tell us far more than we now know about the forces that shaped the lives of Central Alabama's Woodland and Mississippian peoples.

REFERENCES CITED

- Brooms, B. 1980. A Transitional Woodland-Mississippian period Shaft and Chamber Burial from Central Alabama. *Southeastern Archaeological Conference Bulletin* 23:15-19.
- Burke, R. 1933. Report. Arrowpoints.(19) 5 & 6. Montgomery, Alabama.
- 1934 Orange Red Pottery People. Arrowpoints,(20) 1& 2. Montgomery, Alabama.
- Caldwell, J. 1958. Trend and Tradition in the Prehistory of the Eastern United States. Memoir 88. Springfield. American Anthropological Association.
- Chase, D. 1967. New Pottery Types from Central Alabama. *Southeastern Archaeological Conference Bulletin* 5: 41-49.
- 1968a. Pottery Typology Committee for Central Alabama. *Southeastern Archaeological Conference Bulletin* 8: 11-22.
- 1968b. New Pottery Types from Alabama. *Southeastern Archaeological Conference Bulletin* 10. 17-25.
- 1968c. The Hope Hull Complex. *Journal of Alabama Archaeology* 14:1, 17-29.
1979. A Brief Synopsis of Central Alabama Prehistory. Paper Presented to the Annual Meeting of the Alabama Archaeological Society. Auburn, Alabama.
1998. Historic Pottery of Central Alabama. *Alabama Journal of Archaeology* 44: 1-2, 52-98.
- nd.a. Terminal Woodland in Central Alabama: A Hypothetical Demise of a Tradition?. Ms on file. Department of Sociology, Montgomery: Auburn University at Montgomery.
- nd.b. Autauga, Decline or Metamorphosis. Ms. on file. Department of Sociology, Montgomery: Auburn University at Montgomery.

- nd.c. Prehistoric Pottery of Central Alabama, Part I Gulf Formational Through Late Woodland. Ms. on file. Department of Sociology, Montgomery: Auburn University at Montgomery.
- Cottier, J. 1982. The Archaeology of Ivy Creek. Auburn University Archaeological Monograph 3. Auburn, Alabama.
- Dickens, R. 1971. Archaeology of the Jones Bluff Reservoir of Central Alabama. *Journal of Alabama Archaeology* 17: 1.
- Futato, E. 1973. I-65 Highway Salvage: The Position of Twelve Archaeological Sites in Central Alabama. MA Thesis, Department of Anthropology, Tuscaloosa: The University of Alabama.
1977. Selected Radiocarbon Dates from Alabama. *Journal of Alabama Archaeology* 23:1, 37-52.
- Gums, B., C. Phillip and T. Potts. 2001. Phase II Archaeological Testing at site 1Mt318, the Madison Park Site for Bridge Replacement on US 231 North over Western RR Overpass/7mile Creek, ALDOT #BRF-153 (11)/NHF-507n (4)/AHC #98-1029 in Madison Park, Montgomery County, Alabama. Report Submitted to the Alabama Department of Transportation.
- Jenkins, N. 1981. Gainesville Lake Area Ceramic Description and Chronology. Archaeological Investigations in the Gainesville Lake Area of the Tennessee-Tombigbee Waterway. Vol.2, Report of Investigations 12. University: Office of Archaeological Research, University of Alabama
- Jenkins, N. and R. Krause. 1986. *The Tombigbee Watershed in Southeastern Prehistory*. Tuscaloosa: University of Alabama Press.
- Jeter, M. 1977. Late Woodland Chronology and Change in Central Alabama. *Journal of Alabama Archaeology* 23: 112-136.
- Krause, R. 1971. Field Notes in the Possession of the Author.
1984. Modelling the Making of Pots: An Ethnoarchaeological Approach. van der Leeuw and Pritchard Eds., *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*. Amsterdam: Universiteit van Amsterdam.
1985. *The Clay Sleeps: An Ethnoarchaeological Study of Three African Potters*. University: University of Alabama Press.
1995. Attributes, Modes and 10th Century Potting practices in Northcentral Kansas. *Plains Anthropologist* 40, (154):307-52.
1977. Taxonomic Practice and Middle Missouri Prehistory: A Perspective on Donald J. Lehmer's Contributions. *Trends in Middle Missouri Prehistory: A Festschrift Honoring the Contributions of Donald J. Lehmer*. W.R. Wood Ed., 5-13. *Plains Anthropologist* Memoir 13.
- Lehmer, D. 1971. Introduction to Middle Missouri Archaeology. Anthropological Papers No. 1. Washington: National Park Service.
- Mann, J. 2001. Assessment of a Seriation of Late Woodland Pottery from Central Alabama. Paper Given to the 67th annual meeting of Society for American Archeology. New Orleans, Louisiana.
- Meeks, S., and M. Spry. 1999. Archaeological Investigations and Historical Overview of the Proposed Riverside Industrial Park, Montgomery County, Alabama. Report Prepared by The University of Alabama Museums, Office of Archaeological Services. Moundville, Alabama.
- Mikell, G., and R. Turley. 2001. Between the Alabama River Bridges: Testing and Data Recovery Excavations at Reese's Ferry Site (1Ee491 and 1Ee492), Elmore County, Alabama. Report prepared by Panamerican Consultants, Inc. Tuscaloosa, Alabama.
- Nance, R. 1974. *Demopolis Lake Navigational Channel Archaeological Survey*. Tuscaloosa: University of Alabama Press.
1976. The Archaeological Sequence at Durant Bend, Dallas County, Alabama. Special Publications of the Alabama Archaeological Society No. 2.
- Nielsen, J. 1976. Archaeological Salvage Excavations at Site 1Au28. *Journal of Alabama Archaeology* 22:2, 91-173.
- Rouse, I. 1960. The Classification of Artifacts in Archaeology. *American Antiquity* Vol. 25:313-23.
- Sheldon, C., J. Cottier, and J. Mann. 2002. A Late Woodland-Mississippian Culture Contact in Central Alabama. In press, *Journal of Alabama Archaeology*.
- Walthall, J. 1980. *Prehistoric Indians of the Southeast: Archaeology of Alabama and the Middle South*. Tuscaloosa: The University of Alabama Press.
- Waselkov, G. 1979. Lower Tallapoosa River Cultural Resources Survey: Phase I Report. Ms. on file, Archaeological Laboratory, Auburn University Montgomery.
- Willey, G., and P. Phillips. 1958. *Method and Theory in American Archaeology*. Chicago: University of Chicago Press.

Discovery and Excavation of the Moundville Earth Lodge

Vernon James Knight
Department of Anthropology
University of Alabama
Box 870210
Tuscaloosa, AL 35487

ABSTRACT: Archeological investigations during 1999-2002 of the summit of Mound V at the Moundville site, Alabama, revealed a pair of large building foundations of single-set post construction conjoined by a tunnel entranceway defined by wall trenches. The more elaborate of the two buildings was square in plan and had extraordinarily large roof supports and an external embankment of clay. It is an example of the kind of building called earth lodges elsewhere in the Southeast, a form previously unknown at Moundville. I discuss the discovery, excavation, architectural details, and evidence for dating these buildings to the Moundville III phase at ca. AD 1400-1500.

INTRODUCTION

Moundville, in west-central Alabama, is the largest of the Mississippian ceremonial centers in the Deep South, with more than 30 mounds arranged around a central plaza (Knight and Steponaitis 1998:2-6). We are concerned here with architectural remains recently found on the summit of Mound V at Moundville Archaeological Park. Because it is not possible to address every aspect of these remains in this paper, I will concentrate on an account of the discovery and an outline of the main architectural elements.

Mound V is a broad, rectangular artificial platform that adjoins the northern margin of Mound B, the tallest mound at Moundville (Figure 1). It is probably legitimate to think of Mound V as an apron of Mound B, intimately associated with the dominant mound. Mound V measures about 140 by 70 meters in basal dimension, and is approximately 2.5 m thick in the main area of our work, near the northeast corner of the summit. The importance of the space is signaled by the fact that one of Mound B's two ramps ascends directly from the Mound V platform on the north, the other from the east. The only previous

excavations at Mound V were by Clarence Moore in 1905 (1905:141-142), who devoted "eighteen trial holes and 150 feet of narrow trench" to the summit surface, finding no burials and few artifacts of interest to him. He did note the presence of near-surface midden, a detail that was important to us, as it suggested a residential use. A photograph taken from an airplane in April, 1938 of a Four-H Club outing to the Park (Figure 2) shows Mound V recently cleared of vegetation by the Civilian Conservation Corps. Its angular features are relatively well preserved. A close inspection of the photo, however, shows signs of erosion and gullying near the center. As with other mounds in the Park, the platform was to some degree "restored" in the late 1930s. Since then, about two dozen trees have been allowed to grow up on the summit while the area between them has been maintained in grass by mowing, resulting in a pleasantly shaded park-like area.

Our work at Mound V came at the tail end of a ten-year run of field work called the Moundville Public Architecture Project, aided by grants from the University of Alabama and National Science Foundation, and abetted by

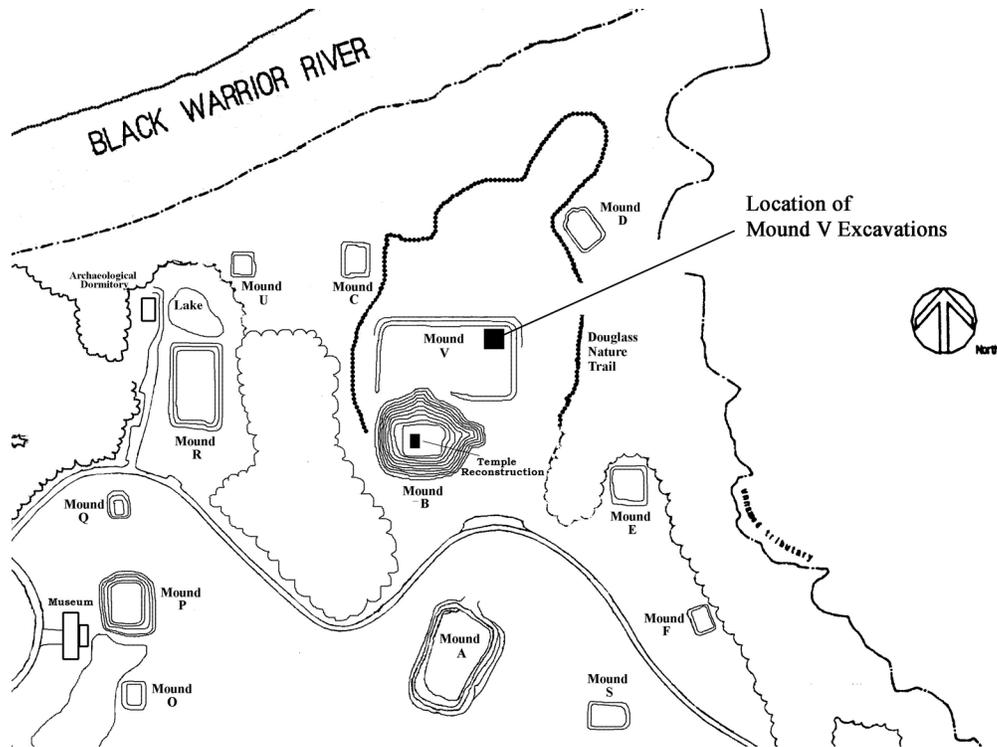


Figure 1. Detail from map of Moundville, showing relationship of Mound V to Mound B in the northern area of the site.

the Alabama Museum of Natural History. The project's aims were to provide a construction chronology for the earthworks by flank trenching Mounds Q, R, E, F, and G, and to investigate suggestions of differences in summit use through extensive horizontal exposure on Mounds Q and E. Our original research design also called for limited testing of two intriguing components of the site layout, (a) Mound A in the center of the plaza, and (b) the Mound V platform, with its curious relationship to

the dominant mound at the site. In both instances our intent was for the testing to be just sufficient to add to the site's construction chronology and to give us some indication of use, by intercepting summit architecture or by recovering artifact assemblages from midden or feature fill contexts. The Mound A work was completed in the fall season of 1996, leaving only the Mound V testing, which was scheduled for the fall of 1999. In anticipation of the work on the Mound V summit, certain of my Mesoamericanist colleagues confidently predicted that the platform supported an elite residential compound. That suggestion was speculative, but it did not seem unlikely, given the northerly location at the site and the association with Mound B, that Mound V was elite real estate of some sort.

THE EXCAVATIONS OF 1999-2002

Devoting the University of Alabama's annual fall semester field school to this work (Figure 3), we established a grid and began the 1999 season with two identical 6 by 1.5 meter trenches (Figure 4), oriented north and south, placed in the center of the platform near where the Mound B northern ramp converged. We found that the near-surface deposits here were loosely consolidated, full of coarse sand and pea-sized gravel, unlike mound fill. Potsherds were scarce. It soon became clear that in both trenches we were digging through a layer of restoration fill, trucked in by the Civilian Conservation Corps in the



Figure 2. Aerial photograph of Mounds B and V, taken from a position over the plaza, April, 1938, showing Mound V cleared of vegetation. The occasion is a 4-H Club outing.



Figure 3. University of Alabama Department of Anthropology Field school, Mound V, fall semester 1999.



Figure 5. Trench in the northeast sector of the Mound V summit at the end of the 1999 season, showing multiple partially excavated features.

late 1930s to level and restore the eroded center portion of the mound. Recognizing this, we abandoned these two trenches and used a 1-inch split core auger to prospect for intact deposits elsewhere on the summit. Finding a promising locality on the northeast section, we set up a third trench measuring 10 by 1.5 meters, and spent the rest of the 1999 term excavating it. Here, just below the humus we encountered numerous intact features of various kinds (Figure 5). It was impossible to excavate and



Figure 4. One of two 1.5 by 6 m trenches dug in the central portion of Mound V during fall, 1999. The one shown here was located near the base of the north ramp of Mound B.



Figure 6. Alabama Museum of Natural History Expedition 23, Moundville site, June 2001. This was one of four Expedition 23 crews, consisting primarily of high school students.



Figure 7. Extent of Mound V excavations at the end of the summer 2001 season, with Alabama Museum of Natural History Expedition 23 crew.

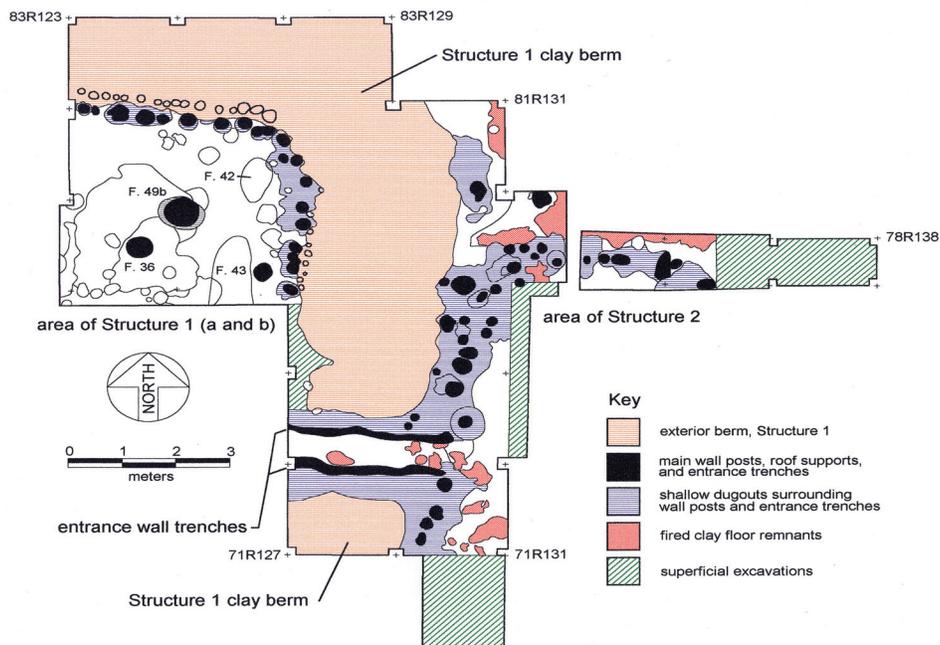


Figure 8. Plan of excavated area, northeast summit of Mound V, showing features associated with Structure 1 (the earth lodge) and adjacent Structure 2, with connecting tunnel entranceway bounded by wall trenches.

record all of these in the remaining time, so I chose to devote a second fall semester field school to this effort in the year 2000, excavating previously exposed features and expanding the 1999 trench in two places to the east and west. By the end of the second season, however, we were still left with unsolved puzzles. We had uncovered parts of what seemed to be a much larger architectural whole that could not be interpreted from our narrow excavation window.

Not wishing to abandon this effort with so little understanding of it, I decided that we needed to continue with a larger effort. Fortunately, a large crew was available in the annual Expedition program of the Alabama Museum of Natural History (Figure 6). I had worked with this organization before, and it suited our needs (and theirs) perfectly. Over a period of four weeks in the summer of 2001, with an average crew size of about 30 per day, we expanded horizontally (Figure 7), primarily to the west but also to the east and south. By the second week it became clear that we had uncovered portions of two adjoining buildings, one of which was heavily earth-embanked and which featured a tunnel entranceway bounded by wall trenches.

Even so, at the close of the summer work, the Expedition crew had exposed and mapped numerous feature stains that remained unexcavated. Consequently I devoted the next fall semester's Department of Anthropology

field school to excavating pits and post holes within the area already opened, completing the record of plan and profile drawings, and collecting additional samples. This work, which was undertaken in the fall of 2001, was primarily in the floor area of the embanked structure. These tasks, however, proved greater than I anticipated, which meant devoting yet another field school to the same work in the fall of 2002, after which we could finally bring closure to the excavations with some understanding of the deposits.

