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November 4-6, 1976

Edited by
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PREFACE

The thirty-third Southeastern Archaeological Conference was held in Tuscaloosa, Alabama, November 4-6, 1976. John A. Walthall served as Program Chairman and Carey B. Oakley handled local arrangements. Ninety scholarly papers were scheduled, including a special symposium in honor of David DeJarnette. Most of the presentations from the latter session were published in 1978 as Special Publication 5 of the Southeastern Archaeological Conference. On Saturday afternoon many of the Conference participants enjoyed a delicious barbecue in the old Moundville tradition, held at Mound State Monument.

Twenty-five papers were submitted for publication subsequent to the meeting. These were transmitted to me at the Asheville SEAC meetings in 1981, and were copy-edited in 1982, with the assistance of Janet E. Levy, University of North Carolina-Charlotte. On behalf of the Southeastern Archaeological Conference, I entend our gratitude to Dr. Levy for her help, as well as to Ms. Susan Fabrick and Ms. Cindy Cart, Department of Anthropology, Florida State Museum, who conscientiously typed the final manuscript. The Florida State Museum absorbed the typing and mailing costs associated with this publication. Publication funds were made available by the Louisiana Research Foundation; the Lower Mississippi Survey, Peabody Museum, Harvard University; the Wentworth Foundation, founded by the late A. Fillmore Wentworth (William M. Goza, President); and the Coca-Cola Bottling Company.

William H. Marquardt

Gainesville, Florida
November 15, 1983

TABLE OF CONTENTS

Program of the 33rd Southeastern Archaeological Conference, 1976

Program Chairperson: John A. Walthall
Local Arrangements: Carey B. Oakley
The University of Alabama

Thursday, November 4

Morning
Welcome: Christopher L. Bramlett, Assistant Vice President for Research, The University of Alabama

Symposium: The Late Pleistocene in the Southeastern United States

Chairperson: C. B. Curren (U. of Ala.)
Discussants: S. Williams (Harvard)
W. Haag (L.S.U.)

Session A

8:00 J. M. Adovasio, J. D. Gunn, J. Donahue (U. of Pittsburgh) and R. Stuckenrath (Smithsonian): Excavations at Meadowcroft Rockshelter 1973-1976: A Progress Report

8:20 D. F. Morse (Ark. Arch. Survey): The Central Mississippi Valley

8:40 G. M. Clark (U. of Tenn.): Pleistocene Geology of Tennessee

9:00 C. Hubbert (U. of Ala.): Recent Reserch into the Paleo-Indian Period of the Middle Tennessee Valley

9:20 A. E. Bogan (U. of Tenn.): Pleistocene Vertebrate Fauna of Tennessee

9:40 B. L. Purrington (Appalachian State U.): Early Man and Environment in the Southern Appalachians

10:00 Break

10:20 J. Chapman (U. of Tenn.): Some Thoughts on Early Archaic Settlement and Subsistence Systems in the Lower Little Tennessee River Valley

10:40 L. Kimball (U. of Tenn.): Early Archaic Tools Based on Stratified Sites in Eastern Tennessee

11:00 P. Cridlebaugh (U. of Tenn.): Morrow Mountain in the Middle South

11:20 C. E. Smith (U. of Ala.): Speculations On the Plant Component of Paleo-Indian Diet

11:40 J. P. Brain (Harvard): A Provisional Early man Sequence in the Lower Mississippi Valley

Volunteered Papers: Intra-Site Analysis and Interpretation

Chairperson: B. C. Keel (National Park Service)

8:00 T. K. Black (U. of Mich.): Biological and Social Analysis of a Middle Mississippian Cemetery: The Turner Site

8:15 B. M. Brooms (Ala. Hist. Comm.): A Woodland-Mississippian Contact Site in Southeast Alabama

8:30 B. M. Butler (Tenn.): The Yearwood Site: A Specialized Middle Woodland Occupation on the Elk River

8:45 B. Clay (U. of Kentucky): The Auvergne Mound and the Central Kentucky Bluegrass Project of Tulane University

9:00 A. Magennis (U. of Tenn.): An Investigation of the Mortuary Patterning at the Eva Site

9:30 D. Merrit (Fla. State): Excavations of a Timucuan Village Site in Northeast Florida

9:45 D. Peterson (Memphis State): Archaic Cremations in the Lower Tennessee Valley

10:30 M. Trinkley (U. of N. Carolina): Preliminary Investigations of a South Carolina Shell Ring

10:45 V. K. Fleming (Ohio State) and J. A. Walthall (U. of Ala.): Historic Aboriginal Occupation of the Guntersville Basin, Alabama

11:00 S. I. Goad (U. of Ga.): The Use of Copper in the Prehistoric Southeastern United States During the Woodland Period

11:20 Discussion

Thursday, November 4 - Afternoon

Symposium: The Late Pelistocene in the Southeastern United States

Session B

1:00 S. M. Gagliano, E. K. Burden and R. A. Weinstein (Coastal Environments, Inc.): Paleo-Indian and Late Quaternary Features, Northern Gulf of Mexico Coastal Zone

1:20 C. B. Curren (U. of Ala.): Paleo-Indian and Late Pleistocene Environment of the Alabama Coastal Plain

1:40 M. Frazier (U. of Fla.): The Faunal and Climatic Changes from Late Pleistocene to Middle Pleistocene in Florida and the Southeast

2:00 G. McDonald (U. of Fla.): Man in the Peistocene of Florida

2:30 S. Cockrell (Fla. Dept. of Archives and History): The Florida Warm Mineral Springs Site

2:40 B. Waller (Fla. Anthropological Society): The Distribution of Bone Projectile Points within the State of Florida

3:00 F. H. Millard (Ga. State): A Multivariate Comparison of North Carolina and Arkansas Fluted Bones

Volunteered Papers:
Environmental and Subsistence Reconstruction

Chairperson: B. Smith (U. of Georgia)

4:15 J. E. Cobb (U. of Tenn.): The Owl Hollow Research Project: New Data on Late Middle Woodland Subsistence and Settlement in Lower Middle Tennessee

4:30 I. W. Brown and J. P. Brain (Harvard): Archaeology of the Natchez Bluffs Region, Mississippi: Hypothesized Cultural and Environmental Factors Influencing Local Population Movement

