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

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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; Pebbles 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 exemplified 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-

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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 United 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 then 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 dur ing 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 saplings, 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 notes were recorded for each lot concerning the general degree of fragmentation of the daub and its coloration.

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

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

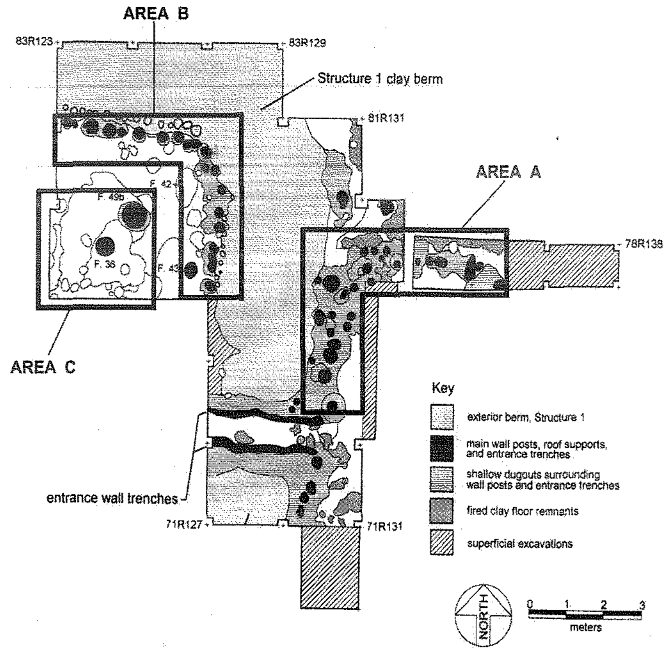

Figure 1. Location of area subsamples.

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%)

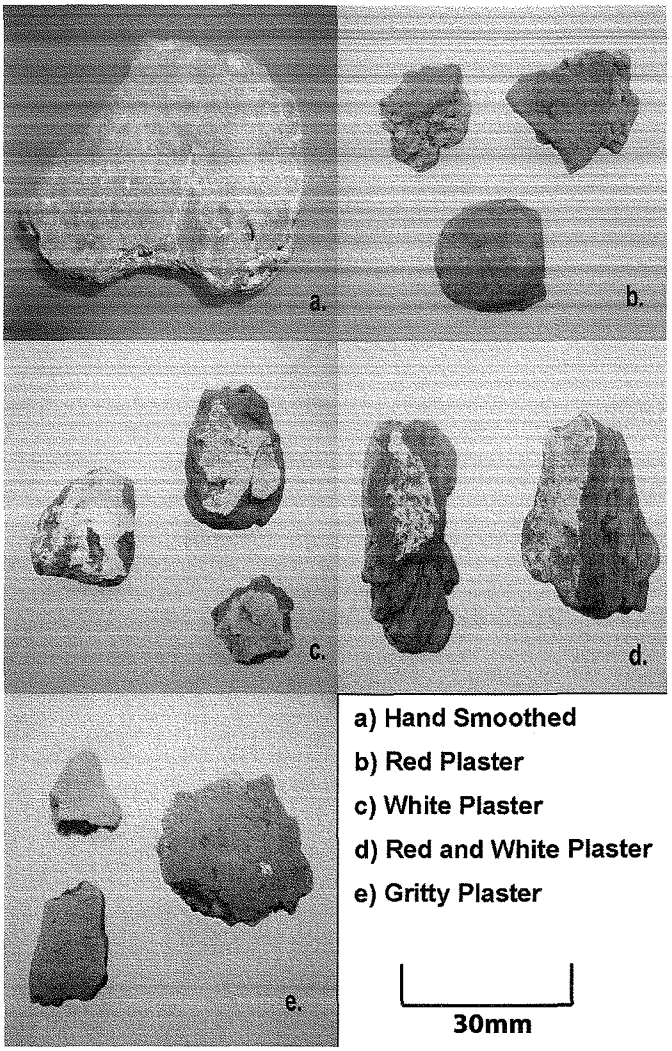

Figure 2. Categories of surface treatments on daub.