In this manner, after five episodes of excavation spread over four years, we had exposed the architecture shown in plan view in Figure 8. To the west, we have the northeast corner of a building surrounded by a massive earth embankment, featuring heavy roof supports and a tunnel entranceway—characteristics identified in the past with buildings called “earth lodges” in the Southeast. To the east, we had intercepted portions of the west and north walls of a second building, directly connected to the first by the entranceway. We will refer to the embanked building as Structure 1, and to the building to the east of it as Structure 2. Both were built essentially at ground level on the Mound V summit as it existed at the time. Although the embanked Structure 1 has a floor that was somewhat dishd out toward the center, it was not built within a discrete excavated pit.



Figure 9. The east berm of Structure 1, looking north, summer 2001. This was an exterior embankment of compact tan-orange sandy clay. The wall trenches of the tunnel entranceway, crosscutting the berm, are seen in the foreground.

STRUCTURE 2

Let us first describe Structure 2, to the east, whose western wall was encountered by our initial trench in 1999. This was a rectangular building with rounded corners, of “single set post” construction (that is, with individually-dug post holes) and with daubed walls. The apparent confusion of wall posts seen in plan view is mainly due to the fact that Structure 2 was rebuilt in place. For each of its incarnations, wall posts were set about 70 cm apart center-to-center. The post holes averaged 20 cm in diameter and were rather deeply set, about 58 cm below the floor level. Two exceptional post holes, perhaps corner posts, were set much more deeply at 106 to 107 cm below the floor level. The daub along this wall line has a gritty exterior finish, and interior impressions show that it was applied against split cane lath-work (Sherard, this volume). When posts were pulled for renovation, as they were at least twice, the post holes were deliberately plugged with brightly colored clean clay—yellow in one instance and orange in another—such that these post holes are virtually color-coded by construction episode. The upper portions of these posts are surrounded on all sides by broad, irregular dugouts, filled with midden. Although these dugouts appear to be trench-like in plan view, these are in no sense conventional wall trenches. I interpret this as a connected series of crude extraction pits, dug around the bases of standing posts for the purpose of pulling them.

The floor of Structure 2 was initially paved with a thick layer of clay, laid down when wet. At least in some areas near the wall, this clay floor was fired in place, probably when an early version of the building burned. Subsequently the baked areas became much broken up and distorted, perhaps by foot traffic, such that remnants of the original clay floor were preserved only in spots. Where



Figure 10. Excavated area of Structure 1 (the earth lodge), looking east, fall semester 2002. The large feature visible in the center is the bisected post pit of the northeast roof support, Structure 1a. The largest circular feature to the right is the northeast roof support of Structure 1b.

the wall dugouts intersected the baked floor areas, the dugouts cut through and therefore postdate the floor. A second, larger zone of baked clay floor was preserved north of Structure 2 in areas marginal to our excavation. I am unsure of the purpose of this patio-like surface and of the circumstances which caused it to be heavily baked.

STRUCTURE 1

Turning our attention to Structure 1, we found that it was surrounded by a loaf-shaped berm of well-compacted tan-orange sandy clay (Figure 9), that sloped both to the interior and to the exterior. This berm was about 2.7 m wide and rose 60 cm above the floor level. It was originally higher, having been truncated at the top by modern activity. We found that the berm slopes were gullied in places, showing that it had been exposed to the elements before the addition of dark brown midden-like deposits that covered its interior and exterior flanks. The berm was interrupted by a tunnel entranceway flanked by narrow wall trenches about 57 cm apart. Not indicated in our plan drawing (for risk of confusion) is the fact that there are actually two superimposed sets of entrance trenches pertaining to two successive buildings of Structure 1 in the same place.

Our work in the northeast corner of Structure 1 (Figure 10) revealed two superimposed floor levels. The first version, which we will call Structure 1a, did not burn, but was dismantled after a period of use. Afterward a clean layer of fill 15 to 20 cm thick was laid down over the floor, and the second version, Structure 1b, was built in place. At some point this second version burned fiercely, resulting in thick piles of daub rubble and charred bits of roof beams strewn across the floor area. The fire was suffi-



Figure 11. North wall line, Structure 1. The main row of post holes is shown, with shallow dugouts surrounding the posts. A separate line of shallow post holes or indentations for leaner posts appears just to the left of the main wall line.

ciently intense to produce silica froth, a gray vesicular glass formed by the melting and fusion of silica phytoliths in grass and cane structural elements (Sherard 2001).

The main wall line thus incorporates post holes pertaining to both buildings (Figure 11). When Structure 1a was dismantled, a certain amount of digging was done around the bases of the posts to dislodge them, resulting in midden-filled dugout areas similar to those of Structure 2, but not quite so extensive. The post holes, spaced about 50 cm apart center to center, averaged 28 cm in diameter and 74 cm deep. They were not vertical, but rather sloped inward from bottom to top toward the center of the building at a very slight angle of about 9 degrees from plumb, reminiscent of the sloping wall posts of the earth lodge found beneath the main mound at Town Creek, North Carolina (Coe 1995:65-72). This was undoubtedly a weight-bearing wall that supported a horizontal plate. Charred bits of pine wood (Tickner, this volume) from

the wall posts of Structure 1b were frequently encountered in the post holes. As Structure 1b burned, the wall fell inward on both the northern and eastern sides, leaving a continuous ridge of daub rubble just interior to the wall line.

In addition to the main wall line, there was a second row of small indentations just exterior to it, set into the base of the clay berm. These indentations—one can hardly call them post holes—were so shallow and so ephemeral that at first we did not believe they could be structural members. In Figure 8, they are shown as small open circles adjacent to the main north and east wall lines. On inspecting these indentations, my colleague Richard Krause, who has first-hand knowledge of earth lodge excavations in the Plains, recognized these as “leaner posts,” homolo-

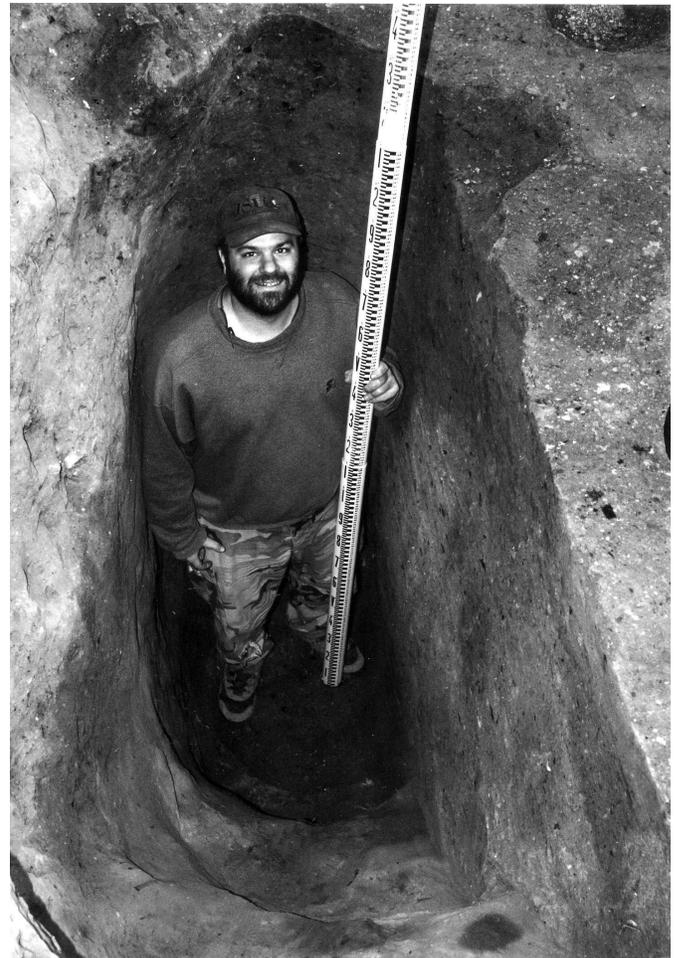


Figure 12. Bisected post pit for Structure 1a roof support (Feature 49b), view to the east. The post insertion and extraction ramp occupies the foreground. At the base was a circular indentation 65 cm in diameter, marking the size of the post. Charred remnants of wood found at the base of this feature show that the post was yellow pine, as was the adjacent roof support post for Structure 1b.

gous with the outermost wall posts of Plains earth lodges against which the sod is embanked.

Daub recovered from the collapsed northern and eastern wall lines revealed a very different patterning than that seen in Structure 2 (Sherard, this volume). The hand-smoothed exterior surfaces here differed from the gritty-textured surfaces of the adjacent structure. More interesting from an architectural standpoint was that whole cane rather than split cane formed the horizontal lathing of this wall. Apparently bundles of two to three whole canes were tied at close intervals to the main wall posts, and heavily grass-tempered daub was built up around this framework to form the wall. The daub-plastered interior east wall was painted in red and white, using pigmented clay slips. We cannot know what the overall painted pattern was like, except to say that red and white painted areas were relatively large. Fragments of daub showing the conjunction of both colors also occurred.

Daub rubble was also found well to the interior of the collapsed walls, evidently having fallen from the underside of the roof. This daub, in contrast to the wall daub, tended to show the impressions of split cane lathing, presumably bound to the interior roof to provide a fireproof coating of hand-smoothed clay plaster.

The roof was held up by interior support posts (Features 36 and 49b in Figure 8), almost certainly four in number, each situated near a building corner. These were large. Shown in Figure 12 is one of the primary roof supports for the initial version of Structure 1. This post hole, Feature 49b, lies at the base of a broad insertion pit which was later re-excavated as an extraction pit, a distinction that is clear in profile view. The post pit is somewhat more than two meters deep, and it bears a compact impression at the base which gives us the diameter of the post itself: 65 cm. This tree-sized post, I suggest, is a case of over-engineering, meant to impress. The species is identified as yellow pine (Tickner, this volume) from remnant charred fragments present at the base. An intriguing architectural fact is that this post, like the main wall posts, leaned inward toward the center of the building at an angle of four degrees from plumb. The fill of the post pit contained

unusual inclusions of tiny, round pellets of copper, which must have had a symbolic significance. The roof support for the corresponding rebuilt version (Feature 36, Structure 1b) was smaller, 51 cm in diameter, with its own insertion pit. It was placed about 1 meter interior to its predecessor. As a result of the burning of the replacement structure, the butt of the smaller roof support post (also yellow pine) was partially preserved in place.

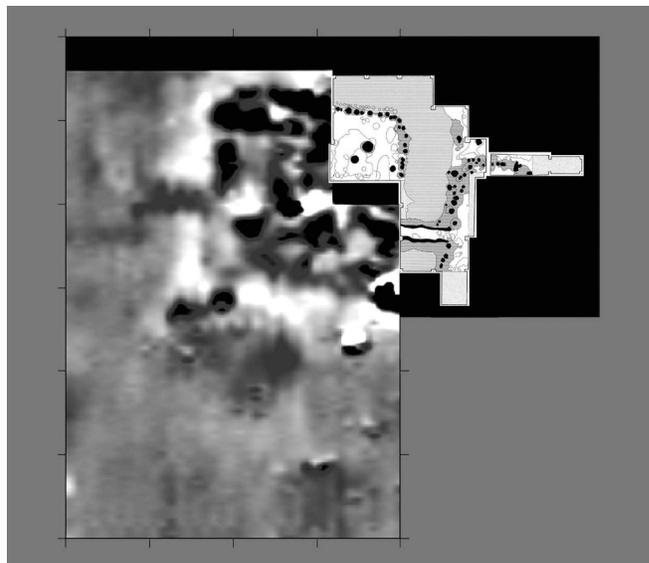


Figure 13. Gradiometer image of the unexcavated portion of the Structure 1 area, with excavation plan superimposed. Tick marks are at 5 m intervals. The surrounding clay berm has a negative magnetic signature and shows as a light-colored square, interrupted by a probable second entranceway to the west. Piles of fired daub lying on the interior floor have a positive magnetic signature and show as black. A contrasting black and white “dipole” near the center marks the probable location of the hearth. Image courtesy of Jay Johnson and Bryan Haley, University of Mississippi.

Table 1. Radiocarbon dates from the Mound V excavations.

Sample No.	Sample Description	Radiocarbon Age	$^{13}\text{C}/^{12}\text{C}$ Ratio %	Conventional Radiocarbon	2 Sigma Age Calibration
Beta-161959	Feature 8. Pocket of wood charcoal within fill of east berm. Structure 1.	620 ± 60 BP	-26.7	590 ± 60 BP	AD 1290 – 1430
Beta-161960	Feature 14. Charred wood from corner post of Structure 2.	570 ± 60 BP	-24.8	570 ± 60 BP	AD 1290– 1440
Beta-161961	Charred wood from roof beam, Structure 1b, Unit 79R125.	250 ± 60 BP	-25.7	240 ± 60 BP	AD 1500 – 1690
Beta-161962	Feature 33. Charred wood from roof support post, Structure 1b.	550 ± 60 BP	-25.7	540 ± 50 BP	AD 1300 – 1440

Our excavations were insufficiently broad to determine the size of Structure 1. In consequence, we used a 1" split core auger to locate the crest of the exterior berm to the west and south. Better still, we were favored by a visit from Jay Johnson and Bryan Haley of the Center for Archaeology at the University of Mississippi, who applied four different remote sensing technologies along a grid in the unexcavated area: ground-penetrating radar, soil resistivity, magnetometry, and gradiometry. Because of the strong magnetic signature produced by daub, they obtained their best results using a fluxgate gradiometer (a Geoscan FM 36). The gradiometer image (Figure 13), with our excavation plan superimposed, reveals a great deal. The piles of fired daub on the floor of the building show as an area of mostly positive magnetic readings which appear as dark patches, mixed with some negative readings which show as lighter patches. As in the excavated area, we can see that concentrations of daub rubble occur both along the wall line and also to the interior, where the daub must represent roof fall. The wall daub appears to be heaviest along the northern margin of the building. The central hearth is indicated by a "dipole," a spot near the middle of the structure where stark positive and stark negative magnetic readings are juxtaposed—rendered as white against black. The top of the clay berm shows up clearly as a square outline with a relatively negative magnetic signature, light in tone, confirming that it is made of homogeneous material with low magnetic susceptibility. One of the nicest features of this image is that it shows a break in the western berm corresponding to the one excavated in the eastern berm—almost certainly a second tunnel entranceway on the west side. It is noteworthy that both entranceways are off-center. With this image we can verify that the building is square, and that the floor as marked by the main wall lines is approximately 11.1 m in diameter, giving a floor area of about 123 square meters. This is large for an earth-embanked building in the Southeast, the only comparably big example being the earth lodge at the Macon Plateau site in central Georgia (Fairbanks 1946).

As for interior features we have only a few indications in the small excavated area. Two oval pits originating at the level of the second structure floor resembled burial pits but contained no human bone. One of these did yield unusual artifacts—a triangular arrow point of clear crystal quartz and a large, white-painted clay bead. Both pits were open at the time of the burning, and the larger of the two pits contained water-sorted sand and silt below the burned debris that could only have accumulated from a breach in the roof. Based on these circumstances and the lack of any artifacts on the floor, it is my impression that the burning of Structure 1b was deliberate, and that skeletal remains may have been exhumed from their sub-floor burial pits just prior to the burning.

CHRONOLOGY, ARCHITECTURAL STYLE, AND FUNCTION

The stratigraphy of the area shows that following the fire that destroyed Structure 1b, humic, midden-like fill was added to the Structure 1 area to even out the piles of fired daub and the surrounding berm. This was followed in succession by the addition of a layer of clean yellow clay, perhaps over the whole locality, although due to modern truncation it was apparent only to the east of the berm. This activity produced a locally mounded area on the Mound V summit, a rise noticed by C. B. Moore and shown on an unpublished topographic map made in the 1930s. Following that, there was yet another midden-producing episode superimposed on the mounded area, about which we know little except for limited evidence of a final structure indicated by yellow clay-filled post holes on top of the mounded surface.

All of this activity, start to finish, was late in the Moundville sequence. Three calibrated radiocarbon dates on charred wood obtained from a post hole in Structure 1b, a mass of charcoal in the east berm, and a post hole in Structure 2 are in close agreement in suggesting construction early in the 1400s (Table 1). Although the pottery has been analyzed, the data remain unreported to date. The diagnostics indicate use during the Moundville III phase, consistent with the radiocarbon dates. The pottery in the upper fills overlying the burned remains includes sherds of the type Alabama River Appliqué and certain other Protohistoric diagnostics, suggesting a final abandonment of the locality around AD 1500.

The architectural style of these remains is South Appalachian Mississippian and was heretofore unknown at Moundville. No earth lodges have been previously reported for the state of Alabama, although several are known from neighboring Georgia, eastern Tennessee, and western North Carolina. The significance of this fact is not obvious, but the sudden appearance of foreign architecture at a time when Moundville was a vacant ceremonial center and a regional necropolis adds a curious detail to the circumstances of Moundville's decline and eventual collapse (Knight and Steponaitis 1998:21-24). Regarding the function of the Moundville structures reported here, we know that they were ceremonially important, from their location, from details of their construction, and from evidence of commemorative ritual activity following their deliberate dismantling and destruction. Regarding more specific questions, a key one being whether or not Structure 1 served as a council house, I will have to reserve judgment pending a full analysis of the associated artifacts and comparison with elite assemblages elsewhere at the site.

APPENDIX: THOSE WHO DID THE WORK

UA Department of Anthropology Field School, Fall Semester 1999

Undergraduates: Jessica Baggett, Melissa Baggett, Charlotte Bohrer, Howard Davidson, Brian Hand, Lori Harris, Kareen Hawsey, Amanda Ingram, Shannon James, Jennifer Keeling, Shannon Koerner, Melina McConatha, Ann Pearson, Brannon Queen, John Simmer, David Wendle, Kelly Whatley, Katherine Williams.

Graduate Assistant: Katherine McGhee-Snow

UA Department of Anthropology Field School, Fall Semester 2000

Undergraduates: Tracy Allen, Jeffrey Brown, Leigh Elgin, Elizabeth Forward, Sharon Freeman, Becky Pitts, Jeff Sherard, Stephnie Weinstein, Josh Willingham.

Graduate Assistant: Tom Lewis

Alabama Museum of Natural History Expedition 23, June 2001

Week 1: Emily Bailey, Davis Burleson, Jennifer Cobb, James Dwyer, Charles Ebert, Wylene Ebert, James Elliott, Patricia Elliott, Chris Hamilton, Amber Harrison, April Kirk, Michael Picone, Benjamin Picone, Locke Provost, Reba Redd.