4:45 A. Fradkin (U. of Fla.): A Consideration of Snake Consumption Among the Aborigines of Florida

5:00 T. A. Kohler (U. of Fla.) Corn, Indians, and Spanish in North-Central Florida

5:15 M. A. Rolingson (Ark. Arch. Survey): Forest and Floods: Clues to the Mississippi Valley Floodplain Environment and Significance for Prehistoric Settlement in Southern Arkansas

5:30 Discussion

Symposium: Quarry Site Research

Chairperson: R. S. Dickens
(Ga. State)

1:00 R. S. Dickens and L. F. Carnes (Ga. State): Introduction

1:10 A. R. Kelly (U. of Ga.): Lithic Site Differentiation: Quarries, Work Shops, Camps, and Caches

1:30 B. A. Purdy (U. of Fla.): Aboriginal Chert Procurement in Florida

1:50 R. S. Dickens and L. F. Carnes (Ga. State): Preliminary Investigations at Soapstone Ridge, DeKalb County, Georgia

2:10 C. T. Sheldon (W. Ga. College); Aboriginal Soapstone Exploitation in Carrol County, Georgia

2:30 S. I. Goad (U. of Ga.): Copper: Its Procurement and Use by the Indians of the Southeastern United States

2:50 T. A. Ferguson (U. of Tenn.): A Reconnaissance of Soapstone Quarries in Spartanburg County, South Carolina

3:10 Discussion

6:00 Business Meeting

Friday, November 5 - Morning

Symposium: New Developments in the Lower Mississippi Valley Ceramic Chronology

Chairperson: J. W. Springer
(N. Illinois U.)

8:00 W. G. Haag (L.S.U.): Poverty Point Period Pottery

8:20 J. R. Shenkel (U. of New Orleans): Ceramics of the Tchefuncte Period

8:40 A. Toth (L.S.U.): The Chronological Implications of Early Marksville Ceramics

9:00 J. W. Springer (N. Illinois U.): The Troyville-Coles Creek Ceramic Sequence at the Bruly St. Martin Site

9:20 V. P. Steponaitis (U. of Mich.): Late Prehistoric Ceramic Chronology in the Natchez Region

9:40 J.P. Brain (Harvard): Ceramics of the Eighteenth Century Tunica

Symposium: Recent Approaches to Piedmont Archaeology in South Carolina and Georgia

Chairperson: A. C. Goodyear (U. of S. Carolina)
Discussants: B. C. Keel (National Park Service)
R. S. Dickens (Ga. State)

10:30 C. M. Baker (U. of Ga.): Some Technological Considerations of Quartz as a Raw Material for Chipped Stone Implements: Experiments and Applications

10:50 V. Canouts (S. Ill.): Excavation Strategies and Results for a Shallow Lithic Site on a Piedmont Ridgetop

11:10 J. H. House (U. of S. Carolina): Exploring Prehistoric Utilization of the Inter-Riverine Piedmont in South Carolina: The Interstate 77 Survey

11:30 A. C. Goodyear (U. of S. Carolina): Strategies and Results in Model Building in the South Carlina Piedmont: The Laurens-Anderson Interstate Connector

11:50 Discussion

Volunteered Papers: Strategies for Survey and Data Recovery

Chairperson: R. Thorne (Miss.)

8:30 W. O. Autry (Vanderbilt): Archaeological Investigations in the Upper Neuse River Basin of Central North Carolina and Evidences Relating to the Location of Adshusheer and Enotown

8:45 G. D. Ellis (U. of S. Florida): Archaeological Site Survey: Problems in the Urban Environment

9:00 H. G. Ayers (Appalachian State): The Occupation of Ridgetop Sites in the Blue Ridge Mountains by Savannah River Archaic Peoples

9:15 J. P. Lenzer and B. Spencer (Gulf South Research Institute): Prehistoric Occupation of the Outer Continental Shelf: The Practicality of a Long-Term Research Strategy Utilizing Existing Seismic Data

9:30 S. Mullins (U. of Fla.): Survey and Excavations in the Paynes Prairie State Preserve, Alachua County, Florida

9:45 M. Rushing and G. Spies (North Gulf Coast Arch. Consortium): Recent Archaeological Investigations of Mound Island, 1Ba2 and Environs

10:30 E. W. Seckinger (U. of Ga.): Predictive Settlement Analysis in Central Georgia

10:45 S. South and R. J. Widmer (U. of S. Carolina): A Subsurface Sampling Stragegy for Archaeological Reconnaissance: Implications for Coastal South Carolina

11:00 R. J. Widmer (U. of S. Carolina): Thom's Creek Settlement Pattern on Cooper River Drainage of Coastal South Georgia

11:15 L. N. Wood (U. of S. Florida): An Interpretation of Survey Results from a Study of C. F. Industries, Inc. Property in Northwestern Hardee County, Florida

11:30 A.E. McMichael (W. Georgia College): Barrier Island Settlement Patterns

11:45 Discussion

Friday, November 5 - Afternoon

Symposium: *The Research Potential of Shell Middens: Methodological and Analytical Considerations*

Chairperson: T. M. Ryan (S. Methodist U.)

1:30 J. L. Michie (U. of S. Carolina): Mechanical Water Screen for Midden Excavation

1:45 J. R. Shenkel (U. of New Orleans): Quantitative Analyses of Two Coastal Middens in Louisiana

2:00 L. E. Aten (National Park Service): Estimating Seasonality Using the Brackish Water Clam *Rangia cuneata*

2:20 T. M. Ryan (S. Methodist U.): The Use of Interlocking Steel Cofferdams in Excavating Submerged Archaeological Sites

2:35 W. H. Marquardt (U. of Missouri) and P. J. Watson (Washington U.) Excavation and Recovery of Biological Remains from the Carlston Annis Shellmound in Western Kentucky

3:30 L. E. Aten (National Park Service): Observations on the Use of *Rangia cuneata* as a C-14 Dating Medium and on the Implications of Its Population Characteristics for Settlement Distribution

3:50 G. H. Weir (Texas A&M): Preliminary Pollen Analysis of the Bayou Jasmine Shell Midden

4:05 W. B. Fawcett and P. R. McGuff (Texas Arch. Survey): Examination of Prehistoric Intra-Site Variability on the Texas Coast: Palmetto Bend Reservoir