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

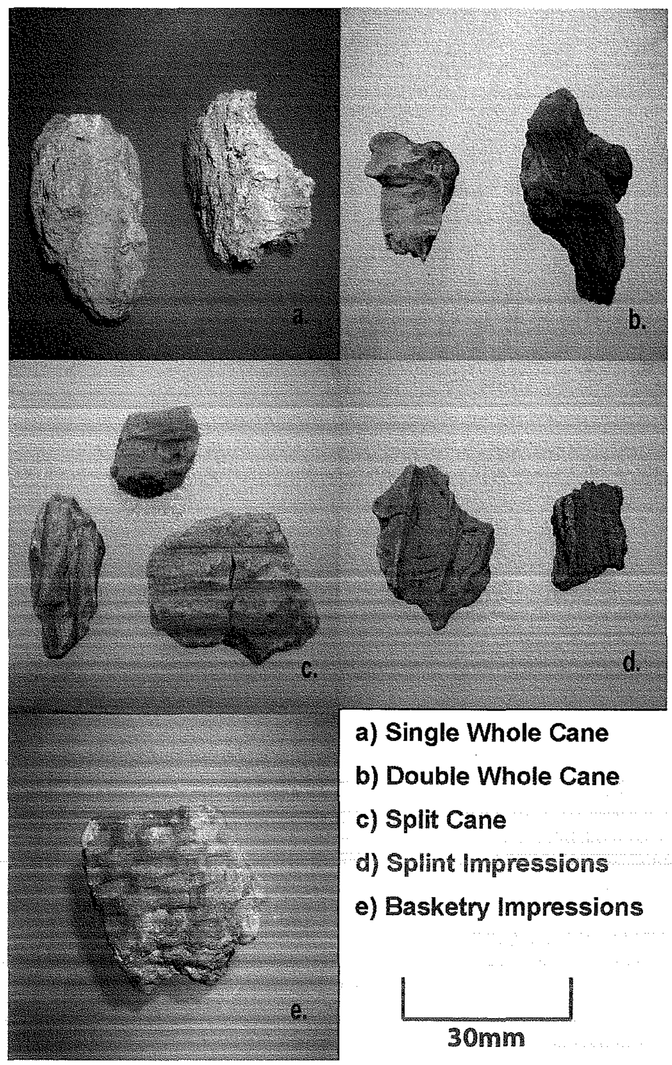

Figure 3. Categories of structural impressions on daub.

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

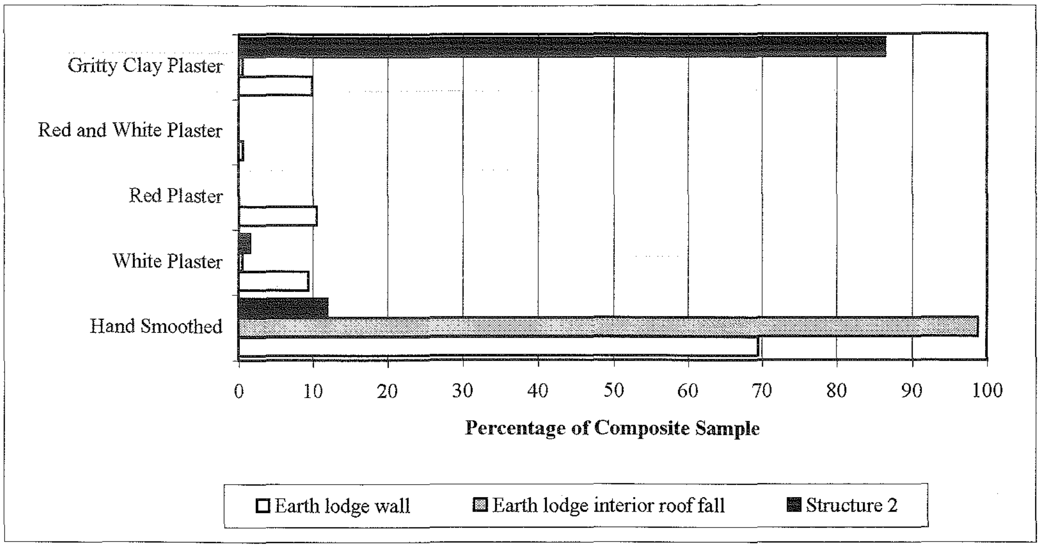

Figure 4. Daub surface finishes by area subsample.