Week 2: Barbara Beaman, Andrew Bernard, Erin Camp, Joyce Crenshaw, Jan Delgehausen, L.E. Delgehausen, Avery Driggers, Lona Hawkins, Jamie Hill, Douglas Jones, Ralph Jones, Susie I. Lanier, Kristen Lomax, Richard Lomax, Beth Newman, Glen Newman, Locke Provost, June Ritchey, Krista Truscott, Lauren Woernle, Darrell Woodall.

Week 3: Elliott Alford, Barbara Beaman, Michael Bricknell, Stephen Bricknell, Cabot Brown, Rush Bruson, Julie Cole, Michael Finnell, Amanda Harbin, Kamrehn Harvey, Mary Harvey, Whitney Harvey, Kathy Joseph, Charles Munoz, Jesse Munoz, Bryan Poe, Billy Shaw, Marcia Veal.

Week 4: Katie Anderson, Joe Anderson, John Anderson, Maiben Beard, David Blum, Belinda Brown, Callan DeRamus, Matt Durham, Suzanne Flynn, Kathleen Hilt, Angela Mayfield, Will Morrison, Neil Pinkerton, Malinda Powers, Craig Reinhart, Anna Rich, Emily Taff, Lila Taff, Philip Taff, Joe Thompson, John Thornhill, Vera Welsh, Daniel Wise.

Staff: Brian Rushing, Bob Pasquill, Rosa Newman, John Hall, Collins Davis, Anne Halli, Monica Newman, Jordan Sandlin, Walter Gowan, Jeff Sherard, Philip Donley, Brian Montabana, Julie Markin

UA Department of Anthropology Field School, Fall Semester 2001

Undergraduates: Charles Burns, Dereik Edwards, Patrick Mann, Robin Newborn, Michael Stevens

Graduate Assistant: Jennifer Myer

UA Department of Anthropology Field School, Fall Semester 2002

Undergraduates: Jamie Boyd, Emily Brewer, Daniel Bridges, Michael Bujalski, Elizabeth Collier, Michael Dockens, Jennifer Elliott, Alex Medicus, Susan Olin, Natalie Porter, Paula Simmons, Jeffrey Whatley.

Graduate Assistants: Steve Barry, Jennifer Myer.

REFERENCES CITED

Coe, Joffre L. 1995. *Town Creek Indian Mound: A Native American Legacy*. University of North Carolina Press, Chapel Hill.

Fairbanks, Charles H. 1946. The Macon Earth Lodge. *American Antiquity* 12:94-108.

Knight, Vernon J., Jr., and Vincas P. Steponaitis. 1998. A New History of Moundville. In: *Archaeology of the Moundville Chiefdom*, edited by V. J. Knight, Jr., and V. P. Steponaitis, pp. 1-25. Smithsonian Institution Press, Washington, D.C.

Sherard, Jeffrey L. 2001. Burning Down the House: The Interpretation of Slag-Like Material Remains Recovered from an Earth Lodge Structure Located on Mound V at the Moundville Site. Paper presented at the 58th annual meeting of the Southeastern Archaeological Conference. Chattanooga, Tennessee

Analysis of Daub from Mound V, Moundville: Its Role as an Architectural Indicator

Jeffrey L. Sherard
Brockington and Associates, Inc.
6611 Bay Circle, Suite 220
Norcross, GA 30071

ABSTRACT: Analysis of fired daub, a construction material of tempered clay commonly associated with the walls and ceilings of Mississippian buildings, has a potential to reveal architectural details not otherwise knowable. For Mound V at the Moundville site, daub rubble was classified by type of surface finish, thickness, and kind of interior impression. Quantitative differences were found among areas of daub fall corresponding to different architectural components. The main wall of Structure 1, an earth lodge, was built up around horizontal lathing of whole cane tied to wall posts, often bundled. Impressions against flattened wooden splints were also found. This wall was hand-smoothed and painted in red and white. The daubed interior ceiling of the same structure, in contrast, was unpainted with the daub applied against a coarse fabric of split cane bound with whole cane stringers. Daub from an adjacent building, Structure 2, had a gritty clay plaster finish and was set against a combination of split cane fabric and whole cane lathing. These modes of construction differ from previously reported Mississippian architectural remains, and highlight the potential role of spatial analysis of daub in understanding the variability in this architecture.

INTRODUCTION

Moundville, located on a high terrace overlooking the Black Warrior River, is one of the largest and most thoroughly investigated archaeological sites in the southeastern United States. At Moundville, scholars have examined such issues as political economy (Welch 1991), subsistence (Scarry 1986, 1998; Schoeninger and Schurr 1998), health (Powell 1988, 1998), social organization (Knight 1998; Peebles 1974; Peebles and Kus 1977), mound construction (Astin 1996; Knight 1995) and chronology (Knight and Steponaitis 1998; Steponaitis 1983). Although much of this research utilizes architectural descriptions, little has focused directly on architecture as a topic in itself.

Excavations on the summit of Mound V, a truncated earthen platform located just to the north of Mound B at the Moundville site, have yielded unsuspected results. From 1999 to 2002, Vernon J. Knight directed excavations that unearthed a large, ceremonial building of a type customarily referred to as an earth lodge. In the Southeastern United States, this building form is best ex-

emplified by the example found at the Macon Plateau site at Ocmulgee National Monument near Macon, Georgia (Fairbanks 1967; Kelly 1938). In addition to the Mound V earth lodge at Moundville, designated Structure 1 by Knight (this volume), a second related structure was encountered just to the east of it designated Structure 2.

Knight's excavations unearthed only the northeast corner of a large earth lodge constructed some time during the early fifteenth century AD. Using the results of remote sensing techniques, the dimensions of the complete building have been estimated at approximately 50 ft (15.2 m) by 50 ft (15.2 m), measured from the outer margins of the earth embankment, while the habitable interior space is approximately 36 ft (11.1 m) by 36 ft (11.1m). At this size, this earth lodge is among the largest yet discovered in the Southeast. In addition, the Moundville earth lodge is the westernmost known example of this architectural form as expressed in the southern states.

The main characteristics of southeastern earth lodges include a sod- and/or thatch-covered roof; large inter-

nal support posts that carry the weight of the roof; an earth embankment around the perimeter of the building giving it a mounded appearance; a central hearth; and one or more narrow tunnel entrances. While not a common building type in the Southeast, examples have been found in the Southern Appalachian region of Tennessee (Webb 1938; Polhemus 1987), North Carolina (Coe 1995; Dickens 1976), and Georgia (Fairbanks 1967; Kelly 1938; Rudolph and Hally 1985; Sears 1958).

Some objection has been raised to the term "earth lodge" as applied in the Southeast (Larson 1994; Rudolph and Hally 1985). Originally, this dispute centered on early diffusionist models (Linton 1924) comparing prehistoric and historic Plains (Alex 1973; Harrington 1920) and Southeastern earth lodge development. Larson (1994) argued that the functional roles and roof construction materials were different between earth lodges in the Plains and the Southeast, and thus that the label may not be applicable in the Southeast. Some scholars have addressed this problem in the Southeast by comparing reported earth lodge structures at a regional level (Crouch 1974; Rudolph 1984). This paper does not address this argument directly, but adds new architectural evidence that may be helpful in resolving the matter.

The focus here is an analysis of the daub excavated from the second of two versions of the re-built Moundville earth lodge (Structure 1b), and neighboring Structure 2 on Mound V. Daub, in essence, is naturally occurring clay mixed with various tempering agents added by the builders to form a material suitable for a variety of construction purposes. These purposes include the formation of rigid walls and the provision of insulation and protection from the elements. For archaeologists, a key factor in the study of daub is fire. In order for daub to be a recoverable artifact, the structure to which it was applied must be exposed to fire. Otherwise, sun-hardened daubed walls and surfaces lose their integrity after the abandonment of a structure and the daub reverts to ordinary clay. Both structures studied here were burned.

The goals of this paper are twofold. One is to present the results of an analysis of the spatial distribution of different categories of Mound V daub. The second goal is to apply these results to a discussion of the architectural form and construction methods used to build the Moundville earth lodge and its associated structure.

PREVIOUS ANALYSES OF DAUB IN THE SOUTHEAST

In most cases, daub is an under-reported artifact class in archaeological literature from the Southeastern Unit-

ed States. Often, the only information we have concerning daub is the weight of the material that was excavated. However, there are a few important accounts of daub in the Southeastern archaeological literature that are more detailed and useful. Generally, reports of daub can be grouped into three kinds of analysis.¹

The most prevalent method of analysis is a simple description of the recovered daub. In many cases, little attention is paid to interpreting daub impressions as revealing different modes of architecture. Typically, this results from small samples or poor daub preservation. In one of the more informative examples, Peacock (1990, 1996) describes the daub found at an upland Mississippian site (22Ok694) in Mississippi. In his discussion, he notes that the daub lacked grass tempering. Instead, much of the sample included a great deal of bone that he believes resulted from the use of clays from within the site's boundaries. With respect to impressions found in the daub, 41 percent of Peacock's sample yielded parallel cane impressions. He interprets these impressions as having resulted from the use of split cane matting in the walls. Other accounts similar to this one include studies by Childress et al. (1995), Peterson (1992), Starr (1997, n.d.), and Starr and Mainfort (1999).

Another focus of daub analysis is to utilize botanical impressions in order to help reconstruct prehistoric environments. Peacock has effectively employed this research strategy in his work on paleoenvironments of the southern Black Belt region (Peacock 1993; Peacock and Reese 2003). Along the same lines, Solis and Walling (1982), based on botanical impressions found in the daub at the Yarborough site in Mississippi, inferred that the burned structure excavated there was possibly constructed during the fall season. Another interesting use of daub in environmental studies was that of Scudder (2000), who compared historic daub samples from Mission San Luis in Florida to pre-Columbian daub found at the Bottle Creek site in Alabama. She utilized X-ray diffraction (XRD) techniques to examine possible differences in tempering agents between historic and Mississippian daub.

Finally, and of most importance to the goals at hand, some researchers are paying special attention to the potential of daub in facilitating interpretations of prehistoric architecture and construction techniques. One of the most often-cited reports in the Southeast is Connaway's (1984) examination of the unusual structures excavated at the Wilsford Site (22Co516) in Mississippi. Connaway developed a daub typology for the site, the different types believed to represent "distinctly separate functions or areas of use in structural technology" (1984:25). Three primary types of daub (A, B, and C) were further subdivided based on morphological characteristics. For Connaway,

1. In addition to the literature discussed here, Phillips (2000) examines analytical strategies based upon size-grading excavated daub. He finds that few wattle impressions are lost if material smaller than ¼ inch is discarded. Also, Shaffer (1993) uses archaeomagnetic techniques to examine the circumstances in which a Neolithic wattle and daub structure burned.

Type A is “traditional” Mississippian woven split cane-impressed daub. Type B daub possesses at least one hand smoothed surface and no woven split cane impressions. Type C daub is heavily grass tempered with structural impressions on at least two surfaces. Based on the daub analysis and the archaeological features found at the site, Connaway proposed a number of construction possibilities for the structures at the site.

Some of the sources already cited (Childress et al. 1995; Starr 1997, n.d.) utilize Connaway’s typology. Both Starr and Connaway make it clear that the application of Connaway’s specific daub typology is limited beyond the original site context. While the Connaway typology is helpful in a comparative sense, it is not a universal classification. Different sites, areas, and regions employed a wide variety of construction techniques that should be reflected in differing forms and spatial distributions of daub.

Another important study provides details pertaining to structures excavated at the Lake George site in Mississippi (Terrel and Marland 1983). At this site, the daub sample is comprised of 64 fragments, mainly excavated from a structure on Mound A. All of the daub was found to be grass tempered. Two types of surface finish were recognized, hand smoothed and that showing a possible applied wash. Three main types of structural impressions were identified: cane, post, and binding. On 48 daub specimens, a total of 80 cane impressions were studied. These varied in width between 0.6-2.2 cm in diameter. Post impressions ranged between eight and 30 cm in diameter, and a number of different types of binding impressions were found. Based upon the evidence of the daub impressions, the walls of the Lake George site structures were estimated to be between 18 and 23 cm thick. The construction sequence for the walls was believed to be as follows. First, sets of vertical posts were placed atop the mound. Next, whole cane or groups of bound whole canes were attached horizontally to the vertically set posts. Once this structural framework was in place, grass tempered daub was applied to form the bulk of the wall.

ETHNONOHISTORIC CLUES

In addition to archaeological accounts of daubed structures, early explorers of the Southeast provided us with descriptions and tantalizing clues regarding the appearance of daubed protohistoric and early historic aboriginal structures. Dumont gives a brief discussion of the preparation of daub in Arkansas and Yazoo houses of the Lower Mississippi Valley region.

Afterward, kneading well with their feet some clay which they mix with that kind of moss of which I have spoken, which is called “Spanish beard,” they make a mud with which they plaster their cabins, which, when this work is finished, appear as if built entirely of earth [Swanton 1911:59].

Similarly, William Bartram, while exploring the Lower Chattahoochee River Valley in Alabama, noted that Yuchi buildings were “large and neatly built; the walls of the houses are constructed of a wooden frame, then lathed and plastered inside and out with a reddish well tempered clay or mortar, which gives them the appearance of red brick walls. . .” (1928:312).

Some ethnohistoric sources provide more details concerning the basic construction technology utilized during the formation of building walls. Of the Natchez temple, Pénicaut writes,

[Once the building’s interior post structure was in place] they attach canes, made and shaped like our laths, from half foot to half foot from bottom to top. They wall in and fill up the empty spaces between the laths with heavy earth and cover it with straw; then they set in place still other laths which they bind together like the first at the ends above in a circle to hold in place the straw which is beneath; then they cover all with mats made of canes split into four pieces. These mats are 10 feet long and 6 feet broad; they are almost like the wattles with which they cover the temple [Swanton 1911:159].

Swanton (1946) noted the existence of two primary types of Native Southeastern buildings. The first type Swanton refers to as the “summer house,” depicted as a rectangular shaped building constructed of widely spaced single set posts. Adair, describing a Chickasaw building, provides a good description of the basic components of this type of house.

For their summer houses, they generally fix strong posts of pitch-pine deep in the ground, which will last for several ages. . . The posts are of an equal height; and then the wall-plates are placed on top of these, in notches. Then they sink a large post in the center of each gable end, and another in the middle of the house where the partition is to be, in order to support the roof-tree; to these they tie the rafters with broad splinters of oak, or hickory. . . Above those they fix either split sapplings, or three large winter canes together, at proper distances, well tied. . . they cover the fabric with pine, or cypress clap-boards. . . In order to secure this covering from the force of high winds, they put a sufficient number of long splint sapplings above the covering of each side, from end to end, and tie them fast to the end of the laths [1930:449-450].

Adair makes no mention of daub walls in the Chickasaw summer house. Jones, however, describing similar dwellings in Georgia and South Carolina, notes that once the posts were set in the ground “they lash in and outside with canes, and plaster them over with a white clay” (1999:39). This description seems to match well with our evidence from Structure 2 excavated on Mound V at Moundville.

The second type of building noted in ethnohistoric sources is the circular winter house, or what traders often referred to as “hot or mountain houses” (Swanton 1946). Quoting Adair again,

To raise these, they fix deep in the ground, a sufficient number of strong forked posts, at a proportional distance, in a circular form, all of an equal height, about five or six feet above the surface of the ground: above these, they tie very securely large pieces of the heart of white oak. . . Then, in the middle of the fabric they fix very deep in the ground, four large pine posts in a quadrangular form, notched a-top, on which they lay a number of heavy logs, let into each other, and rounding gradually to the top. . . Then they weave them thick with their split sapplings, and daub them all over about six or seven inches thick with tough clay, well mixt with withered grass; when this cement is half dried, they thatch the house with the longest sort of dry grass [1930:450-451].

Adair goes on to explain that every town also maintained a large structure utilized as a council house termed a “mountain house.” He clarifies the difference between the two by stating “the only difference between it, and the winter house or stove, is in its dimensions, and application” (Adair 1930:453). David Hally (1997) discusses the relationship between summer and winter houses and the diachronic changes that occurred in these building types as seen archaeologically. These descriptions supplied by ethnohistoric sources of Native Southeastern architecture and daub offer a glimpse of a range of construction practices. With this background, let us now turn to the daub recovered from the Moundville Mound V structures and examine it for patterning.

ANALYSIS PROCEDURES

All cataloged daub lots selected for the sample to be studied were sorted and weighed based on the presence of surface treatments and structural impressions. These surface treatments and structural impressions were counted and recorded by lot. In addition to counting, all applied surface treatments were measured for thickness, and the diameter of all whole cane impressions more than one third complete was measured. Cane diameter measurements were made by developing a standard set of cane gauges (Table 1). This consisted of a graduated, numbered set of 13 cut cane segments, each with a known diameter. For each impression, these segments of cane were fitted into the impression until the closest appropriate gauge was found. In addition to these measurements, any daub piece exhibiting both a structural impression and a finished surface on the opposite face was measured for total thickness. Such measurements were made from the innermost surface of the structural impression to the nearest point on the exterior finished surface. All information was recorded by entry number, catalog number, and all relevant provenience information. Representative and otherwise interesting specimens were pulled during the analysis and re-bagged with all provenience information for further study and photography. Finally, general

Table 1. Cane gauges and metric equivalents.

Gauge #	Cane Diameter Measurement
1	5-6 mm
2	7 mm
3	8-9 mm
4	10-11 mm
5	12 mm
6	13 mm
7	14 mm
8	15 mm
9	16-17 mm
10	18 mm
11	19 mm
12	20 mm
13	21-22 mm

notes were recorded for each lot concerning the general degree of fragmentation of the daub and its coloration.

THE MOUND V DAUB SAMPLE AND AREA SUBSAMPLES

The analyzed Mound V daub sample consisted of 1,340 daub fragments with a combined weight of 142.3 kg (68.8 kg from unit excavations and 73.5 kg from feature excavations). This sample was cataloged as 212 lots representing roughly one-fourth of the total number of accessioned lots of daub from the Mound V project. The sample was selected to include all daub specifically associated with the burned earth lodge (Structure 1b) and the associated second structure (Structure 2; see Knight, this volume).