4:10 C. Pearson (U. of Ga.): Seasonality in Coastal Georgia

4:40 Discussion

Symposium: *Approaches to Anthropological Archaeology Under Contract*

Chairperson: L. M. Raab (Ark. Arch. Survey)

1:00 T. C. Klinger (Ark. Arch. Survey): A Critical Appraisal of "Significance" in Contract Archaeology

1:20 J. E. Price and C. R. Price (U. of Missouri): Understanding Man's Changing Role in the Natural Environment of the Ozark Border

1:40 S. South (U. of S. Carolina): Pattern Recognition in Historical Archaeology

2:00 D. F. Morse and D. G. Anderson (Ark. Arch. Survey): Zebree: An Example of Problem Oriented Contract Research in Northeast Arkansas

2:20 L. M. Raab (Ark. Arch. Survey): A Model of Prehistoric Deer Hunting in the Ozarks: An Example of Problem Orientation in Contract Archaeology

2:40 R. Brooks (Ark. Arch. Survey): The Carroll-Boone Water Transmission Line: An Example of a Problem-Oriented Approach to a Transect Sample in the Ozark Highlands

3:20 J. Sperber (U. of Ark.): Mississippian Socio-Political Organization: An Alternative Approach

3:35 C. H. Kleinhans (U. of Tenn.): The Woodland-Mississippian Interphase in the Normandy Reservoir of Middle Tennessee

4:00 B. Smith (Corps of Engineers): Cultural Resources Management in the Louisville and Nasville Districts, U.S. Army Corps of Engineers

7:00 - 9:00 Special Showing: Art of the Alabama Indians Exhibit. Garland hall, U. of Ala. Campus

Saturday, November 6, Morning

Symposium: Studies in Alabama Archaeology in honor of David L. DeJarnette

Chairperson: J. B. Griffin (Michigan)

8:00 D. W. Chase (Ala. Arch. Society) A Taxonomic Appraisal of Central Alabama Prehistory

8:15 C. B. Curren (U. of Ala.): The Zooarchaeology of Alabama

8:30 N. J. Jenkins (U. of Ala.): The West Jefferson Phase and Alabama Archaeology

8:45 C. S. Peebles (U. of Mich.): Mississippian Polity: Politics and Ritual in the Southeast

9:00 J. A. Walthall (U. of Ala.): Some Comments on Black Warrior Valley Prehistory

9:15 J. W. Cottier (Auburn) and C. T. Sheldon (W. Ga. College): Late Aboriginal Cultural Development in South Central Alabama

9:30 C. T. Sheldon (W. Ga. College) and J. W. Cottier (Auburn): A State Regional Scheme for Cultural Resource Management

9:45 H. B. Ensor (U. of Ala.): Archaeology at 1Je34-A Late West Jefferson Phase Site

10:30 R. S. Dickens and J. H. Chapman (Ga. State): Ceramic Patterning and Social Structure at Two Late Historic Upper Creek Sites in Alabama

10:45 E. Sheldon (Ga. State): Childersburg: Evidence of European Influences Demonstrated by Archaeological Plant Remains

11:00 David DeJarnette and Southeastern Archaeology: A Tribute chaired by C. S. Peebles (U. of Michigan) with contributions from J. B. Griffin, S. B. Wimberly, W. G. Haag, C. Fairbanks, and others

1:30 - 5:30 Afternoon

Barbeque at Mound State Monument

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THE OCCUPATION OF RIDGETOP SITES IN THE BLUE RIDGE MOUNTAINS BY SAVANNAH RIVER ARCHAIC PEOPLES

Harvard G. Ayers
Appalachian State University

Introduction

The occupation of ridgetop sites in the Appalachian Mountains of the eastern U. S. has not been a subject of great concern to archaeologists. This lack of interest has resulted from the heavy emphasis on the excavation of sites located in the alluvial floodplains of the major rivers, mainly in Piedmont and Coastal Plain physiographic settings. This emphasis may be explained by at least two factors: (1) by far the majority of the evidence of Woodland and especially of Mississippian cultures is found in floodplain contexts, presumably due to their agricultural pursuits; (2) evidence of Paleo and Archaic, as well as later cultures, may be found in deeply stratified soil zones due to alluvial buildup. The latter factor allows the archaeologist to establish contemporaneity of data and allows these associations to be relatively placed in chronological order.

Ridgetop sites, on the other hand, do not normally yield vertically stratified remains, and do not yield abundant evidence of late prehistoric cultures. Recent research in the Blue Ridge Mountain area, however, indicates a fairly heavy occupation of such sites by Archaic and perhaps Early Woodland peoples (White 1972; Purrington and Douthit 1976). Interestingly, these early cultures are also represented in floodplain sites, thus indicating the generalized nature of their exploitative patterns. A moderate shift of emphasis toward floodplain sites has been noted by Purrington and Douthit (1976) in Watauga County, North Carolina, for Late Archaic and Early Woodland peoples, but this may be, as they implied, due to the buried nature of earlier Archaic evidence in the floodplains. Recent excavation by Chapman in the Little Tennessee River area has indicated that Early Archaic evidence may be buried by 10 or more feet of alluvium (Schroedl, personal communication).

The fact that later cultures are not heavily represented at many ridgetop sites is of course, in a way, a strength of such sites. Archaic remains are not greatly contaminated by later ones. In addition, the seeming weakness of no vertically stratified remains at many of these sites is partially offset by horizontal separation of different components. At the Wakeman site in Watauga County, North Carolina, Appalachian State University archaeologists Burton Purrington and the author have found distinct horizontal separation of what we interpret to be individual occupations, probably individual campsites. Additional preliminary evidence of such sites was recently recovered by the author and others in conducting a reconnaissance survey of the New River area of Ashe and Alleghany Counties, North Carolina. Max White's excavation of the Evans Gap site (1972) and Gary Wilkins' survey and excavation of sites in the Alleghanies provide further recent information on ridgetop sites.

Description of the Wakeman Site

The Wakeman site (31Wt175) is located about 10 miles northwest of Boone, North Carolina, at an elevation of 4200 feet above sea level. It is situated in what has come to be called, topographically, a saddle. To the east and west of the relatively flat surface of the site the land rises abruptly while to the north and south, the land surface drops off. The site measures about 80 feet east-west, and about 130 feet north-south. Presently flowing springs are located about 100 feet to the north of the site and about 500 feet to the south.