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

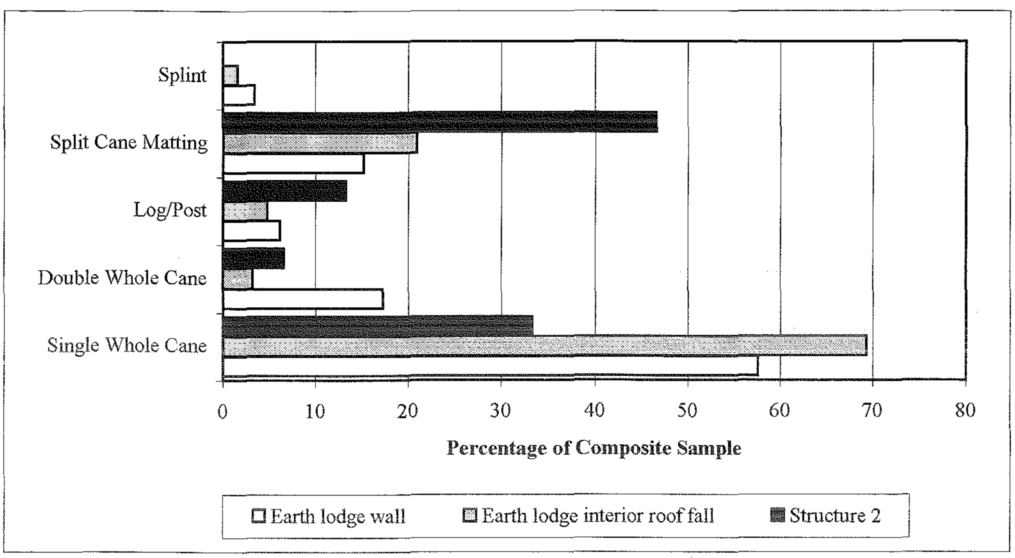

Figure 5. Structural impressions by area subsample.

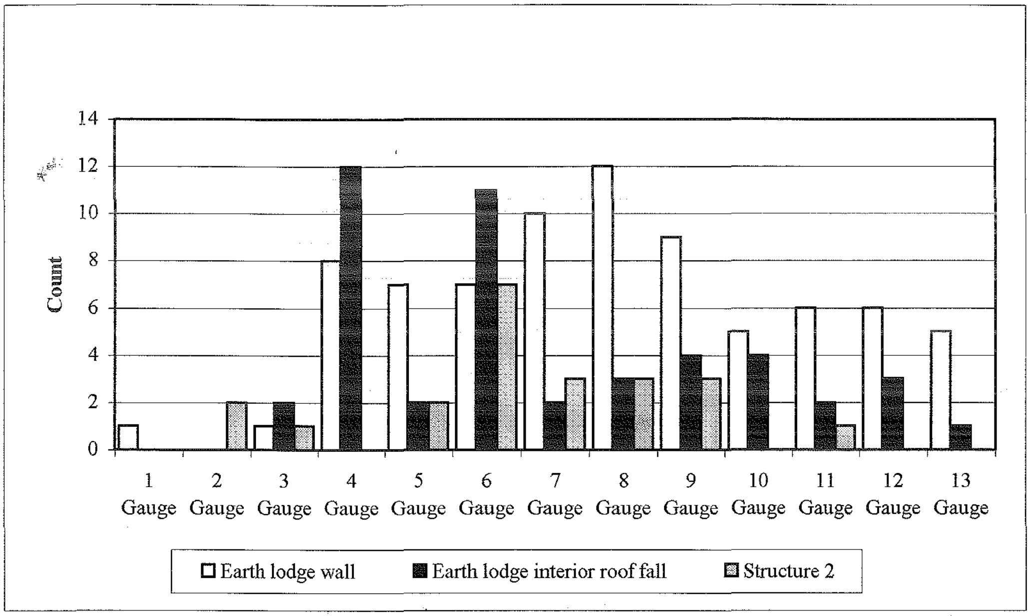

Figure 6. Histogram of cane diameter by area subsample.