The overall sample was divided into three spatial subsamples. Area A is the earth lodge’s conjoined structure designated as Structure 2 (Figure 1). This is a large rectangular structure situated just to the east of the earth lodge’s eastern tunnel entrance. Daub from a series of post hole features and dugout areas (Features 11, 12, 14, 26, and 58) associated with Structure 2’s western and northern walls were analyzed. Seventy-two lots with a combined weight of 26.6 kg comprised this portion of the sample. Excavated daub from this vicinity generally consisted of small- to medium-sized rubble recovered from wall-related features.

Area B is associated with the burned earth lodge’s (Structure 1b) primary wall that separated the building’s interior space from the earth embankment surrounding it (Figure 1). Daub rubble from three excavation units (79R127, 81R125, and 81R127), plus material from a series of post hole features associated with the primary wall (Features 37, 38, 40-42, 44, and 51-54) was examined. Within these excavation units, only cut 3 was analyzed, as this stratigraphic unit corresponds to the earth lodge

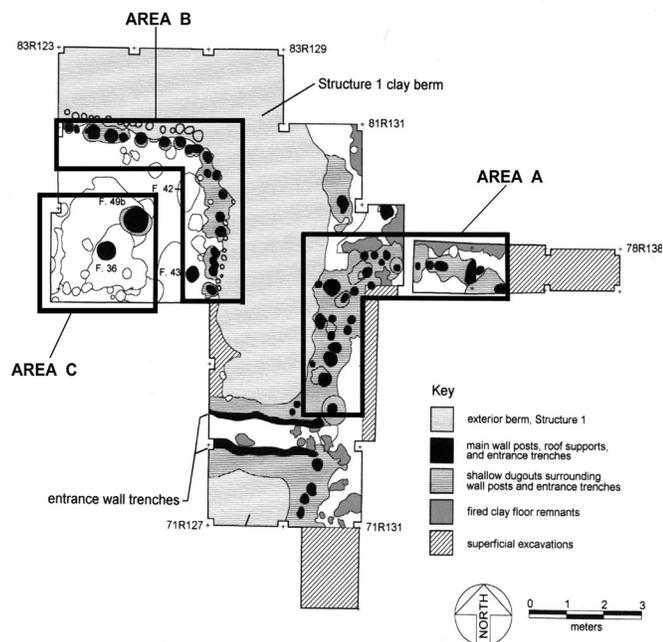


Figure 1. Location of area subsamples.

wall fall. The wall fall consisted of a thick ridge of daub rubble, running just interior to the wall posts, that was separately excavated and dry-screened. In all, 115 cataloged lots from the Structure 1b wall area were studied, including 52.9 kg of daub from the wall fall and 19.4 kg from the wall post features.

Area C is the interior area of Structure 1b, in which the daub is interpreted as primarily roof fall rather than wall fall (Figure 1). In this area, 25 cataloged lots were analyzed. Some of these consisted of material from Feature

22, a large concentration of daub rubble found interior to the primary wall line and main roof supports, in association with highly fragmented remains of charred roof timbers. Also included in Area C was material from excavation unit 79R125, cut 3, which stratigraphically corresponds to the Structure 1b floor. The total weight of analyzed daub for this area is 34.2 kg.

MOUND V DAUB CLASSIFICATION

Excavated daub from the structures on Mound V revealed two main categories of surface treatments applied to the walls. These daubed walls were finished either by hand smoothing or by applying a finishing layer of clay plaster (Table 2). Hand smoothed daub is by far the most commonly recovered surface treatment from Mound V (Figure 2a). This surface type is characterized by a smoothed face in which typically over 75 percent of the tempering impressions seen elsewhere on the piece have been obliterated on the surface. In many cases, specimens exhibit parallel finger marks, showing that the smoothing was accomplished using bare hands rather than tools. In other instances no finger striations are present. Such finishes could have been produced with the use of a pottery trowel or other smoothing tool. No additional finish was applied to this type of daub.

Some daub specimens from Mound V were found to possess a red plaster finish (Figure 2b), thinly applied to the outer surface of the daub. This plaster was primarily a liquefied clay. In order to obtain the red-painted appearance, iron-stained clays may have been selected, or the clay may have been artificially pigmented with red

Table 2. Daub surface types and structural impressions, composite sample and area subsamples.

	Surface Types					Structural Impressions				
	Hand Smoothed	White Plaster	Red Plaster	Red & White Plaster	Sandy/Gritty Plaster	Single Whole Cane	Double Whole Cane	Post/Log	Split Cane Mat	Splint Impressed
Composite Sample	665 (61.1%)	67 (6.1%)	69 (6.3%)	4 (0.3%)	283 (26.0%)	141 (55.9%)	30 (11.9%)	18 (7.1%)	56 (22.2%)	6 (2.4%)
Area Subsamples										
A: Structure 2	30 (11.9%)	4 (1.6%)	0	0	217 (86.5%)	15 (33.3%)	3 (6.7%)	6 (13.3%)	21 (46.7%)	0
B: Structure 1b, wall	456 (69.5%)	62 (9.5%)	69 (10.5%)	4 (0.6%)	65 (9.9%)	83 (57.6%)	25 (17.4%)	9 (6.3%)	22 (15.3%)	5 (3.5%)
C: Structure 1b, roof	179 (98.9%)	1 (0.5%)	0	0	1 (0.5%)	43 (69.4%)	2 (3.2%)	3 (4.8%)	13 (21.0%)	1 (1.6%)

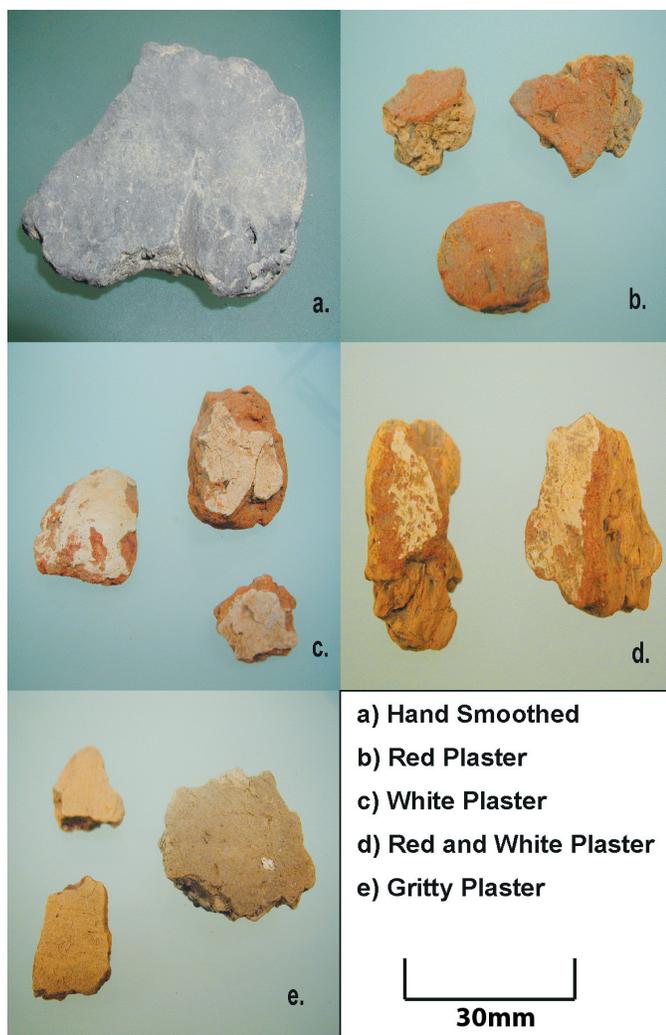


Figure 2. Categories of surface treatments on daub.

ocher. Red plaster has a much coarser texture than the white plaster to be described below, and is often found in thicker layers. The red plaster coating was found to be between 1.5 and 3.0 mm thick. It is presumed that the liquefied clay mixture was applied by hand over the previously prepared daub wall.

Other portions of daubed walls were finished with a white plaster layer (Figure 2c). The white plaster surface treatment is very similar to the red plaster. This surface treatment's primary trait is a muted to bright white, thin layer of finish applied to the daub. The composition of this plaster is unknown; the material most likely was liquefied white-colored clay with the possible addition of powdered shell or other mineral pigments. The white plaster exhibits a very fine texture, and occurs in thin layers from 0.5 to 2.0 mm in thickness.

Additionally, rare pieces showing a red and white plaster combination were identified in the sample (Figure 2d). In every specimen showing this combination, the white plaster was applied over the red. These few daub fragments apparently represent areas of convergence in a red and white

design that seems to have decorated a portion of the walls.

The final surface treatment category is best described as having a sandy puddled clay plaster applied to the wall (Figure 2e). This coating varied in color from a brownish gray to a strong orange red. These color variations presumably resulted from different conditions of firing when the structure burned. The plaster exhibited a highly textured finish, and often had a crackled or crazed appearance. This finish was applied in thicker layers than either the white and red plaster, ranging from 2.0 to 5.0 mm in thickness.

In addition to these surface treatments, daub specimens were examined for structural impressions, including those made by the "wattle" or lathwork in so-called "wattle and daub" architecture (Table 2). The largest category consisted of "partial whole cane" impressions (n=279). This category is a residual group, comprised of various cane impressions showing incomplete casts of the exterior of cane. These generally small fragments lacked sufficient traits to identify the number of whole canes



Figure 3. Categories of structural impressions on daub.

originally present, which were often grouped on larger, more complete specimens. While these partial impressions were systematically recorded during the early stages of analysis, they were excluded from the final tabulations due to the degree of ambiguity in their interpretation.

The next category is “single whole cane” impressions (Figure 3a). Daub fragments falling into this category exhibited a relatively complete smooth, concave cane impression with no other adjacent cane impressions observed on the piece. As with partial cane impressions, this category could potentially be problematic. Some apparent single cane impressions could actually be small pieces that were in contact with one cane that was actually bound together with other canes in multiples.

Specimens falling into the “double whole cane” impression category had two adjacent, parallel smooth concave impressions (Figure 3b). Ordinarily the distance between the impressions is 2 to 3 mm. Evidently the canes represented here were paired, perhaps bound together in the wall framework.

Impressions categorized as “log/pole” exhibit contact with a structural member of much larger diameter than cane. These impressions are concave and tend to possess an irregular surface. This irregular surface is either the result of bark left on the post or the uneven surface of a bark-stripped pole or log. This category of impression is believed to represent the contact of daub with vertically set wall posts and with rafters or other roof components. A few rare specimens also show impressions of binding wrapped around the log or pole.

The “split cane” category of impressions represents contact with parallel elements of very coarsely woven, halved cane (Figure 3c). The impressions are convex, semi-circular in shape, and have linear striations running the length of the impression. These striations are casts of the interior veins of the cane. Split cane impressed daub from the Mound V samples only revealed warp elements of these woven cane fabrics. This type is apparently the most common expression of Mississippian daub elsewhere. In typical Mississippian structures, large, coarsely woven split cane elements were bound to the wall posts, split side outward, and then covered with daub. At some sites, quartered canes are evidently standard for such woven split cane elements (Connaway 1984; Starr n.d.). In the case of Mound V, it appears instead that the canes were halved rather than quartered.

A “splint impressed” daub category consists of a puzzling set of structural impressions (Figure 3d). While comprising only a small proportion of the overall sample, the impression type is distinctive. Pieces have a thin, tabular appearance with periodic parallel ridges protruding from the contact surface. These pieces resulted from daub being applied very thinly against ranges of flat, splint-like objects. As the daub was pressed against these objects, clay was squeezed between adjacent structural pieces, forming the distinctive ridges. Due to their

limited occurrence in the sample, it is difficult to assign an architectural function to these fragments.

ANALYSIS RESULTS BY AREA SUBSAMPLE

The composition of daub from each of the three area subsamples, treated separately, can now be reviewed. We may begin with the daub from the structure adjacent to the earth lodge (Structure 2).

Structure 2 Subsample (Area A)

Daub from the Structure 2 wall area, like that from the earth lodge roof subsample, is dominated by one type of surface treatment. Of the wall daub from Structure 2, 86.5 percent (n=217) has an applied gritty clay plaster finish. Only 11.9 percent (n=30) of the subsample was simply hand smoothed (Figure 4). As hand smoothed daub is characteristic of the main wall line of the adjacent earth lodge, a minor admixture of debris between the two buildings following their burning may well account for the minority presence of hand smoothed daub in the Structure 2 area subsample. The daub from the Structure 2 area was heavily grass tempered, and exhibited a wide range of colors.

Structural impressions for Structure 2 wall area are dominated by woven split cane, together with a strong showing of single whole cane lathing. Of the 45 daub pieces exhibiting structural impressions from this area subsample, 46.7 percent (n=21) are impressions of woven split cane, while 33.3 percent (n=15) show single whole canes. Log or pole impressions constitute 13.3 percent (n=6) of the area subsample, and double whole cane impressions account for 6.7 percent (n=3) (Figure 5). Cane diameter measurements for Structure 2 show a slight preference for gauge 6 (13 mm). However, there is a broad size range apparent within the structure (Figure 6). Only three measurements of thickness between structural member and surface were recorded for Structure 2. The average for these measurements is 45.1 mm. However, this figure is strongly skewed by one outlier, a thickness measurement of 74.5 mm.

Earth Lodge Wall Subsample (Area B)

Results indicate that the primary wall of the earth lodge (Structure 1b) was finished mainly with hand smoothed daub. Of the analyzed daub from the wall area (Area B), 69.5 percent (n=456) was hand smoothed (Table 2). The interior coloration of this hand smoothed daub ranges from a bright orange to very dark brown, no doubt primarily the result of different firing environments. All of this daub is heavily grass tempered, and much of it was fired to a brick hard state. In addition to hand smoothed specimens, 20.6 percent (n=135) of the daub from this

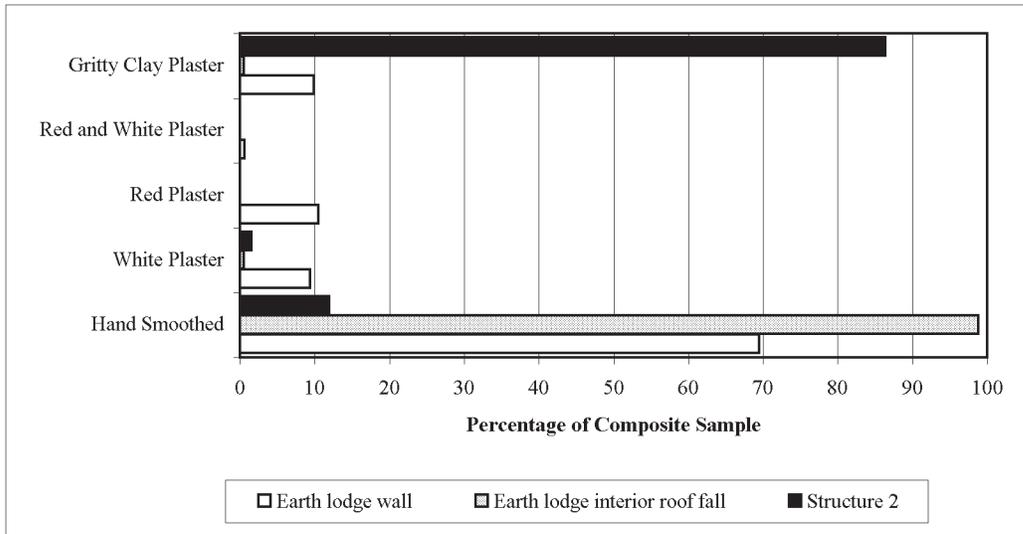


Figure 4. Daub surface finishes by area subsample.

area exhibits a pigmented plaster finish. Of this total, 9.5 percent (n= 62) is white plastered while 10.5 percent (n=69) is red plastered. Less than one percent (n=4) of the daub has red and white plaster in combination. This was the only area subsample in which red and white plaster was encountered (Figure 4).

Finally, 9.9 percent (n=65) of the surface treatment in the earth lodge wall area has gritty clay plaster. Because this gritty clay plaster is the dominant surface treatment found in adjacent Structure 2, as before it seems likely that this minority showing in the earth lodge wall area is the result of disturbance. Some mixing of collapsed debris between Structures 1 and 2 likely happened after the two structures had burned and the rubble spread around in the aftermath.

The earth lodge wall is predominately characterized

by single whole cane impressions. Of the total count of structural impressions for the earth lodge wall, 57.6 percent (n=83) consists of single whole cane impressions. This is followed in order of frequency by double whole cane (17.4 percent, n=25); woven split cane (15.3 percent, n=22); post/log (6.3 percent, n=9); and splint impression (3.5 percent, n=5) (Figure 5).

The diameter of the whole cane impressions shows little standardization in size. A range of cane size was utilized in the earth lodge wall, beginning with gauge 4 (10-11 mm), peaking at gauge 8 (15 mm), and then trailing off to gauge 13 (21-22 mm) (Figure 6).