Geologically, the site is located in a region characterized by a metamorphic rock type referred to as amphibolite. Such rocks are characterized by the preponderance of the mineral hornblende, with biotite, muscovite and quartz also being present. The nearest source of rock suitable for the manufacture of stone tools such as projectile points, knives, etc., except for quartz, is located about 20 miles to the west of the site. ASU geologist Fred Webb has recently tentatively identified the quartzite of the Savannah River Archaic as being Upper Cambrian from about 40 miles distant, to the west. Rhyolite could be acquired from volcanic deposits about 30 miles north of the site in the Mount Rogers area. Chert (including chalcedony and jasper), quartzite, rhyolite as well as quartz were all represented in the artifacts of the Wakeman site.

Up until its clearing some 75 years ago, the site was covered by a forest of mixed hardwoods, mainly chestnut, oak, and hickory. Presently, beech, yellow poplar, locust, and maple are to be found in the surrounding forested areas. Berries include blackberries, dewberries, raspberries, blueberries, and elderberries. Present day fauna observed by the author include turkey, ground hog, rabbit, squirrel, and grouse. In addition, deer and bear are known to be present in small numbers and elk were reported in early historic times.

Soils at the site are moderately developed with a well represented A, B, and C horizon. Artifacts are largely confined to the A and B horizons which have a total depth of about one foot. No plowing has occurred at the site so that disturbance is limited to animal burrows, recent road construction (on part of the site), and whatever disturbance might have been caused by humans walking over the area. Only one or two human-dug pits were observed in our excavation.

Excavation of the site was begun in the summer of 1975 and expanded in the summer of 1976. The artifacts recovered represented predominantly the Archaic and Early Woodland with a very slight representation of later periods. The earliest artifacts recovered were of the type Kirk serrated. This type dates to about 7500 B.C. at the St. Albans site (Broyles 1971). The latest artifact was a stemless triangular projectile point which probably dates to a post A.D. 1000 time. By far the heaviest occupation, however, was by the people of the Savannah River Archaic.

Before proceeding with a description of the Savannah River occupation of the site, the nature of the horizontal separation of components at the site will be described. It seemed that each square or block of squares represented a fairly homogeneous occupation. This was especially evident in the different rock types represented by the flakes and tools from different units. For instance, one square yielded about a dozen, tiny (presumably) pressure flakes of jasper. Another square yielded about two dozen chalcedony flakes and/or artifacts. These rock types were rare or absent in all other squares. Two other areas yielded heavy concentrations of quartzite flakes and/or tools while few quartzite flakes were found elsewhere.

Thus, due to a relative lack of disturbance over most of the site (obviously excluding the road cut), it is felt that artifacts remained in pretty much the same position since they were left behind. Whereas most sites of such a shallow nature have been essentially contextually destroyed by the plow, this site has not. It thus became essential for the excavation procedure to record precisely in three dimensions the location of each flake, sherd, point, etc. The procedure we employed in the field consisted of measuring the distance from two square corner stakes (arc distance) and of calculating the elevation as determined from top of stake measurements. In addition, rough sketches were made in the field showing the position of each piece for a certain level. No plotting of artifacts from precise measurements was done in the field. Instead, computer plotting is being accomplished. A program utilized by Charles McNett and others at American University takes the raw field data and converts them to X, Y, Z coordinates. From this, plan views of the artifacts for a certain level or for the entire square may be plotted by the computer.

The knowledge of the Savannah River Archaic in the Watauga County area of northwestern North Carolina has increased over the last several years due to the survey and excavation program of Appalachian State University. During the excavation of 31Wt142 (the B. Taylor site) a large pit was discovered, the charcoal from which dated to 1740 +/- 80 B.C. (UGA - 1062). The charcoal was closely associated with a complete, quartzite Savannah River projectile point.

At the Wakeman site the Savannah River Archaic is represented by several concentrations of quartzite flakes and/or tools. The best defined quartzite concentration appears to have approximate dimensions of 20' by 20'. Within this roughly circular area, about 2500 flakes and/or tools have been found. Analysis of the artifacts from this complex is not complete and presents some real problems due to the raw material being quartzite. Wear and delicate chipping patterns are difficult to study. Edge angles, however, are expected to be of value in making gross functional distinctions. Only one Savannah River projectile point (of quartzite) has been recovered from the area. No quartzite projectile point blanks, rejects or broken points were present. One grinding stone and one possible ax were also recovered from this block of squares. The only floral or faunal remains found was one charred (hickory?) nut. Another concentration of quartzite flakes was located about 130 feet away from the first, but only one five-foot square has been excavated in that immediate area.

Conclusions

The Savannah River evidence at the Wakeman site is indeed puzzling. It represents a manufacturing station for quartzite tools; two to three thousand flakes and/or tools in a relatively small area of presumably rather short occupation duration would certainly lead to that conclusion. But what was the purpose of this manufacturing station? Only one projectile point was recovered, and there was no evidence of projectile point manufacture. Only one grinding stone was recovered. Although the functional analysis of the quartzite tool types represented by this assemblage is only just being begun, it would appear that most of the tools are knives or scrapers. This might lead one to speculate that this site represents an animal processing station. Although no faunal material has been preserved, present faunal evidence and the present availability of abundant forage for deer, elk, etc., would support the idea of the presence of these animals in the past.

If projectile points were utilized in hunting animals in the vicinity of the site, they were obviously manufactured elsewhere, perhaps nearer the source(s) of the quartzite. This would seem logical in view of the fact that the nearest known source for this rock is about 40 miles and 3000 vertical feet from the Wakeman site. Why then were large quantities of raw material carried to the site to manufacture knife-scraper tools? The answer here might well lie in the fact that if one is only manufacturing projectile points, quite a bit of wastage is involved; the removal of this wastage at or near the quarry would yield an obvious savings in weight to be transported. On the other hand, the manufacture of knives and scrapers would be much less wasteful and in fact almost any sizable flake could conceiveably be utilized with little or no retouch. Thus hundreds of tools could be produced from one core and little waste would have to be carried. If this is in fact the case, one might expect to find similar results at other sites in the area. Further, if the quarry area(s) could be located, extensive evidence of projectile point manufacture might be found.