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 homog enous 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

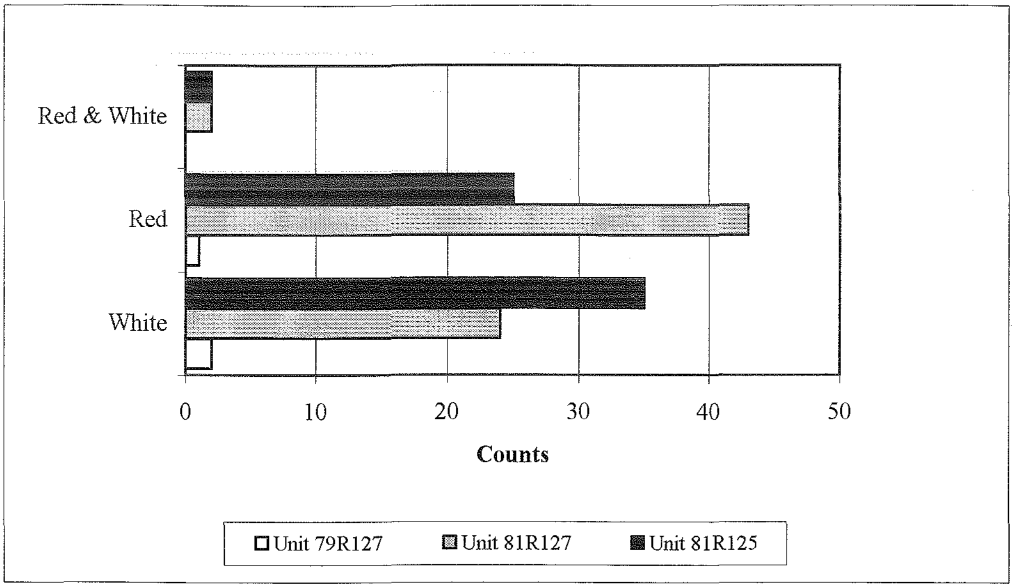

Figure 7. Distribution of pigmented plaster in the earth lodge wall area by excavation unit.

> 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

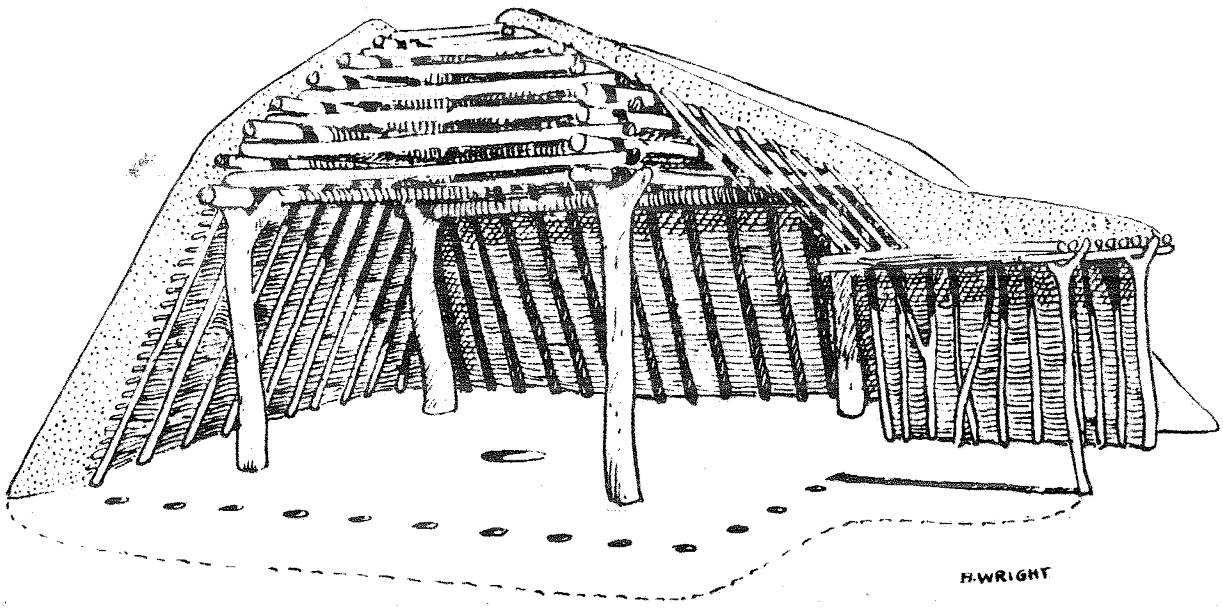

Figure 8. Example of a cribbed-roof Mississippian earth lodge from North Carolina (from Coe 1995).

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 virtually 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. Koeppel, 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.