The earth lodge wall exhibits the highest frequency of splint impressions among the subsamples. With such a small sample, it is difficult to assess the significance of this type, which consists of a thin daub coating over a flat

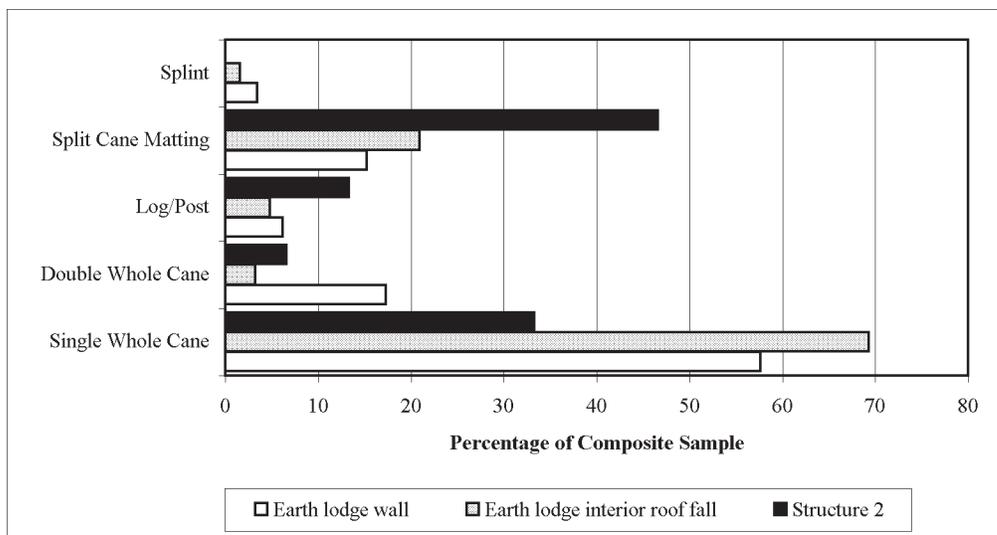


Figure 5. Structural impressions by area subsample.

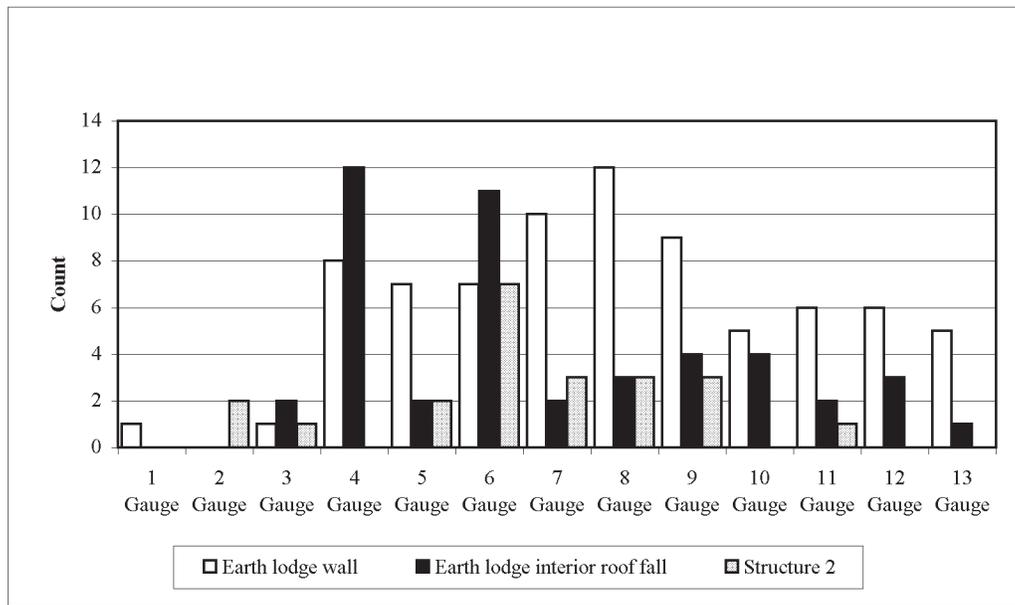


Figure 6. Histogram of cane diameter by area subsample.

surface. At first, it was supposed that the type somehow functioned as a roof component. However, in view of the area subsample distribution, it seems instead that these daub pieces relate to the earth lodge wall in some manner. These forms may have acted as patches in the wall where repairs had to be made, or they may have provided extra strength to crucial points in the wall.

For the earth lodge wall area, twenty measurements of daub thickness between structural member (usually whole cane) and finished surface were recorded. The average thickness was 22.5 mm with a range of 9 mm to 40 mm.

Earth Lodge Roof Subsample (Area C)

Fall from the earth lodge roof area is dominated by hand-smoothed daub, constituting 98.9 percent ($n=179$) of the total for this area subsample. Only one piece of daub exhibited white plaster, and one had a gritty clay finish similar to the dominant finish in adjacent Structure 2 (Figure 4). The roof area daub was a rather homogenous brownish-orange color, and, as in the wall area, all was heavily grass tempered.

Structural impressions from this area subsample are primarily of single whole cane (69.4 percent, $n=43$). The only other impression of significant frequency in this subsample is woven split cane. Here, split cane accounted for 21.0 percent ($n=13$) of the structural impressions. This is the highest relative frequency of woven split cane in the earth lodge (Figure 5). Two modes occur in the whole cane diameter distribution (Figure 6). Gauge 4 (10-11 mm) and 6 (13 mm) together account for 50 percent of the roof sub-sample. All other cane gauges each contribute less than 10 percent. Five thickness measurements

were recorded, yielding an average of 37.6 mm between structural member and finished surface, with a range of 22 mm to 58 mm.

Comparative Discussion

Now that the data have been presented in composite and by area subsample, we can focus on the probable construction methods used in the creation of the earth lodge's wall and roof, and compare these to Structure 2. As already noted, the majority of the daub from the earth lodge wall interior surface was hand smoothed. It is presumed that the exterior surface of this wall was left unfinished, as it was hidden from view behind the earthen embankment and roof margin.

However, roughly 20 percent of the Structure 1b wall daub exhibited pigmented plaster finishes (Table 2). It may be inferred that these pigmented finishes represent painted designs involving broad applications of red and white coloration. While the pattern or design is unknown, this conclusion finds additional support in two lines of evidence. First, red and white were strongly symbolic colors among the historic Southeastern Indians (Hudson 1976). These colors are associated with varieties of painted Moundville pottery, including pottery found in the Mound V excavations. Secondly, ethnohistoric data show that red and white wall paintings occurred in public buildings. During William Bartram's travels in the Southeast during the late eighteenth century, he made the following observations.

The paintings which I observed among the Creeks were commonly on the clay-plastered walls of their houses, particularly on the walls of the houses comprising the Public

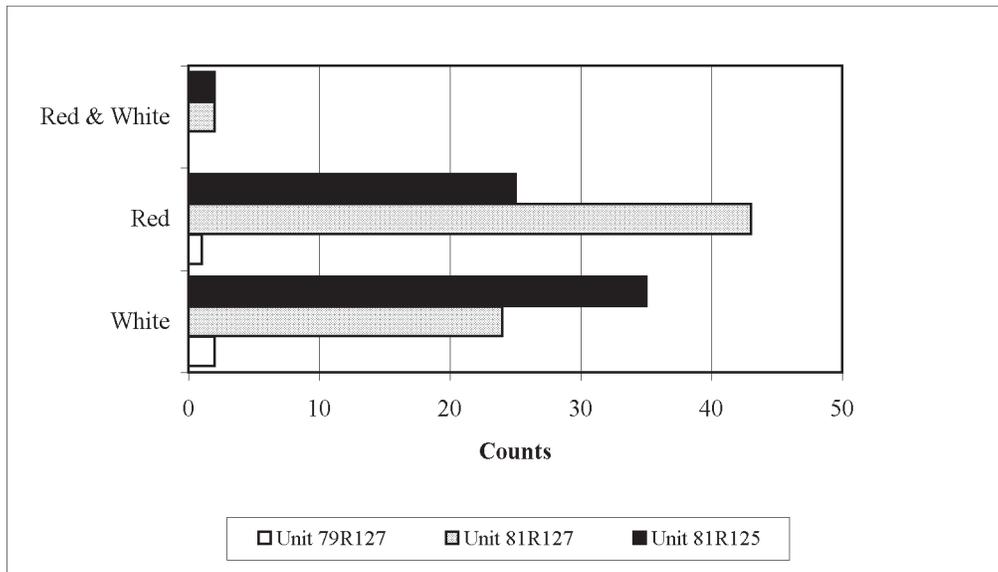


Figure 7. Distribution of pigmented plaster in the earth lodge wall area by excavation unit.

Square. . . The walls were plastered very smooth with red clay, then figures or symbols were drawn with white clay, paste, or chalk; and if the walls were plastered with clay of a whitish or stone color then figures were drawn with red, brown, or bluish chalk or paste [Waselkov and Braund 1995:144-155].

More specific statements can be made about the spatial distribution of pigmented plaster in the earth lodge wall area. The wall fall along the east wall line in Unit 79R127 was practically devoid of colored plaster. Moving northward to wall fall from Unit 81R127, corresponding to the northeast corner of the structure, 62.3 percent ($n=43$) of the pigmented plaster is red, while only 34.7 percent ($n=24$) is white. Moving from this corner westward to wall fall from Unit 81R125, one finds the reverse situation. Here, along the north wall line, 56.4 percent ($n=35$) of the pigmented plaster is white and 40.3 percent ($n=25$) is red. Both of the latter two units contain equal amounts of daub that is both red and white plastered ($n=2$) (Figure 7). Thus, to generalize, much of the east wall was unpainted. The more dominant red components of the design or pattern are found in the area of the northeast corner of the building, grading to stronger white design components along the north wall of the building. The combined red and white plastered daub pieces represent places where the two colors met. The convergence of these colors was evidently not common.

With respect to the construction methods utilized to form the earth lodge wall, a number of inferences can be made. The daub appears to constitute a primary structural component in the manner of masonry, rather than being merely an applied weatherproofing layer or a chinking of close-spaced latticework. It was a thick, massive structural member in its own right, largely self-

supporting of its own weight, held in place only by fairly widely spaced vertical poles and horizontal whole cane laths, sometimes bundled.

In order to construct the wall, builders first placed single set posts deeply into the ground. Next whole canes were bound to the posts at intervals horizontally around the perimeter. The horizontal cane components functioned as laths to provide support for the wall. Then, heavily grass tempered daub was used to form a thick wall between and around the pole and cane framework, from the base up. Finally, most likely while the daub was still rather wet, builders finished the wall by hand smoothing its interior. Again, since the exterior portion of the wall was hidden from view by both the roof and external earth embankment, it was likely left unsmoothed.

The structural impression data suggest that individually-bound whole canes were most commonly used in the construction of the wall. However, it is the opinion of the author, based on frequency of double cane impressions, that bundles of double canes were more commonly used as the horizontal supports. As discussed previously, there is a strong potential for single cane impressions to be misleading. The earth lodge wall has the highest concentration of double cane impressions of the three areas analyzed. Due to the extreme weight of this masonry wall, it seems probable that multiple bound canes were used to add strength and support.

The size of the cane used in the wall also allows inferences about how the wall was constructed. Figure 6 shows a basically normal distribution of cane diameter in the earth lodge wall area subsample. This fact suggests that long, gradually tapering pieces of whole cane were bound to the vertical support posts. The wall was, however, practically devoid of narrow gauge diameter cane. The laborers clearly removed the thin branchy top portion of the

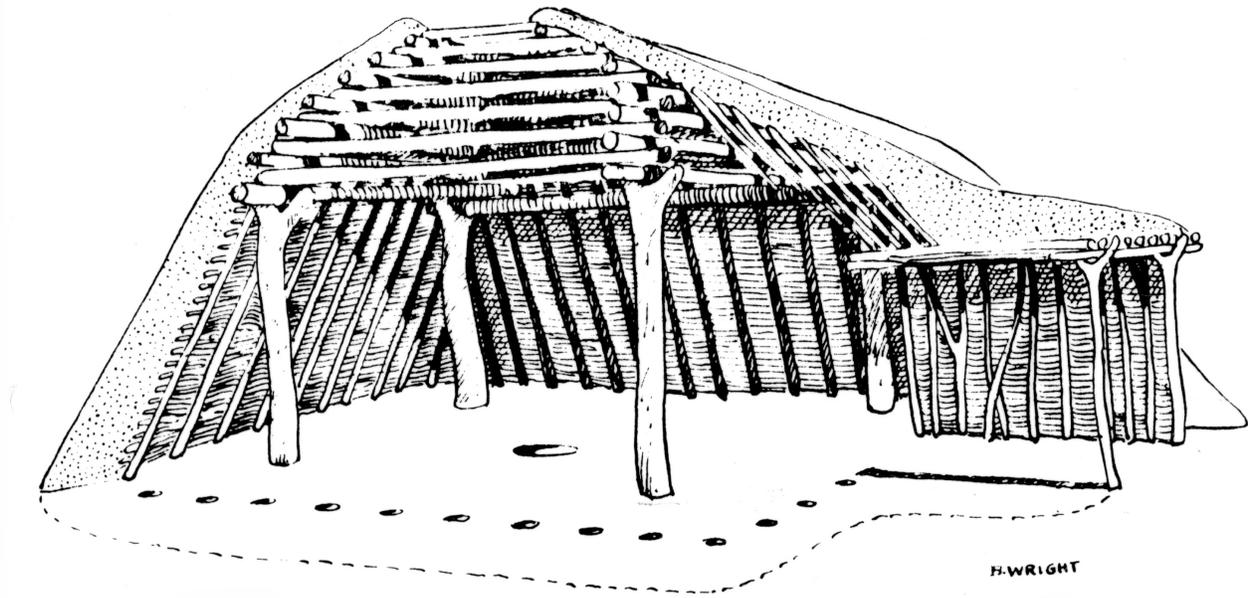


Figure 8. Example of a cribbed-roof Mississippian earth lodge from North Carolina (from Coe 1995).

cane and made use of the thicker middle and basal sections.

This form of wall construction differs from that more commonly reported for Mississippian houses, in which daub was applied to the coarse side of woven split cane components tied to the upright posts. This difference may have to do with the fact that the building is an earth lodge, and the walls in question were protected from the elements by a thick earthen berm. As an important exception, wattle and daub walls reported for the Lake George site in Mississippi do seem to conform to the construction method reported here (Terrel and Marland 1983). There is no mention of split cane in the daub from this site. This, however, may be due to their limited sample ($n=64$). Furthermore, these daub pieces came from a number of different structures excavated at Lake George.

Data from the earth lodge roof fall subsample permits insights relating to the form and construction methods employed in the roof. Large, interior central support posts carried the majority of the roof weight, with the remaining weight displaced onto the earth lodge wall and possibly the surrounding earth embankment. In the author's opinion the roof was most likely constructed in a crib style (Coe 1995) (Figure 8). Ethnohistoric sources clearly report that Southeastern Native Americans understood and utilized cribbed-log construction technology. Hitchcock provides a detailed description of a historic Creek council house roof construction.

The roof over this circle is a cone terminating in a point over the fire some 20 odd feet high. The rafters extend down from the apex of the cone beyond the twelve pillars, which are about eight feet high, to within four or five feet of the ground, which space, of four or five feet is enclosed

entirely with earth. . . Upon the alternate couples of the twelve pillars are first placed horizontal pieces – then upon the ends of these are placed other horizontal pieces between the other couples of pillars then another series of horizontal pieces resting upon the second set, but drawn within towards the centre of the circle a few inches. Upon these again are other pieces still more drawn in [Swanton 1946:389-39].

This type of roof frame, in conjunction with the four heavy interior support posts, would easily be able to carry the weight of a heavy roof. With 20 percent of the structural impressions from the roof subsample showing woven split cane and 69 percent showing single whole cane impressions (Table 2), the following construction techniques are suggested.

Once the primary wall posts, wall plates, central roof support posts, and log plates connecting these at the apex were in place, a series of smaller diameter logs were stacked in alternating levels, gradually tapering inward as the roof frame went up. Radiating rafters were used between the cribbed log interior roof and the primary wall. Once the crib roof and rafters were in place, woven components of halved split cane were lashed to the roof frame. Horizontal whole cane stringers were bound to these components in order to provide additional support for the woven split cane (Figure 9). After this was complete, daub was applied to the interior surface of the roof and then hand smoothed. The practice of applying daub to the interior roof surface is well documented for the Southern Appalachian region (Hally 1997). Interior roof daub would provide the earth lodge fire protection from sparks and embers emitted by the fire maintained in the central hearth (Larson 1994).



Figure 9. Interior roof daub showing woven split cane fabric bound to whole cane stringers. Woven split cane impressions at left, whole cane stringer impression at upper right, binding impression perpendicular to stringer at right.

This is the only location in the earth lodge where split cane appears. Woven split cane, attached with its coarsely textured split side down, offered the builders a solution to the problem of how to daub the interior of the roof and have the daub stay in place. I believe it is safe to conclude that single whole canes were also used in the construction of the interior roof. Double whole cane impressions are practically absent from the roof subsample. Single whole canes used as stringers in conjunction with a cribbed log and rafter roof frame would provide a sturdy framework to support both the woven split cane components and the daub.

The cane diameter measurements from the roof subsample allow additional inferences. Two distinct size modes, gauge 4 (10-11 mm) and gauge 6 (13 mm), were predominant in the roof daub (Figure 6). With both narrower and thicker gauges occurring in low frequencies, it appears that builders preferred the midsection of the cane for roof construction. This may have been because shorter segments of cane were required to span the spaces between roof frame components.

In contrast, Structure 2 presents a completely different picture of construction from that of the adjacent earth lodge. This structure seems to conform more closely to the most commonly reported model of Late Mississippian architecture. Posts were set individually in the ground, to which widely spaced horizontal whole cane laths were bound. This whole cane framework provided attachment points for woven split cane elements, which were then fixed to the wall frame, coarse side out, and finally daub was applied to the exterior surfaces. Split cane comprises over 46 percent of the structural impressions in this subsample, in contrast to the earth lodge wall which is virtu-

ally devoid of evidence for woven split cane (Table 2). Alternatively, the single whole cane in this subsample could have functioned within the roof framework of Structure 2.

The earth lodge wall surface consists of hand smoothed and pigmented plastered walls. Structure 2, in contrast, exhibits a gritty puddled clay plaster finish. Other researchers have observed this mode of surface finish on Southeastern structures (Connaway 1984; Starr n.d.). Starr suggests that this textured finish is possibly the result of rain hitting the structure's wall. However, considering the large quantity of this surface finish ($n=283$) found specifically in the Structure 2 subsample and the uniform thickness of the finish, it is more probable that the coating was intentionally applied.