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SOME TECHNOLOGICAL CONSIDERATIONS OF QUARTZ AS A RAW MATERIAL FOR FLAKED STONE IMPLEMENTS: EXPERIMENTS AND APPLICATIONS

C. Michael Baker
University of Georgia

During the past, many types of stone were selected by man to serve as raw materials for the manufacture of tools. If tool production was accomplished by either a percussion or pressure flaking technique, the raw material most often selected was one whose intended reduction could be completed by means of repeated conchoidal fractures. It might generally be true that raw material reduction and refinement strategies were closely related to the quality of siliceous stone available for use. On the other hand, even if the stone reduction technology was not conditioned in detectable measure by the type of stone utilized, few would disagree that, given a certain technique applied to different types of cryptocrystalline stone, the morphological characteristics of the resulting products would vary in a manner somewhat related to the properties of the different raw materials.

Raw material procurement strategies in the past probably varied in relation to a number of factors. The technological capabilities of a population in connection with its demographic and social structure, as well as natural environmental variables, broadly encompass more specific factors which influenced stone procurement and utilization patterns. Examples of factors which may have been important include the kinds of potentially usable lithic resources which occurred within a given population support area, the location of these resources within the same area, the degree of localization or dispersal of the resources, the volume of the resources, the ease with which they could be extracted, obstructing topographical features, and available means of transport, to name but a few. Whichever of these and other factors were most influential at any given prehistoric time-space coordinate, it is no doubt accurate to state that, in some cases, locally occurring lithic resources were utilized, while in others lithic resources were obtained from relatively long distances. The former example of stone resource procurement strategy appears to be evidenced by a Middle Archaic archaeological manifestation of the piedmont sections of Georgia and South Carolina.

In 1954, Joseph R. Caldwell (1954:37) reported the occurrence of "a distinctive, relatively early, chipped stone assemblage...at the Lake Springs site...on (the) upper Savannah River." The assemblage, because of its stratigraphic position and the predominant raw material represented, was named the "Old Quartz Industry." The Lake Springs assemblage was suggested to be "somehow related" to numerous surface sites in the Georgia and South Carolina piedmont which yielded only quartz artifacts. Indeed, such sites are numerous; however, their precise culture-historical affinity has not yet been demonstrated with satisfaction. Nevertheless it is true that the sites are related by the type of raw material utilized by their inhabitants. Since quartz occurs naturally in these areas, it may be inferred that local stone resource utilization was a characteristic pattern of economic pursuits during at least some segments of the Archaic. It would seem appropriate, therefore, in an area where quartz was apparently selected, modified, and used with great frequency, to consider the properties of this raw material as they might condition the process of chipped stone tool manufacture.

A general characterization of the response of siliceous stone to force applied through a variety of flaking techniques has been provided by a number of authors (Crabtree 1972a, 1972b; Faulkner 1973; Leach 1969; Speth 1972, 1974, 1975). The dynamics of direct percussion flaking have received special attention, and a model has been presented accounting for the complex mechanics of producing hard hammer percussion flakes (Speth 1972). Less sophisticated studies have shown that morphological differences exist between flakes produced by hard and soft hammer percussors (Crabtree 1972b). Generally, a hard hammer flake is relatively thick and has a pronounced bulb of force. An eraillure flake scar often appears on the bulb of force, and fissures or hackles commonly radiate outward from the point of impact on the inner surface of the flake. Compression rings or ripples are also commonly visible on the inner flake surface, and crushing may be evident at the contact area of the striking platform. Soft hammer flakes in comparison are relatively thin, exhibiting a diffuse bulb of force. Eraillure flake scars are less common, and neither fissures nor compression rings occur except on the more isotropic siliceous materials. Platform crushing is rarely evident, and a lip or overhang often occurs on the proximal inner surface of a soft hammer flake.

None of these characteristics, however, is exclusively dependent on the type of percussor utilized. For example, a flake produced with a soft hammer may exhibit a pronounced bulb of force. Nevertheless, these characteristics generally may be used to distinguish the effects of using different percussors during direct percussion flaking. These criteria may be especially applicable in studying the process of flake production when model materials (e.g. glass, obsidian) exhibiting regular conchoidal fracture are utilized (Speth 1974:8). On the other hand, the degree to which the criteria are useful in studying other siliceous materials, such as quartz, has not been determined.

As a variety of cryptocrystalline stone, quartz is less homogeneous, less isotropic and more granular than, for example, chert or obsidian. Consequently, the response of quartz to some applied force may be expected to differ somewhat from other materials. Resulting flakes may also be expected to differ morphologically.

In order to evaluate and characterize the response of quartz to force applied through a direct percussion technique, an experiment was designed whereby two samples of flakes were produced from quartz nodules using both hard and soft percussors. The experiment was expected to provide data which would be useful in describing those attributes of flakes produced by percussion which might be peculiar to quartz. Further, the experiment was considered potentially to be useful for future studies attempting to discern aboriginal stoneworking techniques and reduction/refinement strategies where quartz, or similar granular stones, served as the raw material.

The quartz utilized in the experiment was obtained from a large outcrop in Putnam County, Georgia near the Oconee River. The location has been characterized as a quarry site (Dean Wood, personal communication, 1975); however, the prehistoric importance of the site is unknown, and the degree to which the area was utilized will have to be determined through additional investigation. There is no doubt however that the site was utilized, for concentrations of waste flakes in the vicinity of the outcrop indicate past stoneworking activities.

The material itself was a granular milky quartz which was fairly homogeneous although some impurities were present. Individual crystals in the stone were not observable without magnification; however, the crystals were sufficiently large to give the material a rough texture. Nodules selected averaged around 15 centimeters in their longest dimension. Angular nodules were chosen having edge angles roughly ranging between 50-75 degrees. Such angles provided natural striking platforms.

The direct percussion implements selected included a diorite hammerstone weighing 165 grams and the butt section of a white-tailed deer antler weighing 178 grams. The curvature of the hammerstone was approximately equal to the curvature of the antler viewed in cross-section. Following the experiment, the percussors were again weighed, and it was determined that the weight of each implement had been reduced. The hammerstone weighed 154 grams, and the weight of the antler was 173 grams.