While Structure 2 seems to better represent our conventional understanding of Late Mississippian wattle and daub architecture, one unusual daub impression was identified in this area subsample. A medium-sized piece of daub clearly exhibits, on a flat surface, a woven cane basketry impression (Figure 3e). This tightly woven material may represent an impression from a component of the Structure 2 wall. Potentially it represents a more formal version of the coarse split cane components applied to a portion of the structure, with the smooth finished side exposed, presumably on the interior of the building, producing a more refined space. If this were its function, it seems odd that this kind of impression is not more common, unless it was rare to daub over interior wall surfaces, partitions, or internal furniture to which fine matting was applied. It is difficult to assign a specific structural role to this impression based on a unique occurrence.

CONCLUSIONS

Hopefully this study can serve as another point of departure for research on daubed Mississippian architecture in the Southeast region. With a number of daubed Mississippian structures excavated in the West-central Alabama in recent years, much new data can be brought to bear on regional Mississippian architecture and construction methods. By integrating daub analysis with spatial data relative to archaeological features, a great deal of architectural information can be developed. With the addition of ethnohistoric data, an even more complete picture is promised.

As we have seen, the Mound V earth lodge (Structure 1b) and its associated building (Structure 2) were built in very different ways. Structure 2 was apparently constructed using typical Late Mississippian methods, while the earth lodge was assembled by utilizing less common construction technology. The earth lodge wall, considered as a largely self-supporting masonry element, represents a distinctive construction method perhaps adapted to the dry, indoor setting of an earth-covered and earth-embanked structure, while the interior roof daub seems

more conventional, at least in the Southern Appalachian area. Questions remain as to whether or not the method of wall construction was dictated by the building type, and whether this method, like the overall form, was non-local knowledge introduced to Moundville. A case has been made previously for the introduction of foreign architectural styles in the public architecture at Moundville (Ryba 1997).

At this point, it seems reasonable that with the adoption of a non-local architectural form at Moundville, a new method of wall construction was also brought in. The only way to settle the question is by further study. With future comparative studies of daubed structures, basic patterns of construction should be brought to light. Hopefully this study of Mound V daub can serve as an example and provide stimulation for future studies. By building upon analytical techniques, new and more conclusive information will be generated on the range and development of Mississippian architecture.

REFERENCES CITED

- Adair, James. 1930. *History of the American Indians*. Edited by Samuel Cole Williams. Promontory Press, New York.
- Alex, Robert. 1973. Architectural Features of Houses at the Mitchell Site (39 DV 2), Eastern South Dakota. *Plains Anthropologist* 18:149-159.
- Astin, Robyn L. 1996. *Mound M: Chronology and Function at Moundville*. Unpublished Masters thesis, Department of Anthropology, University of Alabama, Tuscaloosa.
- Bartram, William. 1930. *The Travels of William Bartram*. Macy-Masius Publishing.
- Boudreau, Eugene H. 1971. *Making the Adobe Brick*. Fifth Street Press, Berkley.
- Childress, Mitchell R., Mary Evelyn Starr, Christopher D. Koeppl, David C. Crampton, and Guy G. Weaver. 1995. *Archaeological Investigations at Helena Slackwater Harbor, Phillips County, Arkansas*. 2 vols. Garrow and Associates. Report submitted to the Department of the Army, Memphis District, Contract No. DACW-66-91-D-0112.
- Clayton, Lawrence A., Vernon James Knight, Jr., and Edward C. Moore (editors). 1993. *The De Soto Chronicles: The Expedition of Hernando de Soto to North America in 1539-1543*. 2 vols. University of Alabama Press, Tuscaloosa.
- Coe, Joffre. 1995. *Town Creek Indian Mound: A Native American Legacy*. University of North Carolina Press, Chapel Hill.
- Connaway, John M. 1984. *The Wilsford Site (22-Co-516) Coahoma County, Mississippi: A Late Mississippian Period Settlement in the Northern Yazoo Basin*. Archaeological Report No. 14. Mississippi Department of Archives and History, Jackson.
- Crouch, Daniel. 1974. Southern Appalachian Earth Lodges. Unpublished Masters thesis, Department of Anthropology, University of North Carolina, Chapel Hill.
- Dickens, Roy S. 1976. *Cherokee Prehistory: The Pisgah Phase in the Appalachian Summit Region*. University of Tennessee Press, Knoxville.
- Fairbanks, Charles H. 1946. The Macon Earth Lodge. *American Antiquity* 12:94-108.
- Harrington, M.R. 1920. *Certain Caddo Sites in Arkansas*. Indian Notes and Monographs, Museum of the American Indian, Heye Foundation, New York.
- Hudson, Charles. 1976. *The Southeastern Indians*. University of Tennessee Press, Knoxville.
- Jones, Charles C. 1999. *Antiquities of the Southern Indians, Particularly of the Georgia Tribes*. University of Alabama Press, Tuscaloosa.
- Kelly, Arthur R. 1938. A Preliminary Report on Archaeological Explorations at Macon, Georgia. *Anthropological Papers No. 1. Bureau of American Ethnology Bulletin* 119, pp. 1-69. Smithsonian Institution, Washington, D.C.
- Knight, Vernon J., Jr. 1995. Chronology and Use of Public Architecture at the Moundville Site: Excavations in Mounds R, F, G, and E. Second interim report submitted to the National Science Foundation, Award No. 9220568.
- Knight, Vernon J., Jr. 1998. Moundville as a Diagrammatic Ceremonial Center. In *Archaeology of the Moundville Chiefdom*, edited by Vernon James Knight and Vincas P. Steponaitis, pp. 44-62. Smithsonian Institution Press, Washington D.C.
- Knight, Vernon J., Jr., and Vincas P. Steponaitis (editors). 1998. *Archaeology of the Moundville Chiefdom*. Smithsonian Institution Press, Washington D.C.
- Hally, David J. 1997. "As Caves Below the Ground": Making Sense of Aboriginal House Form in the Protohistoric and Historic Southeast. In *Between Contacts and Colonies: Archaeological Perspectives on the Protohistoric Southeast*, edited by Cameron B. Wesson and Mark A. Rees, pp. 90-109. University of Alabama Press, Tuscaloosa.
- Larson, Lewis H. 1994. The Case for Earth Lodges in the Southeast. In *Ocmulgee Archaeology: 1936-1986*, edited by David J. Hally, pp. 105-115. University of Georgia Press, Athens.
- Linton, Ralph. 1924. The Origin of the Plains Earth Lodge. *American Anthropologist* 26:247-257.
- Peacock, Evan. 1990. Archaeological Testing at the Landfill #1 Site (22-Ok-694), Oktibbeha County Mississippi. Report submitted to the Golden Triangle Planning and Development District. On file, Mississippi Department of Archives and History, Jackson.
- Peacock, Evan. 1993. Reconstructing the Black Belt Environment Using Leaf Impressions in Daub. *Southeastern Archaeology* 12:148-154.
- Peacock, Evan. 1996. Test Excavations at an Upland Mississippian Site in Oktibbeha County, Mississippi. *Mississippi Archaeology* 30:1-20.
- Peacock, Evan, and Mary Celeste Reese. 2003. A Comparison of Three Methods of Paleoenvironmental Analysis at an Archaeological Site on the Mississippi Black Prairie. In *Blackland Prairies of the Gulf Coastal Plain*, edited by Evan Peacock and Timothy Schauwecker, pp 64-79. University of Alabama Press, Tuscaloosa.
- Peebles, Christopher S. 1974. *Moundville: The Organization of a Prehistoric Community and Culture*. Unpublished Ph.D. dissertation, University of California, Santa Barbara.
- Peebles, Christopher S., and Susan M. Kus. 1977. Some Archaeological Correlates of Ranked Societies. *American Antiquity* 42:421-448.
- Peterson, Nancy E. 1992. The Daub Fragments. In *The Early Bronze Age Village of La Muculufa and Prehistoric Hut Architecture in Sicily*, by Brian E. McConnell. *American Journal of Archaeology* 96:31-33.

- Phillips, John M. 2000. *Architectural Remains at Wickliffe: A Middle Mississippian House in Western Kentucky*. Unpublished Masters thesis, Department of Anthropology and Sociology, University of Mississippi, Oxford.
- Polhemus, Richard R. 1987. *The Toqua Site, 40Mr6: A Late Mississippian Dallas Phase Town*. 2 vols. Tennessee Valley Authority, Knoxville.
- Powell, Mary Lucas 1988. *Status and Health in Prehistory: A Case Study of the Moundville Chiefdom*. Smithsonian Institution Press, Washington D.C.
- Powell, Mary Lucas. 1998. Of Time and the River: Perspectives on Health during the Moundville Chiefdom. In *Archaeology of the Moundville Chiefdom*, edited by Vernon James Knight and Vincas P. Steponaitis, pp. 102-119. Smithsonian Institution Press, Washington D.C.
- Rudolph, James L. 1984. Earth Lodges and Platform Mounds: Changing Public Architecture in the Southeast United States. *Southeastern Archaeology* 3:33-45
- Rudolph, James L., and David J. Hally. 1985. *Archaeological Investigations at the Beaverdam Creek site (9Eb85) Elbert County, Georgia*. Archaeological Services. National Park Service. Submitted to U.S. Army Corps of Engineers, Savannah District.
- Ryba, Elizabeth A. 1997. *Summit Architecture on Mound E at Moundville*. Unpublished Masters thesis, Department of Anthropology, University of Alabama.
- Scarry, C. Margaret. 1986. *Changes in Plant Procurement and Production during the Emergence of the Moundville Chiefdom*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.
- Scarry, C. Margaret. 1998. Domestic Life on the Northwest Riverbank at Moundville. In *Archaeology of the Moundville Chiefdom*, edited by Vernon James Knight and Vincas P. Steponaitis, pp. 63-101. Smithsonian Institution Press, Washington D.C.
- Schoeninger, Margaret J., and Mark R. Schurr. 1998. Human Subsistence at Moundville: The Stable-Isotope Data. In *Archaeology of the Moundville Chiefdom*, edited by Vernon James Knight and Vincas P. Steponaitis, pp. 102-119. Smithsonian Institution Press, Washington D.C.
- Scudder, Sylvia. 2000. Analysis of Prehistoric and Colonial Daub. Unpublished report submitted to Dr. Bonnie McEwan, San Luis Historic Site, Tallahassee, Florida.
- Sears, William H. 1958. The Wilbanks Site (9Ck5), Georgia. *Bureau of American Ethnology Bulletin* 196, pp. 129-144. Smithsonian Institution, Washington, D.C.
- Shaffer, Gary D. 1993. An Archaeomagnetic Study of a Wattle and Daub Building Collapse. *Journal of Field Archaeology* 20(1):59-75.
- Solis, Carlos, and Richard Walling. 1982. *Archaeological Investigations at the Yarborough Site (22Cl814)*, Clay County, Mississippi. Report of Investigations 30. University of Alabama Office of Archaeological Research.
- Starr, Mary Evelyn. n.d. Daub and Other Baked Clay Objects from the Oliver Site. In *The Oliver Site*, edited by John M. Connaway. Unpublished Manuscript on file, Mississippi Department of Archives and History, Jackson.
- Starr, Mary Evelyn. 1997. Powell Bayou (Part II) and Dockery: Two Mississippian Components in the Sunflower Basin of Mississippi. *Mississippi Archaeology* 32:79-98.
- Starr, Mary Evelyn, and Robert C. Mainfort, Jr. 1999. The Harry Osborn Collection: An Early Nineteenth-Century Artifact Assemblage from Memphis, Tennessee. *Mississippi Archaeology* 34:1-15.
- Steponaitis, Vincas P. 1983. *Ceramics, Chronology, and Community Patterns: An Archaeological Study at Moundville*. Academic Press, New York.
- Swanton, John R. 1911. *Indian Tribes of the Lower Mississippi Valley and Adjacent Coast of the Gulf of Mexico*. Bureau of American Ethnology Bulletin 43. Smithsonian Institution, Washington, D.C.
- Swanton, John R. 1946. *Indians of the Southeastern United States*. Bureau of American Ethnology Bulletin 137. Smithsonian Institution, Washington, D.C.
- Terrel, John E., and Sidney Marland. 1983. Appendix B: Notes on Architectural Detail Derived from Analysis of the Impressions in the Daub. In *Excavations at the Lake George Site Yazoo County Mississippi, 1958-1960*, by Steven Williams and Jeffrey P. Brain. Papers of the Peabody Museum of Archaeology and Ethnology 74. Harvard University, Cambridge.
- Waselkov, Gregory A., and Katherine E. Holland Braund (editors). 1995. *William Bartram on the Southeastern Indians*. University of Nebraska Press, Lincoln.
- Webb, William S. 1938. *An Archaeological Survey of the Norris Basin in Eastern Tennessee*. Bureau of American Ethnology Bulletin 118. Smithsonian Institution, Washington, D.C.
- Welch, Paul D. 1991. *Moundville's Economy*. University of Alabama Press, Tuscaloosa.

Analysis of Wood Charcoal from an Earth Lodge on Mound V at Moundville

Amanda Tickner

Department of Anthropology

University of North Carolina – Chapel Hill

301 Alumni Bldg, CB#3115, Chapel Hill, NC 27599-3115

ABSTRACT: This paper presents the results from an analysis of carbonized wood remains found at Mound V, Moundville in the earth lodge and associated Structure 2 excavated by Vernon James Knight. The data are discussed in relation to three aspects: the local forest composition, the construction properties of the wood used, and a brief comparison to wood used in a comparable Mississippian structure, the Macon Earth Lodge in Georgia. Possible symbolic properties of the wood are also discussed with respect to red cedar.

INTRODUCTION

The Moundville polity, located in the Black Warrior River valley in Alabama, was one of the largest late prehistoric chiefdoms in the Native Southeast and has been the subject of considerable study (Knight and Steponaitis 1998; Peebles 1978). The Moundville polity was made up of several types of settlement: farmsteads, single mound sites, and the large center of Moundville itself (Bozeman 1982; Knight and Steponaitis 1998; Peebles 1978). The Moundville center incorporates at least 29 monumental mounds and platforms situated around a large central plaza. Mound V is located adjacent to and opposite the plaza from Mound B, the largest mound at Moundville and one with a long history of use.

Vernon James Knight of the University of Alabama directed excavations at Mound V at Moundville from 1999 through 2002. Knight's excavations revealed two structures. Structure 1 was an earth lodge in the South Appalachian style with a destruction and rebuilding episode (the first of the earth lodge episodes is referred to as Structure 1a, the second Structure 1b). No other structures built in a similar fashion have been found at Moundville. Structure 2 is a rectangular building without an earth embankment. These Mound V structures probably were initially built in the early 1400s AD, based

on radiocarbon dates, which places them in the Moundville III phase (Knight, this volume).

This paper presents the results of an analysis of carbonized wood remains from the structures found at Mound V. I will first describe the composition of the taxa found in the features representing the structures and their relationship to the structures. I will then discuss the suitability of the building materials and their availability in the landscape. Finally, I will briefly compare the construction materials to those used in another excavated Mississippian earth lodge located at Ocmulgee National Monument, Georgia.

METHODS

I identified to genus up to 20 pieces of carbonized wood larger than 2.0 mm from each of 55 samples. The samples come from specific structural features which are roughly representative of the various structural components making up the earth lodge (Structures 1a, 1b) and the adjacent structure (Structure 2). Generally, in Eastern Woodlands contexts it is considered necessary to have a minimum of twenty pieces of wood to adequately

represent the wood taxa in a feature (Asch et al. 1972:3). However, as this analysis is not aimed at landscape reconstruction but rather an architectural analysis, I considered samples with fewer than 20 pieces to be adequate for my purposes.

Each wood fragment was examined under a low-power microscope (40×). At this magnification, wood can usually be identified to genus level. The features of a tree species' vascular system, the pores, the presence of material in the pores called traecema, the rays, the growth pattern (early versus late wood characteristics), and the texture can all be used to identify wood to a low taxonomic level (Hoadly 1990). Using these various diagnostic features, each piece of wood was identified to the lowest possible taxonomic category.

If hard wood is not ring porous (i.e., laying down distinctive early versus latewood patterns), the wood is considered "diffuse porous." Diffuse porous woods are difficult to identify to the genus level at the low magnification available to me, so occasionally I used the "diffuse porous" category to describe wood when no further determination could be made. Only a few features, mostly in Structure 2, contained diffuse porous wood, hence this limitation did not seriously affect my analysis.

Sometimes it was not possible to make a definitive identification. If an identification to genus or to a higher taxonomic group was not possible, I assigned the wood to an "unidentifiable" category.

RESULTS

Before describing the results of my analysis, I will describe the primary wooden components of the Structure 1 earth lodge, as presently understood. The earth lodge contained the following wood components: (a) four main center posts, (b) a log cribwork over the center posts, (c) roof rafters radiating from the center cribwork, (d) main wall support posts, (e) auxiliary exterior wall posts which lean on the wall of the main posts, (f) a long entrance way, and (g) small poles placed on the outermost sides to hold sod in place over the structure. The main walls were lathed with whole cane bundles and were plastered with clay (Sherard, this volume). Earth lodges in the South Appalachian tradition generally share many of these features.

The majority of the wood samples were from post hole features. Because the samples from post hole features contained multiple species of wood, it can be assumed that wood from multiple structural elements was present in the postholes. This situation makes for challenging interpretation. The excavator (personal communication) has provided interpretations of the features and data which assume that the earth lodge was a carefully planned and constructed structure, suggesting that it is unlikely that wood was haphazardly selected and used.

This assumption entails the idea that the different wood components of the structure, such as the roof rafters and the cribwork, each were deliberately made of a selected wood type or perhaps a range of types.

Table 1 groups the samples by proveniences arranged by architectural component. The majority of the wood in the samples was pine; 65 percent of the total wood in all the samples was pine. It is likely that the majority of the large structural elements in the earth lodge were of pine. After the larger structural elements burned, the abundant charred wood from them probably found its way into many post hole features.

The majority of samples examined were from Structures 1a and 1b, the earth lodge. Of these, the majority come from the second phase of construction, Structure 1b. This is because the first version of the structure was carefully dismantled, and unlike the second version of the earth lodge, did not burn. Therefore the preservation of samples for analysis from Structure 1a is low. There were only three features representing Structure 2 in the study sample, so this structure will only be considered briefly.