The experimental procedure simply consisted of striking flakes from the quartz nodules using the respective percussion implements. Both the percussors and nodules were hand-held. Each implement was used to remove 100 flakes. In order to control for the striking platform angle, when possible, a soft hammer flake would be removed from a nodule and subsequently, a hard hammer flake would be removed adjacent to the previous flake scar. Nevertheless, the striking platform angle and the thickness of the platform were difficult to control except within certain limits.

During the experiment, after the removal of each flake, several observations were recorded. The first observation was whether or not flakes had inadvertently detached from areas of the nodules not contacted by the percussors. During preliminary experimentation, some flakes were seen to detach even from the opposite side of the cores from which a flake had been purposefully struck. A second observation was whether a flake broke into smaller fragments upon detachment. The number of flakes, if present, and their direction of fracture were noted. Finally, the distal fracture characteristics of each flake were recorded. When these observations had been made, each flake was placed in a separate appropriately labelled envelope. As stated previously, 100 soft hammer and 100 hard hammer flakes were produced for comparison.

The flake samples were analyzed and compared by using the set of discrete attributes outlined in Figure 1. Each flake was inspected under fluorescent lighting; and, after all observations were made, the frequencies of occurrence of each attribute for each flake sample were tabulated. These data were then compared, and, where relevant, evaluated with a chi-square statistic. The following results were obtained.

Only four cases of inadvertent flake detachment occurred during the production of flakes with the hammerstone. Only one case was observed when using the antler baton. All occurrences consisted of singular inadvertently detached flakes.

In both samples of flakes, bulbs of force were observed in very low frequencies. Only 8 hard hammer flakes and 4 soft hammer flakes exhibited bulbs of force. Even on these occasions the bulbs were quite diffuse and scarcely noticeable. Overall, in both flake samples only a slight swelling could be observed on the proximal inner flake surfaces. Eraillure scars were noticeable on each of the soft hammer flakes exhibiting bulbs of force yet only 2 of the hard hammer flakes with bulbs of force exhibit eraillures. Overall, the occurrence of eraillures was quite infrequent and, when present, were actually questionable as to their existence. Both compression rings and fissures also occurred in very low frequencies. Compression rings occurred on only 4 hard hammer and 3 soft hammer flakes. Fissures were noticeable on 4 hard hammer flakes, but none were observed on flakes produced with a soft hammer.

The frequencies of flakes which broke upon detachment from the nodules are listed according to fracture characteristics in Table 1. As indicated, a greater frequency of hard hammer flakes broke during their detachment. In order to evaluate the significance of this difference, a chi-square test was utilized which yielded the value of $\chi^2=12.7638$ with 3 degrees of freedom. The corresponding level of significance was approximately .005, suggesting a reasonably clear non-random association between the flake breakage characteristics and the percussion technique employed. With both samples, the predominant fracture was one which occurred longitudinal to the long axis of the flake.

Table 2 lists the flake curvature characteristics of the two samples. The majority of the hard hammer flakes exhibited no curvature while the majority of the soft hammer flakes were concave. Only a small percentage of flakes within either sample were convex. A chi-square test run on these data yielded a significance level of less that .025 ($\chi^2=8.3403$, d.f.=2), allowing the tentative rejection of the hypothesis that there was no difference between the samples.

The point of impact characteristics of the flakes within each sample are given in Table 3. Before these characteristics were noted, each flake was washed to eliminate minute particles of stone from the striking platform. This was done to simulate the effects of natural weathering which would reduce the shatter adhering to the surface of aboriginal flakes. The point of impact was undetectable in 70% of the soft hammer flakes; however, in the hard hammer sample, two-thirds of the flakes exhibited points of impact which were readily noticeable. In addition, 34% of the hard hammer flakes were indented on the inner surface of the flake at the point of impact. A chi-square test of these data gave a value of $\chi^2=29.2794$ with 2 d.f., suggesting that the observed differences between the samples was likely to occur by chance only once in a thousand times ($p<.001$).

When viewed under fluorescent lighting, fracture planes or force fractures were observed on the flakes with rather unexpected frequency (Table 4). No multiple fracture planes were observed. However, 30% of the hard

Figure 1. Qualitative attributes observed during the quartz flake analysis.

A. Inadvertent Flake Detachment
    1 absent
    2 singular
    3 multiple

B. Flake Breakage During Detachment
    1 absent
    2 singular oblique
    3 singular longitudinal
    4 multiple oblique
    5 multiple longitudinal
    6 longitudinal & oblique

C. Distal Fracture Characteristic
    1 hinge
    2 step
    3 feather
    4 core

D. Outer Flake Surface Characteristics
    1 flat
    2 concave
    3 convex
    4 ridged obliquely
    5 ridged longitudinally
    6 irregular

E. Lateral Margins
    1 parallel
    2 symmetrical, not parallel
    3 irregular

F. Flake Curvature
    1 straight
    2 concave
    3 convex

G. Bulb of Force
    1 absent
    2 present

H. Eraillure Flake Scar
    1 absent
    2 present

I. Platform Configurations (Outer Surface)
    1 straight
    2 concave
    3 convex
    4 angular
    5 irregular

J. Platform Configuration (Inner Surface)
    1 straight
    2 concave
    3 convex
    4 angular
    5 irregular

K. Point of Impact
    1 absent, undetectable
    2 present
    3 present, indention

L. Compression Rings
    1 absent
    2 present

M. Fissures
    1 absent
    2 present

N. Force Fractures
    1 absent
    2 singular oblique
    3 singular longitudinal
    4 multiple oblique
    5 multiple longitudinal
    6 longitudinal and oblique

Table 1. Distribution of fracture characteristics among experimental flakes.

	absent	oblique	longitudinal	long. & oblique	Totals
hard hammer	52	10	30	8	100
soft hammer	76	4	15	5	100
Totals	128	14	45	13	200

Table 2. Distribution of curvature characteristics among experimental flakes.

	straight	concave	convex	Totals
hard hammer	46	40	14	100
soft hammer	35	59	6	100
Totals	81	99	20	200

Table 3. Distribution of point of impact characteristics among experimental flakes.

	absent	present	present, indention	Totals
hard hammer	34	32	34	100
soft hammer	70	21	9	100
Totals	104	53	43	200

Table 4. Distribution of force fractures among experimental flakes.

	absent	oblique	longitudinal	Totals
hard hammer	70	6	24	100
soft hammer	81	3	16	100
Totals	151	9	40	200

hammer flakes exhibited singular force fractures, and 19% of the soft hammer flakes exhibited the same. A chi-square test was performed on the data to evaluate the observed differences with the results supporting the null hypothesis of association (χ^2=3.4013, d.f.=2, p>0.1). The pattern in the observed data, nevertheless, suggests the potential for using this attribute to discriminate flaking techniques.