Structure 2, a rectilinear building which is not an earth lodge, is represented by wood samples from Features 11, 12, and 14, all "dugouts" associated with post holes in the structure's west wall (Knight, this volume). The majority of the wood found in these features is pine, although there was a significant amount of both diffuse porous and cedar wood in these samples as well. The northwest corner post of Structure 2 may have been cedar, based on the prevalence of cedar in a large and especially deep post hole within Feature 14.

As stated earlier, the majority of the earth lodge structure, including both the original and the rebuilt version (Structures 1a and 1b), appears to have been constructed of pine. Sixty-five percent of the total wood in these samples was pine. The pines found in the Black Warrior River Valley are of the southern pine group, which is also called the yellow or hard pine group. Species in the southern pine group that are present in Alabama include shortleaf pine (*Pinus echinata*), longleaf pine (*Pinus palustris*), and loblolly pine (*Pinus taeda*). The southern pines species have very similar wood characteristics and morphological features.

The large roof support posts of the earth lodge in both construction phases were pine (Figure 1). The wood pieces from Feature 36, a roof support post from Structure 1b, exhibited very small growth rings, which is characteristic of shortleaf pine (*Pinus echinata*). However, given the uniform nature of pine and the southern pine group in particular, it is difficult to definitively identify the species. The support posts were quite large, 65 cm in diameter in one case (Feature 49b, Structure 1a) and 51 cm in diameter in the other (Feature 36, Structure 1b) (Knight, this volume). The largest wood component of the roof itself, the cribwork, was probably homogeneously pine as well.

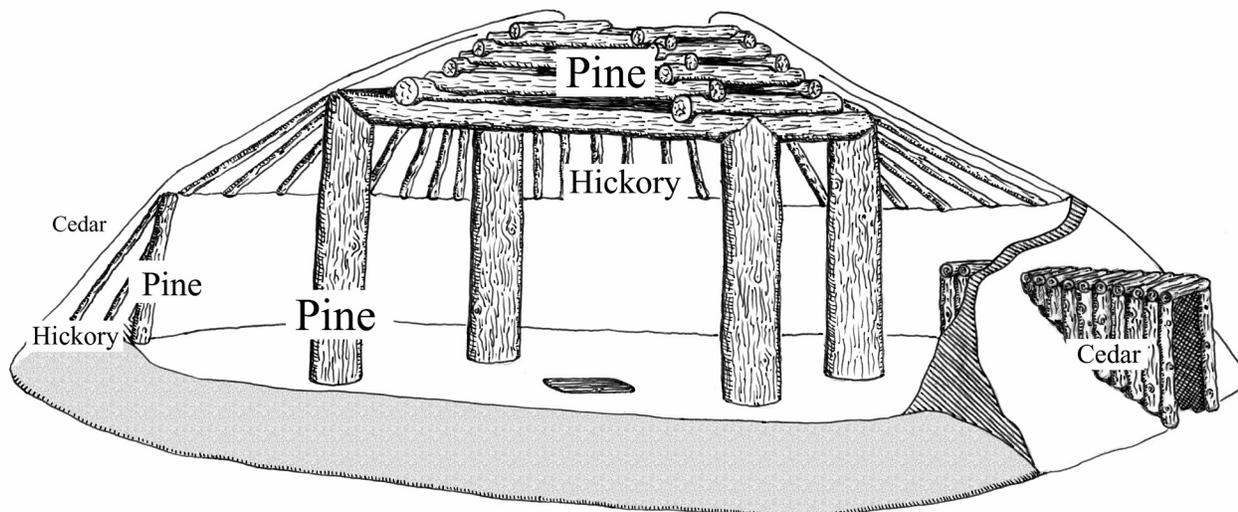


Figure 1. Cutaway drawing of earth lodge Structure 1b, showing wood components identified for structural elements

The majority of the radiating-rafter components of the roof were probably hickory, based on the predominance of that wood type in the rafter samples studied from the outer roof area. If the rafters were homogeneously hickory, the appearance of pine among these samples may be intrusive either from the adjacent wall or from the central cribwork.

Pine predominates heavily among the primary wall posts, suggesting that the majority of the wall posts were of this wood type. It is possible that the wall posts were homogeneously pine, in which case the presence of hickory and some oak among these samples may be intrusive from roof rafter or leaner post remains falling in on the wall post features.

Leaner posts stood outside the primary wall at the base of the surrounding clay berm, providing a base for embanking sod. The leaner post components were represented by shallow features, and the wood samples contained in them may have become intermixed with wood from nearby interior post remains. It is likely that the majority of these leaner posts were hickory, but the small number of samples representing the leaner posts makes it difficult to say for certain.

External poles were probably placed around the earth lodge in order to keep the sod in place, a practice typical of Plains earth lodges. Wood from these poles was found in soils overlying the interior side of the clay berm, between it and the wall line (Knight, personal communication). Much of the wood from these samples is cedar, although hickory is also well represented.

The only other component of the earth lodge where much of the wood identified is cedar is the tunnel entranceway. It is possible that the entranceway was made entirely of cedar, or of a combination of cedar and pine.

DISCUSSION

I will now discuss the data in relation to three aspects: the composition of the local forest, the construction properties of the wood used, and a brief comparison to wood used in a comparable structure at another Mississippian site, the Macon Earth Lodge at Ocmulgee National Monument, Georgia. Possible symbolic properties of the woods used will be briefly mentioned with regard to red cedar.

Forest Composition

The Black Warrior River Valley crosses the boundary between the upland Cumberland Plateau region and the Coastal Plain (Peebles 1978:392-393). Boundaries between ecosystems frequently are characterized by a high diversity of plant and animal species and ecological communities. The Black Warrior Valley is no exception to this rule of boundary diversity. Moreover, this diversity was probably even higher in the past, before severe logging and other stressors on diversity (including chestnut blight) impacted the region.

Scarry (1986:67-113) recaptured knowledge of some of this pre-industrial diversity in the Black Warrior Valley in her forest reconstruction based on Government Land Office (GLO) survey data. This technique utilizes the records surveyors took of "witness trees;" trees they marked indicating the corners of range and section lines. Despite possible biases towards preferred trees and poor identifications on the part of surveyors, which were accounted for statistically within the reconstruction, the information provided by the early nineteenth-century surveys was effectively used by Scarry to create a picture of the forest communities near the Moundville polity. It must be noted, however, that these forests had been undisturbed for several centuries when the surveys were conducted, which was not the case during the Moundville III phase.

Table 1. Identified wood samples from structure proveniences.

Provenience	No. of Samples	Pine	Hickory	Cane	Diffuse porous	Cedar	White Oak	Red Oak	UID
Structure 2, wall area									
Feature 11	3	17	4	0	5	12	7	4	1
Feature 12	1	8	2	0	10	0	0	0	0
Feature 14	2	20	4	0	5	16	2	4	2
Structure 1a, 1b, major roof support posts									
Feature 36	13	180	0	0	0	0	0	0	5
Feature 49B	3	49	0	0	0	0	0	0	0
Structure 1b, roof components/rafters									
Unit 81R125, cut	3	0	15	0	0	0	0	0	0
Unit 81R125, cut	3	0	19	0	0	0	0	0	0
Unit 79R127, cut	3	0	0	0	12	0	0	0	0
Structure 1a, 1b, primary wall posts									
Feature 37C	1	9	3	0	0	0	2	3	0
Feature 38	2	16	11	6	1	0	7	1	3
Feature 38A	1	9	2	1	0	0	1	0	1
Feature 44	1	5	10	1	0	0	0	0	0
Feature 51	1	8	0	0	0	0	0	0	0
Feature 52B	1	19	0	0	1	0	0	0	0
Feature 53	1	14	0	1	2	0	3	0	1
Feature 54	1	16	2	2	0	0	0	0	0
Feature 57	1	18	2	0	0	0	0	0	0
Structure 1a, 1b, leaner posts									
Feature 32A	1	11	0	0	0	0	0	0	0
Feature 32F	1	0	16	0	0	0	0	0	4
Feature 32H	1	3	1	0	1	1	0	0	2
Structure 1b, external poles (?)									
Unit 75R129, cut	2	3	7	0	0	9	1	0	0
Unit 79R129, cut	2	8	1	3	0	5	0	2	0
Unit 79R125, cut	2	20	0	0	0	0	0	0	2
Unit 83R125, cut	2	7	7	0	2	3	0	0	1
Unit 83R125, cut	2	0	8	0	0	5	0	0	0
Unit 73R129, cut	3	2	1	0	0	0	0	0	0
Structure 1b, entranceway									
Feature 26	1	9	0	0	0	9	0	0	2
Structure 1b, auxiliary interior posts									
Feature 30	2	40	0	0	0	0	0	0	0
Feature 33	1	15	0	0	0	0	0	0	1
Feature 35	1	20	0	0	0	0	0	0	0
Feature 40	1	9	0	0	0	0	0	0	0
Totals		535	115	14	39	60	23	14	25

Nonetheless, given the lack of palynological data, they constitute the best data set available.

As Scarry describes the landscape surrounding Moundville, it can be divided into two broad areas above and below the Fall Line, that are further subdivided into various ecological zones based primarily on elevation and soil type. In the Moundville area, there are five terrain groups: Fall Line Hills, terrace, bottomland, swamp, and riverbank.

The Fall Line Hills' rugged slopes and poor soils make them unattractive for farming. The forests on these hills were characterized by mixed hardwoods and pine. There were eight dominant taxa, with red oak and pine being the overwhelming majority; hickory, various oak taxa, chestnut, and black gum comprised the rest.

The terrace zones are Plio-Pleistocene stream terraces that parallel the Black Warrior River and separate the flood plain from the Fall Line Hills. The Moundville site is located on a particularly high terrace that overlooks the river. The soils of the terraces are suitable for cultivation. The forests of this zone were very similar to those in the Fall Line Hills except that hickory was somewhat less abundant, while pine was somewhat more frequent.

The bottomlands below the Fall Line have alluvial soils that are generally good for cultivation. Within the bottomlands, differences in elevation and drainage capability result in variability in both agricultural potential and plant communities. There were a wide variety of tree species in the bottomlands, some of the most prominent being holly, sweet gum, white oak, beech, and pine.

The tree taxa found in swamps differed significantly from those in other zones. Water tolerant species were obviously more significant, and the hickories found in these forests were mostly those bearing inedible nuts (bitternut and water hickory). Sweet gum, holly, maple, willow, white oak, and beech comprised the majority of tree taxa found in the swamps. It is also the only zone where cypress is found relatively frequently.

River bank communities below the fall line were quite distinct from the other area forest communities. Oaks were not prominent species. Dominant species of the river bank zone included maple, ash, hackberry, and sycamore.

With Scarry's GLO reconstruction in mind, placing the wood data from the Mound V structures in relationship to the landscape is possible. Most taxa found in the samples were found in varying abundance in all nearby forest communities; this is especially true of the two most common taxa in the assemblages, pine and hickory. However, the areas where those two species are most common are the terraces and Fall Line Hills. Linking wood taxa found in the samples to zones in which they are common is in no way a definitive answer to the question of where the Mound V builders were obtaining their construction materials. Most areas had probably undergone some anthropogenic disturbance, and most taxa found are fairly

ubiquitous throughout the zones adjacent to Moundville. What is relevant is that the builders of the earth lodge and the adjacent structure probably did not go to any great effort to collect specific species of wood from great distances. Their choices of wood were consistent with what was available conveniently, and as I will discuss next, appropriate functionally.

Construction And Symbolic Properties

There are many different species of pine, and they have slightly different qualities. It is worth mentioning that the common perception of pine as being "soft" wood and hence inferior to the majority of hardwoods is somewhat misleading. The hardest softwood is comparable in durability to a mid-range hardwood.

Softwoods may also have other advantages that some hardwoods lack, including vertical strength and a decreased susceptibility to rot. In regard to rot resistance, it is worth noting that the only other structures at Moundville for which there is wood identification are the palisades, which were constructed of pine poles. These palisade poles are assumed to have been in place for 10-20 years, given the rot resistance of pine (Pashin and de Zeeuw 1970:458-459). Pines also have the advantage of being ready-made straight poles, with little processing required before they can be effective building components.

All the pines in the southern pine group have fairly comparable structural properties. The species of the southern pine group cannot be easily distinguished from one another based on wood structure, and in fact they are usually sorted by density in lumberyards (Pashin and de Zeeuw 1970:458). All of the southern pines are used in modern construction, especially shortleaf and longleaf pine (Petrides and Wehr 1988:159-160). The general standard in lumberyards for structural grade wood among the southern pines is an average of 6 growth rings per inch. The central roof support post in Structure 1a on Mound V has double this number of rings per inch. In other words, besides being very large, the central posts were certainly made of structurally sound wood (Pashin and de Zeeuw 1970:457).

Hickory is a remarkably durable hardwood with a high all-around strength. It makes sense, given the strength of hickory, that it would be desirable as a rafter component whereby it would support large portion of the roof.

Another species selected for its construction features may have been cedar, used in a few components of both the earth lodge and adjacent Structure 2. While cedar is known to have ritual importance among the Southeastern Indians, it also has a relatively high rot resistance compared to other available wood types. The proveniences in the earth lodge where cedar was prominent were in the areas where wood was found from poles on the outside of the lodge, probably serving to hold down sod, and also at

at the entrance tunnel. Both of these features may have been more exposed to the elements than the other building components, hence rot resistance would have been an asset.

There may be a symbolic component to the use of red cedar as well. It has been shown by Mary Simon that in the American Bottom of the Mississippi River Valley, red cedar was more often used in elite or ritual-related Mississippian structures than in other contexts, especially during the Stirling (1100-1200 A.D.) and Moorehead (1200-1275 A.D.) phases (Simon 2002:296-98). These phases are chronologically earlier than the Mound V structures. Also, Simon (2002:298) identifies a trend in later Mississippian domestic, non-elite architecture to incorporate red cedar in construction, perhaps as protection from the supernatural as documented in ethnographic accounts.

It is noteworthy that all of the red cedar in the earth lodge is in areas of the structure that may have been visible from the outside. Red cedar may have served as a marker of the earth lodge's elite or ritual status, in addition to its prominent location on Mound V. The placement of red cedar components is also consistent with the later uses in the American Bottom as a spiritually protective element. There may also be ritual significance in the placement of cedar at the tunnel entranceway, where one would have to "pass through" the cedar to gain entry.

However, it is difficult to conclude anything from the presence of red cedar in this context due to the fact that there are no other structures from the Moundville polity for which wood remains have been analyzed. Without non-elite or other comparison structures, it is not possible to show differential use of red cedar in elite or ritual structures that would demonstrate the symbolic value of red cedar in this context.

Comparisons With The Macon Earth Lodge

As noted earlier, the earth lodge structure on Mound V is unique at Moundville. Thus intra-site comparisons are not possible. One of the few structures in the Southeast of similar size and character to the Mound V earth lodge is the Macon Earth Lodge at Ocmulgee National Monument in central Georgia. Fortunately a wood analysis was conducted on some of its structural elements. Excavations led by A. R. Kelly in 1938 revealed a circular structure constructed in a fashion generally akin to the Mound V structure (Fairbanks 1946:94). Volney H. Jones conducted the wood analysis of the structural features of the Macon Earth Lodge. Jones described only a few components of the lodge (Fairbanks 1946:97). Rafters (roof beams) were species of the southern pine group. The large vertical roof support posts were white oak (*Quercus alba*) and post oak (*Quercus stellata*).

The wood used in the Macon Earth Lodge is obviously different from the comparable components of the Mound V structures, in which the roof supports were pine and

the rafters probably hickory. The lack of significant oak in the Moundville earth lodge is of interest.

The landscape around the Macon Plateau is not radically different from the area surrounding Moundville. Species of trees and their ubiquity in the landscape should be similar in the two areas. There is no clear explanation for the difference in the two structures. It may be that food trees in the form of oak and hickory were valuable enough that only minor harvesting was acceptable, rather than the destruction of older trees for construction. However, given the ubiquity of oak trees and hickory in the landscape, and the prominence of corn versus nuts in the diet during this time period at Moundville (Scarry 1986; Scarry and Welch 1995), conservation for food seems like an unlikely explanation for the lack of oak in construction.

CONCLUSION

The structures on Mound V were constructed rationally, out of structurally sound materials which were collected locally. There may also have been symbolic elements in the selection of wood for these structures, especially with regard to red cedar. However, without comparable evidence from other Moundville structures it is difficult to interpret such symbolism with any certainty. Perhaps future excavations will reveal other structures that will allow for the comparisons necessary to reach conclusions regarding symbolic properties in construction materials at Moundville.

REFERENCES CITED

- Asch, Nancy B., Richard I. Ford, and David L. Asch 1972 *Paleoethnobotany of the Koster Site*. Illinois State Museum, Illinois.
- Bozeman, Tandy K. 1982 *Moundville Phase Communities in the Black Warrior Valley, Alabama*. Unpublished Ph.D. dissertation, University of California, Santa Barbara.
- Hoadley, R. Bruce 1990 *Identifying Wood*. Tauton Press, Connecticut.
- Fairbanks, Charles H. 1946 The Macon Earth Lodge. *American Antiquity* 12:94-108.
- Knight, Vernon James, Jr., and Vincas P. Steponaitis 1998 A New History of Moundville. In *Archaeology of the Moundville Chiefdom*, edited by Vernon James Knight, Jr. and Vincas P. Steponaitis, pp. 1-25. Smithsonian Institution Press, Washington, D.C.
- Pashin, A.J., and Carl de Zeeuw 1970 *Textbook of Wood Technology, Vol. 1*. McGraw-Hill, New York.
- Peebles, Christopher S. 1978 Determinants of Settlement Size and Location in the Moundville Phase. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 369-416. Academic Press, New York.
- Petrides, George A. and Janet Wehr 1988 *A Field Guide to Eastern Trees*. Houghton Mifflin, New York.

Scarry, C. Margaret 1986 *Changes in Plant Procurement and Production during the Emergence of the Moundville Chiefdom*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan.

Scarry, C. Margaret, and Paul D. Welch 1995 Status-Related

Variation in Foodways in the Moundville Chiefdom. *American Antiquity* 60:399-419.