Both the inner and outer surfaces of the striking platforms were categorized according to their general configuration. The outer platform surface configuration was mainly a function of the quartz nodules' outer surface morphology. The inner surface configuration of the platform, on the other hand, was to some degree conditioned by the mode of flake production utilized. The frequency distribution of the inner surface platform characteristics is provided in Table 5. Although the chi-square test indicated differences between the samples to be at a rather low order of significance (χ^2=6.3807, d.f.=4, p >0.1), the following observations were made.

A straight inner platform surface was noted on a larger percentage of the hard hammer flakes. Also, more of the hard hammer flakes had irregular inner platform surfaces. This possibly was related to the number of hard hammer flakes which were indented at the point of impact. By far the majority of the soft hammer flakes exhibited a convex inner platform configuration. The percentage of convex inner platform surfaces was greater for the sample of flakes produced with the antler baton.

The distal fracture characteristics of the flakes from both samples were very similar. Eighty-one of the 100 hard hammer flakes feathered from the nodules during their detachment while 84 of the soft hammer flakes feathered. The remaining flakes in each sample, 19 and 16 percent respectively, exhibited either step or hinge fractures. While these differences between the samples are not statistically significant, overall the proportion of hinge and step fractures is considered somewhat higher than would normally be expected.

The lateral margins of the flakes in each sample produced were essentially the same in configuration. Twenty-two and 24 percent of the hard and soft hammer flakes had symmetrical marginal edges with the majority in each sample being irregular. The flake edge configuration was probably dependent upon the outer core surface morphology and independent of the flaking technique employed.

Discussion

The results of the analysis indicate that the different flaking implements employed produced flakes, which in some cases, exhibited attributes whose frequency of occurrence was determined to be statistically significant between the samples. The criteria which were most useful in distinguishing between percussion techniques include the frequency and character of flake breakage during detachment, force fractures, point of impact characteristics, inner platform surface configuration, and flake curvature.

As noted, a relatively large number of flakes broke upon their detachment from the nodules. However, a significantly greater number of hard hammer flakes were observed to break. The majority of the breaks which occurred in each sample were longitudinal. The resulting fragments from such a break exhibit angular surfaces which are roughly perpendicular to the striking platform. That such a high proportion of angular flake fragments were produced during the experimentation may help to explain the frequent occurrence of similar items in aboriginal quartz artifact assemblages.

Commensurate with the occurrence of flake breakage during detachment were the relatively high frequencies of force fractures observed on flakes which had not actually fragmented. While the frequencies of force fractures within the samples were not statistically significant to a great degree, their relatively frequent occurrence may be a common phenomenon and may also be used to distinguish the types of percussion techniques employed for flake production.

Flake curvature was a characteristic found to be useful in distinguishing between percussion techniques. The statistical significance of the frequency variations between the samples was relatively high; however, these results are accepted with a degree of caution. It may be that the degree of flake curvature was related to the morphological characteristics of the nodules from which the flakes were produced. Further experimentation will be necessary to clarify the relationships. The most significant frequency variation between the samples was the observation of point of impact characteristics. The exact point of impact was not discernible on most of the soft hammer flakes. However, on 66 of the hard hammer flakes the point of impact was readily detectable. It is no doubt true that the hammerstone, because of its hardness, crushed the platform at the point of impact. The force of the hammerstone being focused at one particular point possibly also accounts for the relatively high frequency with which indentions were produced on the inner surface of the platforms at the points of impact. The presence and characteristics of the point of impact, then, are quite useful for discerning different techniques of flake production.

Viewed in connection with the point of impact characteristics, the inner surface configuration of the striking platform is also useful for distinguishing between flaking techniques. Though the frequency variations between the samples were not greatly significant, they do suggest an interesting hypothesis. Considering only those flakes whose platform inner surface was either straight or convex, it is readily seen that a greater number of soft hammer flakes had convex inner platform surfaces. The hard hammer flakes exhibited straight inner surfaces with greater frequencies. Taking into account the point of impact indentions on the hard hammer flakes and the corresponding relatively high frequencies and percentages of straight platform inner surfaces, it may be suggested that the force of a hard hammer serves to collapse the bulb of force to a detectable degree. This notion however requires further attention.

The overall results of the experiment and analysis indicate that hard hammer and soft hammer percussion flaking techniques, when applied to quartz, yield flakes which vary according to the frequency of occurrence of certain attributes. These findings suggest, therefore, that the experimental data may be useful to consider in attempting to discern prehistoric stoneworking techniques.

Application

In order to evaluate the feasibility of employing the set of qualitative attributes for this purpose, an analysis of a sample of unbroken quartz flakes from a prehistoric assemblage was undertaken. The flakes (N=100) were chosen from a surface collection obtained from 9Pm113, a multi-component site in Putnam County, Georgia. It should be noted that the precise culture-historical affinity of the sample and the degree to which post-depositional processes have altered the sample are both unknown.

Each of the 100 flakes was inspected under fluorescent lighting. A set of four attributes was referred to that included those from the experimental study which, in their various states, were found to be the best indicators of the different flaking techniques. These attributes are point of impact characteristics, flake curvature, inner platform surface configuration, and force fractures.

Following the observation of these attributes for each flake, their frequencies of occurrence were tabulated for the entire sample. As indicated in Table 6, the point of impact characteristics were fairly equally distributed. However, the distribution of the characteristics relating to flake curvature and inner platform configuration exhibited a somewhat different pattern.

In order to ascertain the relative significance of the frequency distributions for these latter characteristics, the entire sample of flakes was divided according to the three states of the point of impact attribute. This attribute was shown to be the most distinguishing criterion between the experimental samples. The results of chi-square tests run on these data (Tables 7 and 8) indicated only slightly significant distributional differences in the curvature ($\chi^2=7.6152$, d.f.=4, $p \cong 1$) and inner platform surface characteristics ($\chi^2=17.8366$, d.f.=8, $p<.025$) according to the three sub-samples. These findings do not allow the rejection of the null hypothesis that there is no difference between the samples. Nevertheless, the general patterns of these data are in keeping with the results of the experimentation.

Force fractures were not observed in great frequency among the aboriginal flakes (Table 6). A chi-square test of these data demonstrated insignificant associations of force fractures with point of impact characteristics.

A separate sample of aboriginal quartz flakes (N=215) was randomly selected to measure the frequency with which flake breakage occurred during prehistoric stoneworking activities at this site. Although breakage characteristics (i.e. oblique, longitudinal, etc.) were not tabu-

Table 5. Distribution of inner platform surface characteristics among experimental flakes.

	straight	concave	convex	angular	irregular	Totals
hard hammer	21	4	57	4	14	100
soft hammer	16	4	70	5	5	100
Totals	37	8	127	9	19	200

Table 6. Distribution of flake characteristics within the aboriginal sample.

Point of Impact	
absent, undetectable	39
present	32
present, indention	29

Curvature	
straight	37
concave	56
convex	7

Inner Platform Configuration	
straight	29
concave	3
convex	46
angular	6
irregular	16

Force Fractures	
absent	90
singular oblique	1
singular longitudinal	3
multiple oblique	1
multiple longitudinal	2
long. & oblique	3

Table 7. Distribution of curvature characteristics according to sub-groups of aboriginal flakes based upon point of impact characteristics.

	straight	concave	convex	Totals
absent	9	27	3	39
present	12	18	2	32
indented	16	11	2	29
Totals	37	56	7	100

Table 8. Distribution of inner platform surface characteristics according to sub-groups of aboriginal flakes based upon point of impact characteristics.

	straight	concave	convex	angular	irregular	Totals
absent	12	2	23	0	2	39
present	7	1	16	2	6	32
indented	10	0	7	4	8	29
Totals	29	3	46	6	16	100

lated, it was observed that, of 215 flakes, 141 (66%) were broken and 74 (34%) were complete. Although somewhat questionable, on theoretical grounds these data suggest that flake breakage occurred during flake detachment approximately 50% of the time. In any case, these data do point to the occurrence of a high incidence of flake breakage, a significant finding of the experimental study.

At this point it would be erroneous to employ the results of the present analysis in generalizing about stoneworking techniques utilized in the past at 9Pm113. The "mixed" nature of the sample studied as well as its small size preclude such generalizations. As stated, this was a study designed to evaluate the feasibility of using a certain set of qualitative attributes in order to discern past stone reduction techniques. As such the study can be termed at least a partial success. The attributes delineated for the experimental samples were also observable on the aboriginal flakes. In addition, the patterns of occurrence of these attributes on the aboriginal flakes were somewhat similar to the experimental findings.

Of course the attributes utilized are not the only ones which could be employed in studying the technology of quartz nodule reduction. In fact, a limitation of the subsequent comparative study was that flakes resulting from initial reduction activities were compared with those from an assemblage probably representing various stages of different reduction/refinement strategies. Also, the attributes chosen are technological, and their relationship to functional activities or stylistic configurations is unknown.

No continuous or quantitative attributes were employed in this study, a shortcoming which should be considered in future research dealing with this subject. It is also true that the attributes observed may occur on flakes independent of the percussion technique involved. However, with large samples of aboriginal flakes, the attributes used in this study, in conjunction with others, may be useful in characterizing technological developments at particular time-space coordinates and their possible change through time.

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THE BIOLOGICAL AND SOCIAL ANALYSIS OF A MISSISSIPPIAN CEMETERY FROM SOUTHEAST MISSOURI: THE TURNER SITE, 23BU21A*

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In recent years, mortuary analysis has made important contributions to our understanding of prehistoric societies. Many of the studies which have been published have dealt with large, complex sites. Furthermore, they have examined undisturbed cemeteries containing the remains of well-preserved individuals. In general, poorly preserved and badly disturbed cemeteries have been written off as a waste of time. Another characteristic of these studies has been that the mortuary analysis is performed by an archaeologist who is dealing with information provided by a physical anthropologist. This presents some difficulties with well-preserved remains, but creates almost insurmountable problems when the skeletal material is in poor condition. I undertook the analysis of the Powers Phase burials in order to demonstrate two points: First, the analysis of disturbed, poorly preserved human remains can be profitable; and second, that mortuary analysis can be greatly facilitated when the entire analysis is performed by one person.

The Powers Phase was a Middle Mississippian society of Southeast Missouri. Excavations of Powers Phase sites have been conducted by the University of Michigan Museum of Anthropology. Burials from three sites of the Powers Phase were examined. The largest site of the phase, Powers Fort, a ceremonial center with a truncated mound, is located at the edge of the Ozark escarpment in Butler County. Limited excavations at Powers Fort yielded five adult and three infant burials. Two Powers Phase villages, Turner and Snodgrass, were nearly completely excavated. A cemetery which yielded 54 burials containing 118 individuals was excavated at the Turner site. However, Snodgrass, which is located just 200 yards from Turner, produced only six scattered adult burials from the village area, and several infant burials from beneath house floors.

A number of problems were encountered in the examination of the Powers Phase burials. First of all, with the exception of Powers Fort, the preservation of the skeletons was poor. Very few vertebrae, ribs, hands, feet, or long bone epiphyses were recovered. Second, when the existence of the Turner cemetery became known to pothunters, they descended on the site in droves and did a very effective job of looting the burials, destroying much of the skeletal material in the process. Third, during storage, bones from some of the burials somehow became mixed together. It is clear, therefore, that the Turner site cemetery will provide a test of the value of mortuary analyses under adverse circumstances. A number of physical analyses provided most of the basic data used for the social analyses. The most critical of these physical analyses were the assessment of age and sex.

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*The detailed analysis is now in print: The Biological and Social Analysis of a Mississippian Cemetery from Southeast Missouri, 23BU21A, University of Michigan, Museum of Anthropology, Anthropological Papers 68. TKB 8/16/83.