Simon, Mary L. 2002 Red Cedar, White Oak, and Bluestem Grass: The Colors of Mississippian Construction. *Midcontinental Journal of Archaeology* 27:273-301.

MUSEUM BULLETIN SERIES (1975-PRESENT)

1. Systematics of the Percid Fishes of the Subgenus *Ammocrypta*, Genus *Ammocrypta*, with Descriptions of Two New Species. James D. Williams. 56 pp., illus., June, 1975. \$5.00
2. Endangered and Threatened Plants and Animals of Alabama. Herbert Boschung, Editor. 93 pp., illus., October, 1976. \$7.50
3. Containing: A New Species of *Semotilus* (Pisces: Cyprinidae) from the Carolinas. Franklin F. Snelson, Jr. and Royal D. Suttkus. *Etheostoma neopternum*, a New Percid Fish from the Tennessee River System in Alabama and Tennessee. W. Mike Howell and Guido Dingerkus. Taxonomy, Ecology and Phylogeny of the Subgenus *Depressicambarus*, with the Description of a New Species from Florida and Redescriptions of *Cambarus graysoni*, *Cambarus latimanus*, and *Cambarus striatus* (Decapoda: Cambaridae). Raymond William Bouchard. 60 pp., illus., February, 1978. \$5.00
4. Systematics of the Percid Fishes of the Subgenus *Microperca*, Genus *Etheostoma*. Brooks M. Burr. 53 pp., illus., July, 1978. \$5.00
5. Containing: *Notropis candidus*, a New Cyprinid Fish from the Mobile Bay Basin, and a Review of the Nomenclatural History of *Notropis shumardi* (Girard). Royal D. Suttkus. *Notropis stanauli*, a New Madtom Catfish (Ictaluridae) from the Clinch and Duck Rivers, Tennessee. David A Etnier and Robert E. Jenkins. 23 pp., illus., May, 1980. \$5.00
6. Containing: A New Species of Cyprinodontoid Fish, Genus *Fundulus* (*Zygonectes*), from Lake Pontchartrain Tributaries in Louisiana and Mississippi. Royal D. Suttkus and Robert C. Cashner. Karyotypes in Populations of the Cyprinodontid Fishes of the *Fundulus notatus* species-complex: A Geographic Analysis. W. Mike Howell and Ann Black. An Isozymic Analysis of Several Southeastern Populations of the Cyprinodontid Fishes of the *Fundulus notatus* Species-Complex. Fred Tatum, Ronald Lindahl and Herbert Boschung. 35 pp., illus., April, 1981. \$5.00
7. Plant Resources, Archaeological Plant Remains, and Prehistoric Plant-Use Patterns in the Central Tombigbee River Valley, Gloria May Caddell. 39 pp., February, 1982. \$5.00
8. Containing: Description, Biology and Distribution of the Spotfin Chub, *Hybopsis monacha*, a Threatened Cyprinid Fish of the Tennessee River Drainage. Robert E. Jenkins and Noel M. Burkhead. Life History of the Banded Pygmy Sunfish, *Elassoma zonatum* Jordan (Pisces: Centrarchidae) in Western Kentucky. Stephen J. Walsh and Brooks M. Burr. 52 pp., illus., August, 1984. \$6.00
9. Systematics of *Notropis cahabae*, a New Cyprinid Fish Endemic to the Cahaba River of the Mobile Basin. Richard L. Mayden and Bernard R. Kuhajda. 16 pp., illus., November, 1989. \$3.50
10. Containing: *Notropis rafinesquei*, a New Cyprinid Fish from the Yazoo River System in Mississippi. Royal D. Suttkus. Reproductive Behavior of *Exoglossum* species. Eugene G. Maurakis, William S. Woolcot, and Mark H. Sabaj. *Scaphirhynchus suttkusi*, a New Sturgeon from the Mobile Basin of Alabama and Mississippi. James D. Williams and Glenn H. Clemmer. 32 pp., illus., June, 1991. \$5.00
11. Containing: A New Species of *Hydropsyche* (Trichoptera: Hydropsychidae) from Alabama, with Additional State Records for the Curvivalpia. Paul K. Lago and Steven C. Harris. New Caddisflies (Trichoptera) from the Little River Drainage in Northeastern Alabama. Kenneth Frazer and Steven C. Harris. New Caddisflies, (Trichoptera) from Alabama and Florida. Steven C. Harris. Survey of the Trichoptera in the Little River Drainage of Northeastern Alabama. Kenneth S. Frazer, Steven C. Harris and G. Milton Ward. 22 pp., illus., September, 1991. \$4.00
12. Variation of the Spotted Sunfish, *Lepomis punctatus* Complex (Centrarchidae): Meristics, Morphometrics, Pigmentation and Species Limits. Melvin T. Warren Jr. 47 pp., illus. May, 1992. \$6.00

13. Containing: Effects of Impoundments on Freshwater Mussels (Mollusca: Bivalvia: Unionidae) in the Main Channel of the Black Warrior and Tombigbee Rivers in Western Alabama. James D. Williams, Samuel L. H. Fuller and Randall Grace. *Etheostoma chermocki*, a New Species of Darter (Teleostei: Percidae) from the Black Warrior River Drainage of Alabama. Herbert T. Boschung, Richard L. Mayden, and Joseph R. Tomelleri. 21 pp., illus. September, 1992. \$5.00
14. Catalog of Freshwater and Marine Fishes of Alabama. Herbert T. Boschung. 268 pp., December, 1992. \$12.00
15. Containing: Archaeological Survey and Excavations in the Coosa River Valley, Alabama. Vernon James Knight, Editor. Including: Archaeological Research in the Middle Coosa Valley. Vernon James Knight. Archaeological Research in the Logan Martin Basin. L. Ross Morrell. Lamar in the Middle Coosa River Drainage: The Ogletree Island Site. Richard Walling. The Milner Site: A Mid-Seventeenth Century Site Near Gadsden, Alabama. Marvin T. Smith, Vernon J. Knight, Julie B. Smith, and Kenneth R. Turner. Seventeenth Century Aboriginal Settlement on the Coosa River. Marvin T. Smith. 87 pp., illus., January, 1993. \$10.00
16. Containing: *Elassoma alabamiae*, a New Species of Pygmy Sunfish Endemic to the Tennessee River Drainage of Alabama (Teleostei: Elassomatidae). Richard L. Mayden. A New Species of Percina (Odontopholis) from Kentucky and Tennessee with Comparisons to *Percina cymatotaenia* (Teleostei: Percidae). Brooks M. Burr and Lawrence M. Page. Systematics of the *Etheostoma jordani* Species Group (Teleostei: Percidae), with Descriptions of Three New Species. Robert M. Wood and Richard L. Mayden. 44 pp., illus., June, 1993. \$10.00
17. Containing: *Etheostoma (Ulocentra) scottie* (Osteichtheys: Percidae), a New Darter from the Etowah River System in Georgia. Bruce H. Bauer, David A. Etnier and Noel M. Burkhead. Present and Recent Historic Habitat of the Alabama Sturgeon, *Scaphirhynchus suttkusi* Williams and Clemmer, in the Mobile Basin. John Selden Burke and John S. Ramsey. Roland Harper, Alabama Botanist and Social Critic: A Biographical Sketch and bibliography. L. J. Davenport and G. Ward Hubbs. 45 pp., illus., May, 1995. \$10.00
18. pH and Temperature in Ectothermic Vertebrates. Gordon R. Ultsch and Donald C. Jackson. Life Histories of *Notuus baileyi* and *N. flavipinnis* (Pisces: Ictaluridae), Two Rare Madtom Catfishes in Citico Creek, Monroe County, Tennessee. Gerald R. Dunkins and Peggy W. Shute. 69 pp., illus., December, 1996. \$10.00
19. The Mound Island Project: An Archaeological Survey in the Mobile-Tensaw Delta. Richard S. Fuller and Ian W. Brown. 151 pp., illus., June, 1998. \$10.00
20. Containing: The Loss of Free-flowing Streams in the Gulf Coastal Plain. David Shankman. Allozyme Variation in the Longnose Shiner, *Hybopsis longirostris* (Teleostei, Cyprinidae). Tom Titus, E. O. Wiley, and Mitchell Allen. A New Species of *Cycleptus* (Cypriniformes, Catostomidae) from the Gulf Slope Drainages of Alabama, Mississippi, and Louisiana, with a Review of the Distribution, Biology, and Conservation Status of the Genus. Brooks M. Burr and Richard L. Mayden. 57 pp., illus., August, 1999. \$10.00
21. Unionid Mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. Jayne Brim Box and James D. Williams. 143 pp., illus., April, 2000. \$20.00
22. Containing: Andrew C. Moor's "Evolution Once More": The Evolution-Creationism Controversy from and Early 1920's Perspective. William D. Anderson, Jr. Systematics and Biogeography of the *Notropis rubellus* Species Group (Teleostei: Cyprinidae). Robert M. Wood, Richard L. Mayden, Ronald H. Matson, Bernard R. Kuhajda, and Steven R. Layman. 80 pp., illus., November, 2002. \$20.00
23. Containing: Description of Larval and Juvenile Robust Redhorse, *Moxostoma robustum*. Gregory L. Looney,

- Cecil A. Jennings. Systematics, Variation, and Speciation of the *Macrhybopsis aestivalis* Complex West of the Mississippi River. David J. Eisenhour. 48 pp., illus., December, 2004. \$10.00
24. A Historical and Current Perspective of the Freshwater Mussel Fauna (Bivalvia: Unionidae) from the Choctawhatchee River Drainage in Alabama and Florida. Holly N. Blalock-Herod, Jeffrey J. Herod, James D. Williams, Britton N. Wilson, and Stuart W. McGregor. 26 pp., illus., July, 2005. \$10.00
25. Containing: Systematics, Evolution and Biogeography of the *Etheostoma simoterum* Species Complex (Percidae: Subgenus *Ulocentra*). Steven L. Powers and Richard L. Mayden. Distribution and Status of Freshwater Mussels (Bivalvia Unionidae) of the Lower Coosa and Tallapossa River Drainages in Alabama. Michael M. Gangloff and Jack W. Feminella. The Osteology of the Stonecat, *Noturus flavus* (Siluriformes: Ictaluridae) with Comparisons to Other Siluriforms. Jacob J. Egge. 88 pp., illus., August, 2007.
26. An Archaeological Survey in Clarke County, Alabama. Ian W. Brown. 129 pp., illus., January, 2009. \$20.00

ALABAMA MUSEUM OF NATURAL HISTORY PUBLICATION

Special Publications

1. Moundville, An Introduction to the Archaeology of a Mississippi Chiefdom, 2nd Edition. John Walthall. 47 pp., illus., March, 1994. \$3.50
2. Ten Thousand Years of Alabama History, A Pictorial Resume. W. Phillip Krebs. 130 pp. illus., January, 1986. \$10.00
3. The Mounds Awaken: Mound State Monument and the Civilian Conservation Corps. Joy Baklanoff and Arthur Howington. 36 pp., illus. October, 1989. \$3.00

Museum Papers (1910-1960, Terminated)

1. Smith Hall, The New Museum and Home of the Geological Survey. E. A. Smith. 7 pp. 1 plate. Out of Print
2. The Museum as an Educator. Herbert H. Smith. 25 pp., 8 plates, 1912. Out of Print
3. Directions for Collecting Land Shells. Herbert H. Smith. 12 pp., 1912. Out of Print
4. Annotated List of the Avery Bird Collection. Ernest G. Holt. 142 pp., 1 plate, 1921. \$3.00
5. Preliminary Catalogue of Alabama Amphibians and Reptiles. H. P. Loding. 59 pp., 1922. Out of Print
6. The Anculosae of the Alabama River Drainage. Calvin Goodrich. 57 pp., 3 plates, 1922. Out of Print
7. The Genus *Gyrotoma*. Calvin Goodrich. 32 pp., 2 plates, 1924. Out of Print
8. The Terrestrial Shell-Bearing Mollusca of Alabama. Bryant Walker. 32 pp., illus., 1928. Out of Print
9. Footprints from the Coal Measures of Alabama. T. H. Aldrich, Sr. and Walter B. Jones. 64 pp., illus., 1930. \$3.00
10. Goniobases of the Vicinity of Muscle Shoals. Calvin Goodrich. 25 pp., 1930. Out of Print
11. Alabama Reptiles. William L. Haltom. 145 pp., 39 plates, 57 figs., 1931. Out of Print
12. Description of a Few Alabama Eocene Species and Remarks on Varieties. T. H. Aldrich, Sr. 21 pp., 6 plates. \$3.00
13. Moundville Culture and Burial Museum. Walter B. Jones and D. L. DeJarnette. 8 pp., 22 illus., 1936. Out of Print
14. The Argiopidae or Orb-Weaving Spiders of Alabama. Allan F. Archer. 77 pp., 5 plates, 1940. \$3.00
15. Anthropological Studies at Moundville. Part I. Indian Skeletons from the Museum Burials at Moundville Part II. Possible Evidence of Scalping at Moundville. C. E. Snow. 57 pp., illus. 1940. \$3.00
16. Condylodiaphysal Angles of Indian Humeri from North Alabama. C. E. Snow. 38 pp., illus., 1940. \$3.00
17. The Bessemer Site (Excavation of Three Mounds and Surrounding Village Areas near Bessemer, Alabama). D. L. DeJarnette and S. B. Wimberly. 122 pp., illus., 1941. \$3.00
18. Supplement of the Argiopidae of Alabama. Allan F. Archer. 47 pp., 4 plates, 1941. \$3.00
19. McQuorquodale Mound. A Manifestation of the Hopewellian Phase in South Alabama. S. B. Wimberly and H. A. Tourtelot. 42 pp., illus., (1941) 1943. \$3.00
20. Mound State Monument. 19 pp., illus., 1941. Out of Print
21. Two Prehistoric Indian Dwarf Skeletons from Moundville. C. E. Snow. 90 pp., 2 plates, 1946. \$3.00
22. The Theridiidae or Comb-Footed Spiders from Moundville. Allan F. Archer. 67 pp., 2 plates, 1946. \$3.00
23. The Flint River Site, Ma⁴⁸. William S. Webb and D. L. DeJarnette. 44 pp., illus., 1948. Out of Print
24. The Whitesburg Bridge Site, Mav¹⁰. William S. Webb and D. L. DeJarnette. 44 pp., illus., 1948. Out of Print
25. The Perry Site, LU²⁵. William S. Webb and D. L. DeJarnette. 69 pp., illus., 1948. \$3.00
26. Little Bear Creek Site, CT⁸. William S. Webb and D. L. DeJarnette. 64 pp., illus., 1948. Out of Print
27. New Anophthalmid Beetles (Fam. Carabidae) from the Appalachian Region. J. Manson Valentine. 19 pp., 2 plates, 1948. \$3.00
28. Land Snails of the Genus *Stenotrema* in the Alabama Region. Allan F. Archer. 85 pp., 10 plates, 1948. \$3.00
29. Moundville: An Historic Document. Carl E. Guthe. 14 pp., 1950. Out of Print
30. A Study of the Theridiid and Mimetid Spiders with Descriptions of New Genera and Species. Alan F. Archer. 44 pp., 4 plates, 1950. \$3.00

31. Carvernicolous Pselaphid Beetles of Alabama and Tennessee, with Observations on the Taxonomy of the Family. Orlando Park. 107 pp., illus., 1951. \$3.00
32. Guntersville Basin Pottery. Marion D. Hemilich. 69 pp., illus. 1952. \$3.00
33. A Key to the Amphibians and Reptiles of Alabama. Ralph L. Chermock. 88 pp., illus., 1952. Out of Print
34. New Genera of Anophthalmid Beetles from Cumberland Caves (Carabidae, Trechini). J. Manson Valentine. 41 pp., 5 plates, 1952. \$3.00
35. New Genera and Species of Cavernicolous Diplopods from Alabama. Richard L. Hoffman. 13 pp., illus., 1956. \$3.00
36. Archaeological Investigations in Mobile County and Clarke County, Southern Alabama. Steve B. Wimberly. 262 pp., 7 plates, 1960. \$5.00

NOTICE TO AUTHORS

Send manuscripts to: Editor, BULLETIN ALABAMA MUSEUM OF NATURAL HISTORY, The University of Alabama, Box 870345, Tuscaloosa, Alabama 35487-0345. Papers concerning all natural history disciplines, including anthropology, astronomy, biology, the earth sciences, and history of science will be considered. Please do not submit papers that have been published or that are being considered elsewhere.

Before submitting, it is recommended that you carefully examine this Notice to Authors, or you may contact the Editor for a copy of the style sheet. Careful review of a recent BULLETIN for style and sequence may be helpful.

Authors should submit a clean, double-spaced, typed manuscript on white 8.5 x 11 inch paper, including copies of all tables, figures and photographs (originals will be requested upon acceptance of paper). Manuscripts should NOT have a right justified margin. Diacritical marks are the responsibility of the author.

Manuscripts should be arranged accordingly:

Title; Author(s) and Address(es)

Abstract – all bold face, with author/title leader

Text – headings should be bold face and mixed case, subheadings are mixed caps

Materials Examined

Appendices

References

Figures

Figure Captions (BULLETIN does not use designation “Plates”)

Tables

Table Headings

Abstracts should be a summary of the paper. Use metric or English (metric) equivalents. The location of tables and figures should be noted on the manuscript. Illustrations should be black and white drawings or good quality photographs. No foldouts, please.

Upon acceptance, author should supply: corrected typed manuscript, a standard disk or CD containing manuscript and tables, and original artwork and photos. BULLETIN word processing standard is Microsoft Word, although most major word-processing program files can be dealt with. Authors are strongly encouraged to discuss electronic compatibility with the Editor. Original art, graphs and photos will be returned.

Page charge contributions are welcomed. Because of continually increasing costs, financial contributions to the BULLETIN from its authors are of great assistance. However, inability to pay will not prejudice the editorial processing of an article. If organizational funding is available, it is urged that authors arrange for contributions to the BULLETIN to offset printing costs. The cost of printing is presently calculated at \$125.00 a page.

